# Evaluation of the tax incentive for private investors in Sweden

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# Evaluation of the tax incentive for private investors in Sweden[*]

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## Abstract

Governments around the world have introduced angel investor tax credits to stimulate equity financing with the purpose to foster innovative entrepreneurship. This evaluation study provides an analysis of the investor tax deduction programme that was introduced in Sweden 2014. Exploiting investor eligibility for the tax subsidy, we use a difference-in-difference approach to estimate the performance of the beneficiary firms compared to firms backed by non-eligible investors. We further investigate the investors and investment characteristics. Our findings imply that the programme seems to direct funds to companies with low growth prospects. The descriptive analysis indicates that the majority of investors targeted by the program most likely are not sophisticated business angels or driven entrepreneurs. The programme therefore seems to contribute to a poor allocation of funds in the economy.

**Keywords**: business angels, investor tax credit entrepreneurship policy, government subsidy

**JEL classification**: G24, G32, H71, L26,

# 1.  Introduction

Start-ups and small and medium enterprises (SMEs) are important for job creation and economic growth, driving innovation and aggregate productivity growth (Holden, 2007; Decker et al, 2017). To foster high-growth entrepreneurship, governments around the world pursue a broad industrial policy, including supply-side and demand-side instruments, ranging from investment incentives, and public procurement to public support of the provision of skills. After the 2008 global financial crisis, policy makers have been concerned about a decline in innovative entrepreneurship, with limited access to financial capital considered an important driver. A policy instrument that has since received particular attention and been adopted by an increasing number of countries since, is angel investor tax credits (European Commission, 2017).

Angel investors are wealthy individuals who directly invest their own money, either alone or with others, in private firms without family connections (Mason and Harrison, 2008; Lerner, 2000). Business angels are considered an important source of funding for entrepreneurial business, particularly in providing funding at early stages where the required amounts are too small to be considered economic by venture capital funds (Mason and Harrison, 2011). In addition to finance, angels typically bring expertise, knowledge and networks to the company.

The rationale for promoting business angel investments is that early-stage investing is considered disproportionally affected by credit market imperfections. By reducing risk, lowering investment costs and increasing expected returns, government policy is expected to boost financing for firms that have positive net present value investment projects once market failures are internalised.

Tax incentives targeting angel investors have several advantages compared to direct firm subsidies. There is no picking-winners or distortion of competition since investment decisions are made by angels and the market. The instrument is more precise than a general tax relief of capital gains. In addition, administrative costs are relatively low (Denes et al, 2020). However, although a tax credit programme offers attractive flexibility, there is no guarantee that local high-growth entrepreneurship will be stimulated. As pointed out by Denes et al (2020), this requires that investors with the experience and skill to allocate capital to high-quality startups increase their investment activity in response to the policy. Also, it needs good investment projects and companies experiencing a shortage of funding.

An increasing number of policy evaluations of angel investor tax credit programs have been introduced in the aftermath of the financial crisis. This report adds to the literature by evaluating the Swedish tax deduction for investments by individuals introduced in December 2013. The tax incentive is targeted at private investments in SMEs, providing seed, start-up or expansion capital in the form of equity. Insiders, such as founders, shareowners and other related persons, can benefit from the measure if shares are acquired when the firm is established, but business angels only are eligible investors if new shares are issued at a later stage. Before the policy introduction, the Swedish authorities estimated the share of angel investments to be approximately 12 % of total tax claims, whereas the main part of tax claims consisted of start-up financing.

To examine whether the investor tax relief has had the intended fostering effects on entrepreneurial activity and early-stage financing, we conduct a threefold analysis. First, we examine the developments since policy introduction in external equity financing in small businesses, in all firms as well as in high sales growth firms and young firms. Next, since several prior studies have displayed evidence that the investor tax policies are targeting unexperienced investors, see section 2.3, we provide a detailed analysis of the investor group claiming tax deduction. Finally, we explore the effectiveness of the tax relief design in promoting firm growth. By comparing the performance of firms that receive investments from business angels benefiting from the tax relief, with similar firms that receive investment from non-eligible sources such as VC-funds, pension funds, insiders and other institutional investors, we can address the two prerequisites mentioned above. First, the empirical design provides an indirect test of the programme's ability to attract knowledgeable investors. Second, in a similar vein we can indirectly test the effectiveness of the tax reform in alleviating the equity gap faced by small businesses. If both prerequisites are satisfied, we can expect the beneficiary firms to perform at least as good as the non-beneficiaries. On the other hand, a poorer performance by beneficiary firms implies that the tax incentive is subsidising investments that are deemed less profitable without the subsidy.

Our results suggest that the Swedish investor tax relief programme displays low precision and modest performance. A cited goal in the preparatory documents for the tax incentive is to increase angel and entrepreneurial activity. Following the introduction of the programme, we do not observe a surge in external equity investments by professional investors, neither in the amount nor number of deals. Moreover, the beneficiary firms relatively underperform the non-eligible firms both in terms of future turnover and value added, implying that the type of investor responding to the tax incentive are relatively less skilled. The descriptive analysis of investor characteristics confirms that individuals claiming the tax subsidies have in general low industrial and managerial experience.

Similarly, tax reliefs for start-up financing do not appear to produce projected results. Firm founders do indeed take advantage of the programme, but instead of increasing equity capital investments, the tax relief is frequently used as a rebate on minimum start-up capital. On average, founder and start-up investor characteristics do not signal innovative entrepreneurship, but rather individuals coming from "FFF" (i.e. family, friends and fools) or founders classified as "combinators" (i.e. those with an employment as their main income). In conclusion, transferring funds to both these investor groups does not seem to generate added value. Without additionality, the investor tax subsidy cannot be motivated.

The paper proceeds as follows. Below we review the literature on investor tax credits. We then describe the policy context in various countries and end the section with a presentation of Sweden's programme for investor tax deduction. In the following section, we present data and summarise our descriptive analysis. Next, we outline the empirical approach to assess the effect of investor tax subsidies on firm growth. The results of our empirical analysis are presented in the next section and potential explanations for the findings are discussed. We conclude with policy implications.

# 2.    Literature review

## 2.1    Financial constraints for innovative entrepreneurship

One of the financial system's very important roles is to identify and fund profitable ventures. However, it has been questioned how efficient the capital markets are functioning for innovative entrepreneurship. There are several lines of arguments speaking for financial frictions (Stiglitz and Weiss, 1981; Berger and Gottschalk, 2022). The value and risk of a project are only known to the firm's insiders. These information asymmetries may lead financiers to increase the price or ration investments, which adversely affects the supply of capital (Akerlof, 1970). A second problem driven by information asymmetries is moral hazard which occurs when credits have been approved, and entrepreneurs take on excessive risk, misuse the funds or decrease their commitment to the project (Holmstrom, 1979). It is argued that informatic asymmetries particularly holds for growth firms with intangible assets (Freel, 2007; Schneider and Veugelers, 2010). In addition, intangibles are less redeployable, have uncertain liquidation values, and cannot serve as collateral, which further increases risk. The intangible character of technical innovations may also expose the firm to knowledge dissemination to potential competitors. It is scholarly believed that these knowledge spillovers are socially beneficial but prevent the full appropriation of investments (Arrow, 1972; Levin, 1988). Asymmetric information and spillover externalities on the capital markets for new venture entrepreneurs imply that private investments in innovative entrepreneurship are generally too low. In theory, this suggests that governmental intervention to correct these market failures is warranted. In practice, such financial constraints are difficult to identify. On well-functioning financial markets, a lack of finance would indicate bad projects rejected by sophisticated investors.

## 2.2    An efficient investor tax relief programme

Financial incentives such as investor tax reliefs are one of the most frequently used policies to encourage investing at firms' early stages (Lerner, 1998; Criscuolo et al 2022a and 2022b ). As discussed earlier, subsidies to angel investors could be a cost-effective policy instrument to facilitate additional equity funding into entrepreneurial firms. However, since the policy is regressive, reallocating income from taxpayers to already wealthy individuals, it is absolutely key that there is additionality. Subsidies to private investors could leave investment decisions and aggregate supply of financing unaffected, while private funds are replaced by public funds (Berger and Bergschalk, 2022). An effective policy should target high-skilled, wealthy, individuals who have the capacity to channel scarce resources into qualified firms and possess the necessary skills to add value such as managerial support, business strategy and networking. Conversely, the introduction of the investor subsidy should not induce investors to increase the number of investments beyond their optimal commitment level, such that the extent of managerial advice that each company receives is lowered (Boadway and Keen, 2006; Kannaianinen and Keuschnigg, 2003). Lastly, but not less importantly, the policy should not push households into excessively risky savings portfolios but target well-off investors that are able to absorb losses (Bach et al, 2022).

Taken together, an inefficient tax incentive would not automatically have positive effects on aggregate financing. Furthermore, policy could back inferior firms, and subsidizing additional bad investments that would not be profitable without the subsidy (Bach et al, 2022). As we will see next, the policy design could also be financially unattractive or too complex which will prevent policy take up. For an overview of desirable features in the design and operation of investor tax incentive programs, see European Commission (2017).

## 2.3    Evaluations of investor tax incentive programmes

Table 1 presents academic studies and official reports evaluating the effects of investor tax incentives on investors and investments. This strand of literature is thin, but recent and growing, in hot pursuit of the evaluability of the many policy introductions that followed the 2008 financial crisis. As expected from an emerging literature, the studies are diverse as regards empirical approach, data collection and outcome focus. Whereas some evaluations rely on descriptive analysis based on questionnaires and interviews, others use more sophisticated econometrical methods with control groups.

We find six recent studies with a counterfactual approach. Barker (2017) and Denes et al (2020) both uses cross-state identification, exploiting the staggered introductions and expirations of state-level tax credit programmes in the United States. In an extension, Denes et al (2020) compare a control group of certified applicant firms that failed to find a subsidised investor with firms financed by investors receiving a tax credit, thus both groups include eligible firms. Also, Cowling et al (2008) compare firms within the Enterprise Investment Scheme (EIS) in the UK with a control group of unsupported firms. The unsupported firms were matched in terms of sector, fixed assets and age to resemble the firms within the scheme, but unlike in Denes et al's study, firm capital demand is non-observable. In a German study, Berger and Gottschalk (2021) compare entrepreneurial firms that are eligible vs non-eligible for the introduced investor credit programme, INVEST – Zuschuss für Wagniskapital". In this scheme, firm eligibility is mainly based on industry classification and patent ownership. Gonzalez-Uribe and Paravisini (2019) evaluate the Seed Enterprise Investment Scheme (SEIS) launched by the UK government in 2012, also by exploiting eligibility-induced variation for identification. Qualified firms correspond to firms younger than two years that conform to certain size criteria in terms of maximal gross assets and number of employees. This group approximates more than half of the UK firms. Outcomes are compared for firms with assets near the eligibility threshold, and the age criterion is used to perform a placebo test. Lastly, Solodoha et al (2023) examine the Angels Act policy implemented in Israel in 2011. Firms are grouped into a treatment and control group according to period of establishment, where the latter group refers to start-ups established before the Angel's Act.

Table 1 Summary of policy evaluations of investor tax incentive implementation

| Author, yr, country | Identification | Empirical approach | Outcome variables | Results |
|---|---|---|---|---|
| Barker, 2017<br>US, Iowa (AITC, IFTC) | Cross-state | FE, negative binomial regression model, panel data analysis | Number of investment deals, average size of deals and various growth entrepreneurship metrics | Inconclusive results on the effect of the number and average size of investments; share of scale-ups and the density of high growth companies were affected by the existence of a tax credit measured using the tax credit rate, while the average growth rate of startups was not. |
| Bell, Wilbanks and Hendon, 2013<br>US | State-level variation | Descriptive analysis with t-tests (pretest-posttest) | Entrepreneurial activity (entrepreneurs per capita) | The rate of increase in entrepreneurial activity greater than policy introduction in 22 (29) states |
| Berger and Gottschalk, 2021<br>Germany | Eligible vs non-eligible entrepreneurial firms in annual survey data | Difference-in-difference<br>Matching based on founding team and company characteristics | Probability to receive angel investor funding, amount of angel capital, angel investor engagement | After policy introduction, increased angel financing in terms of the number of firms and financing amounts. No effect on managerial support. Significant entry of new investors |
| Bilau et al., 2017<br>Portugal | | Survey data | Take-up, angel views | Low take-up of tax relief amongst angels, heterogenous angels vary in responsiveness |
| Carpentier and Suret, 2007<br>Canada | Reference group of firms of the same size and industry | Descriptive analysis with t-tests | Business angels vs current shareholders, profitability (return on equity, net margin) performance (sales growth, equity growth) | Few angels participate (FFF (40-50%) investments that would have been made regardless), poor quality of firms that benefit from the programme (the programme attracted lemons), firms also underperform compared to the companies of the same size and industry |
| Cowling et al., 2008<br>UK (EIS, VCT) | Control group of unsupported firms | Panel data analysis, FE and RE, Hausman Matching based on sector, fixed assets and age | Gross profits, profit margins, fixed assets, labour productivity, debt/equity, investment, survival rates, sales turnover, employment | (EIS, VCT) Gross profits (+0); Profit margins (--); Fixed assets (++); Debt/equity ( -0); Investments (00); sales turnover (++); labour productivity (+0); Employment (++); survival (--); |
| Denes et al., 2020<br>US | A. State-level variation in tax credit introduction<br>B. Failed applicant firms as control group<br>C. Investor + LinkedIn<br>D. Investor survey | A. Diff-in-diff; B. FE<br>Control variables: Programme restrictions, supply of alt. startup capital, pre-investment empl., empl.growth, founder experience, professional vs non-professional investors | A. Number of angel investments, various entrepreneurial activity metrics (13 outcome var)<br>B. VC-funding, employment growth | A. Increase in the number of angel investments<br>No significant effect on entrepreneurial activity (13 variables)<br>B. No effect on VC-capital, successful exit or employment growth<br>C. investment increase driven by inexperienced investors |
| EDRG, Inc. and Karl F. Seidman Consulting Services 2014<br>US (Minnesota) | | Descriptive based on programme data, surveys and interviews, economic model simulation | Equity investments in qualified small businesses, credit, number of jobs and wages of those jobs in beneficiary businesses, change in tax paid, net benefit to state | Angel, in-state investment, increased but likely due to the end of a recessionary period), 80% new to angel investments, programme increased awareness of investment opportunities, employment growth, cost-benefit ratio below 1, according to simulation, |

| Author, yr, country | Identification | Empirical approach | Outcome variables | Results |
|---|---|---|---|---|
| Gonzalez-Uribe and Paravisini, 2019 UK (SEIS) | Eligibility vs non-eligible (total assets, age) firms at policy launch | Difference-in-difference Placebo test with age | Probability of equity issuance, investment (change in net fixed assets) | Increased probability of an equity issuance, increased average amount of issued equity, increased number of equity investors, low take-up of subsidy by majority of eligible firms (only 1% of eligible firms taking advantage of the subsidy); increasing investments (more than equity infusion) for subsidy takers |
| Hellman and Schure, 2010, Canada | Comparison with VC-investors (also beneficiaries) + 2 control groups | Mostly descriptive analysis based on register data, survey, interviews, case study | Total taxes, tax credits, firm performance (empl, wages, revenues, assets), firm financial performance | Tax income increases, job and revenues increase, leveraged capital increased. Ind. invest. underperform relative VC invest but access more debt capital, low rates of successful exits or failure. |
| Hendon et al, 2012 US (Hawaii, Louisiana, Wisconsin, Minnesota, Oregon, Vermont) | | Meta evaluation, literature summary of evaluations | Discussion of various outcome measures | State investment tax credit programmes vary with eligibility, level of funding available per investment and per year, and whether the credits are refundable. All these factors can cause significant variability in effectiveness of a state programme. |
| Li et al., 2016 China | Regional variance economic factors | Panel data analysis Control variables: Regional GDP-growth, regional angel total assets, regional fixed assets investments, population | Angel investment amount, return on investment | Increase in angel investment amounts (of multiple policies), regional economic growth |
| Rehrmann et al., 2017 US (Maryland) | | Descriptive | Program design, bankruptcy, investments, jobs, new firms | Many firms out of business, few jobs created, no evidence of increased investments in industry or increased company formation and net growth |
| Schulte, 2016 US | Control group of "matched" states without angel tax credit | Longitudinal pretest-posttest with a control group | New technology jobs/firms | No effect on new technology jobs |
| Solodoha et al., 2023 Israel | Eligible vs non-eligible in terms of period of establishment | Diff-in-diff, negative binomial regression model. PSM based on number of entrepreneurs, managers and financing rounds, prior entrepreneur experience, entrepreneurs with PhDs/MDs, firm age | Number of investors per start-up, average investment per firm | Decrease in number of angels investing. Investments decreased compared to counter factual. Complexity of policy conditions one reason. |
| Toumi and Boxer, 2015 US (Maryland, Wisconsin) | | Regional input-output modelling system (no control group) | Gross output, value added, earnings, employment | A substantial boost in leveraged capital (additive investment funds), local employment, earnings, and value added. In particular, the generated revenue more than covers the credit outlay. |

As in Berger and Gottschalk (2021) and Gonzalez-Uribe and Paravisini (2019), our study explores the programme eligibility criteria, however in our case, this involves investor eligibility instead of firm eligibility.[1] Equity issuing firms are grouped and compared according to type of investor and, whether they are qualified for the investor tax deduction, which, as shown in Denes et al (2020) will lessen the problems with non-observable capital constraints. Our empirical approach and identification strategy are further elaborated in section 6.1.

In Table 2 the evaluation findings are arranged according to outcome variable. Investor tax incentives, an often stated goal by policymakers, are intended to increase angel activity in terms of the number and size of investments. Most of the evaluations report that the number of investors and investments as well as investment amount is increasing. As discussed in section 2.2, the investment ability and managerial skills of targeted investors are key to efficient capital allocation and startup development. Current evaluations consistently find that targeted investors are less experienced and new to angel investments.

The reported effects on beneficiary firms are mixed. Some studies report negative or no effects on profitability, while others find mixed effects on firm performance and investments. On the community level, leveraged capital is boosting, which is consistent with the findings on angel activity. In can be concluded that the effect on entrepreneurial activity is weakly negative, as is evidence on local employment and growth effects. Lastly, the studies that comment on policy implementation indicate low policy take-up in some countries and varying efficiency. The Israeli evaluation in Solodoha et al (2023) specifically emphasises the programme design as responsible for the poor outcomes.

Taken together, the findings brought forward by the existing evaluation literature suggest that it is indeed challenging to incentivise skilled investors to invest in firms. Tax incentives for investors can increase capital supply for early-stage firms, but investments do not necessarily back high-growth innovative firms. Rather, as it turns out, the prerequisites for policy effectiveness stressed in the theoretical literature and described above, seem in many cases to have failed, together with other factors that can drive or block investment activity. In this paper, we complement the findings summarised in this chapter with a descriptive analysis of the developments in external equity financing in small businesses, and by providing a closer examination of targeted investors and beneficiary firms. In the next chapter, we will describe the Swedish tax deduction scheme that was implemented in 2014.

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[1] Berger and Gottschalk (2021) construct several control groups by using different firm and investor eligibility criteria.

Table 2 Findings from investor tax incentive policy evaluations

| Tax policy effect | Indicator | Findings | Country | Author/s |
|---|---|---|---|---|
| Angel investments | Number of investors | Increase | Germany | Berger & Gottschalk (2021) |
| | | | UK | Gonzalex-Uribe & Paravisini (2019) |
| | | Decrease | Israel | Solodoha et al. (2023) |
| | Number of investments | Increase | US | Denes et al. (2020) |
| | | | Germany | Berger & Gottschalk (2021) |
| | | Increased probability of equity issuance | UK | Gonzalex-Uribe & Paravisini (2019) |
| | | Inconclusive | US (Iowa) | Barker (2017) |
| | | Decrease | Israel | Solodoha et al. (2023) |
| | Investment amount | Increase | Germany | Berger & Gottschalk (2021) |
| | | | UK | Gonzalex-Uribe & Paravisini (2019) |
| | | | China | Li et al. (2016) |
| | | Inconclusive | US (Iowa) | Barker (2017) |
| | Investor quality | Younger, more local, less experienced | US | Denes et al. (2020) |
| | | 80% new to angel investments | US (Minnesota) | EDRG et al. (2014) |
| | | Few new angels, mostly FFF | Canada | Carpentier & Suret (2007) |
| | | No effect on managerial support | Germany | Berger & Gottschalk (2021) |
| Beneficiary firm | Profitability | Lower return on equity, net margin | Canada | Carpentier & Suret (2007) |
| | | No effect on gross profits and debt/equity, negative on profit margins | UK | Cowling et al. (2008) |
| | Performance | Lower sales growth, equity growth, low rates of successful exits or failure | Canada | Carpentier & Suret (2007) |
| | | Higher sales, labour productivity, and employment | UK | Cowling et al. (2008) |
| | | Lower survival | UK | Cowling et al. (2008) |
| | | Increase in jobs and revenue | Canada | Hellman & Schure (2010) |
| | | No effects on young-firm employment, successful exits | US | Denes et al. (2020) |
| | Investments | Increasing | UK | Gonzalex-Uribe & Paravisini (2019) |
| | | No effects | UK | Cowling et al. (2008) |
| Community-level outcomes | Entrepreneurial activity | No effects on job creation, startup entry, patenting | US | Denes et al. (2020) |

| Tax policy effect | Indicator | Findings | Country | Author/s |
|---|---|---|---|---|
| | | Majority of states with increase in entrepreneurial activity as measured by the Kauffman Index | US | Bell et al. (2013) |
| | | Positive effects on share of scale-ups and density of high growth companies. No effect on average growth rate of startups. | US (Iowa) | Barker (2017) |
| | | Many firms in industry out of business | US (Maryland) | Rehrmann et al. (2017) |
| | | No effect on startup entry | US (Maryland) | Rehrmann et al. (2017) |
| | Leveraged capital | Boost | US (Maryland + Wisconsin) | Toumi & Boxer (2015) |
| | | | Canada | Hellman & Schure (2010) |
| | | Increase but no evidence of causality | US (Minnesota) | EDRG et al. (2014) |
| | | No evidence | US (Maryland) | Rehrmann et al. (2017) |
| | Local employment, earnings and value added | Increase | US (Maryland + Wisconsin) | Toumi & Boxer (2015) |
| | | No effect on new technology jobs | US | Schulte (2016) |
| | | | US (Minnesota) | EDRG et al. (2014) |
| | | Few jobs in industry created | US (Maryland) | Rehrmann et al. (2017) |
| | | No effect on net growth | US (Maryland) | Rehrmann et al. (2017) |
| | | Regional economic growth | China | Li et al. (2016) |
| | Tax income | Increase | Canada | Hellman & Schure (2010) |
| Policy implementation | Take-up | Low | UK | Gonzalex-Uribe & Paravisini (2019) |
| | | (Due to complexity) | Israel | Solodoha et al. (2023) |
| | | (Heterogenous angels varies in responsiveness) | Portugal | Bilau et al. (2017) |
| | Efficiency | Revenue exceeding credit outlay | US (Maryland + Wisconsin) | Toumi & Boxer (2015) |
| | | Cost-benefit ratio below 1 | US (Minnesota) | EDRG et al. (2014) |
| | | Variations in eligibility, level of funding available per investment and per year, whether the credits are refundable cause significant variability in effectiveness | US (Hawaii, Louisiana, Wisconsin, Minnesota, Oregon and Vermont) | Hendon et al. (2012) |

# 3. The Swedish investor tax incentive programme

In December 2013 Swedish authorities introduced a tax incentive for individuals investing directly into equity of small companies. The intent of the programme is to cut capital costs for small firms which will increase the number and size of equity investments. The aim is also to level out the tax treatment of investments financed with own or borrowed capital (prop. 2012/13:134).[2] The programme compensates individuals who invest their private funds in young firms with a capital tax relief on 50% of the investment. The investment cap is limited to 1.3 billion SEK over a year, which means that the deduction cannot exceed 650 thousand SEK over a year. The investment must be paid in cash, and shares must be acquired either at the firm's establishment or when new shares are issued.[3] The eligible investments are limited to SEK 20 million per firm over a year. To be eligible for the benefits, both the investor and the firms they invested in must meet certain criteria. Target firms must be small, with at most 50 people employed and with a maximum turnover, or a maximum balance sheet, of SEK 80 million. Moreover, the target firm must have a salary base of at least SEK 300 000 during the year when the investment is made or during the fiscal year after the investment. Investments in firms in the shipbuilding, coal or steel industries are excluded as well as investment firms, cooperatives and firms listed on the stock exchange. The target firms may not be in financial difficulty and from June 2020 not older than seven years (prop. 2019/20:99). All individuals who are liable for capital gains tax on shares in Sweden are eligible for the tax relief. However, from 2016, the investor or related persons must not have shares in the target firm, or from a company within the same company group during the fiscal year for which the deduction is claimed or the previous two fiscal years. This implies that insiders, i.e., executives of these companies along with the employees and their families, can benefit from the measure if shares are acquired when the firm is established, but business angels, i.e., external investors, only are eligible investors if new shares are issued at a later stage.

In the preparatory documents (Finansdepartementet, 2012), the total budget of the tax incentive was estimated to SEK 800 million annually. It was predicted that one third of the 45 000 annually established limited liability firms, thus 15 000 firms, would meet both the salary base and the size conditions. The predicted number of firms issuing new shares that qualify for the scheme amounted to 2 000 firms annually, approximately half of all cash paid equity issuances. In total, 17 000 firms were approximated to be included in the

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[2] The tax system favours investments with loaned capital compared to equity or reinvested profits in that interest expenditure tax are deductible while dividends must be paid by taxed funds and in addition be taxed at the investor. This put companies that have difficulties obtaining loans at a disadvantage. Limited companies that inject capital into other limited companies will normally not be double taxed since the dividends on holdings for business purposes are tax-free. Thus, giving limited companies an investor deduction would not offset any tax asymmetry. This is the motivation given in the preparatory documents for the investor tax relief only to be given to individuals (prop. 2012/13:134).

[3] Shares can also be acquired from a legal person and consist of shares in a company without prior activity (a dormant company).

scope of the investor tax incentive. On the investor side, 20 000 private investors were predicted to apply for the tax relief. These figures turned out to be overestimated, as well as the ratio of the number and share of newly established firms vs. older firms issuing new shares.

Figure 1 Number of annual beneficiary firms and investors
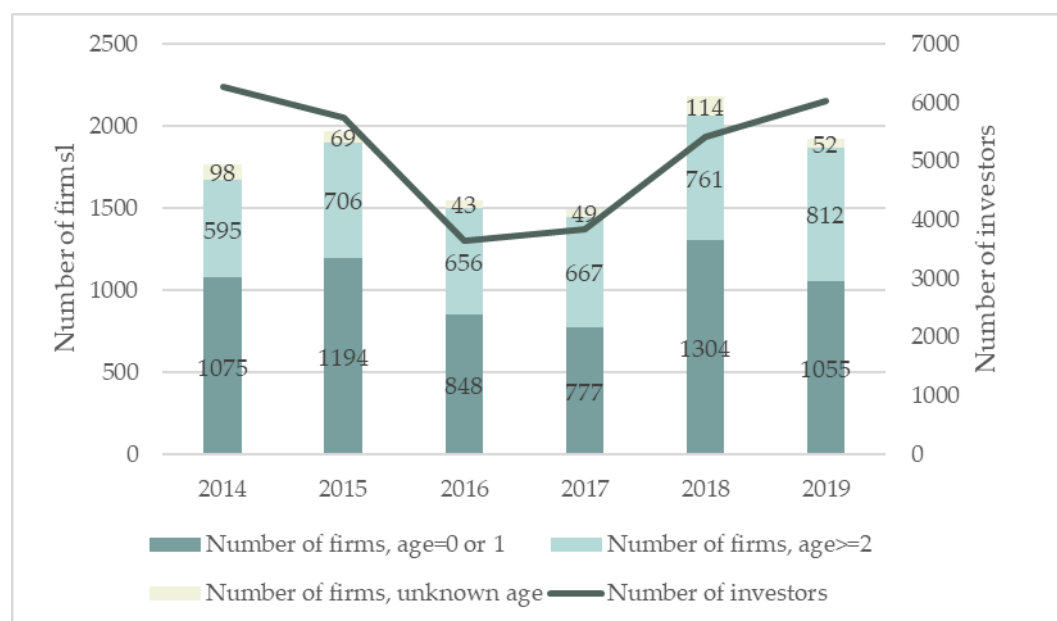


Source: Swedish Tax Authority and Statistics Sweden

Figure 2 Investment amounts
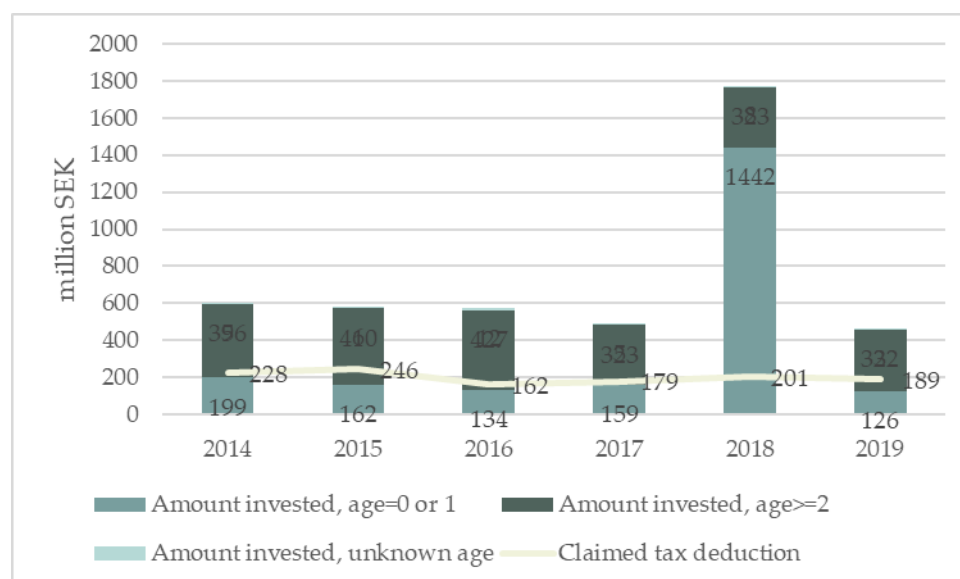

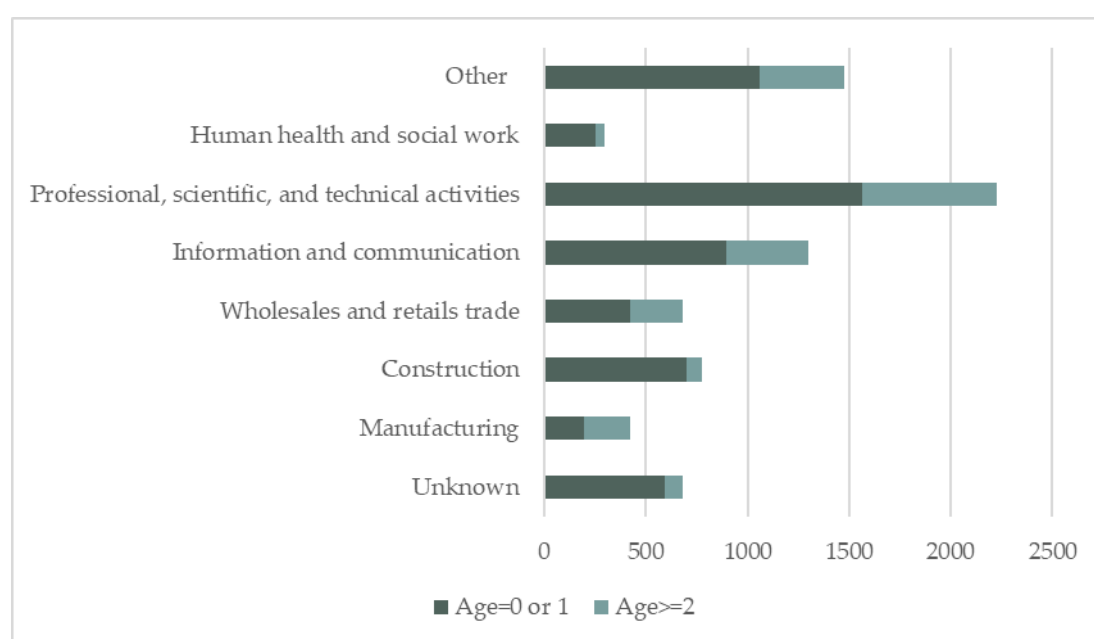
Source: Swedish Tax Authority and Statistics Sweden

We see that on average close to 62% of the firms receive subsidised investment at foundation while the remaining 38% receive investments at the expansion phase, which corresponds to a more equal balance between the two types of investments than expected by regulators. Also, the number of investors that were expected to apply for the investor

tax deduction is much lower than anticipated. The first year the tax relief scheme was rolled out, the number of investors claiming tax relief amounted to 6 263 individuals. After a 40% decrease over a couple of years, the number of individual investors has, at the end of our study period, almost climbed back to first year levels.

**Fel! Hittar inte referenskälla.** shows the amounts of capital that the programme has leveraged; including the total investments and the allocation over startup and expansion phases, defined as above with reference to firm age. Not surprisingly, the investments are larger at later stages than at firm foundation. The year 2018 stands out with a noticeable peak in early-stage investments; however, the sum of claimed tax deductions have been roughly SEK 200 million annually during our study period. These claims translate to an annual tax relief cost of SEK 60 million, substantially less than the calculated SEK 800 million. The descriptive statistics on equity investments is explained in detail in Appendix.

Figure 3 Beneficiary firms, by industry and age



Source: Swedish Tax Authority and Statistics Sweden

The allocation of beneficiary firms by industry and age group is presented in **Fel! Hittar inte referenskälla.**. The most common type of firm is within corporate services (professional, scientific and technical activities) and information and communication, which constitutes over 50 percent. Firms in construction are common among new firms, but less common among more established firms. A larger share of established firms consists of manufacturing firms, but this is less common among new firms.

The average investments, in means and quartiles, are presented in Table 3. Since there is a large difference between newly established firms and new firms that have also issued new shares, this category is split in two. See the Appendix for a detailed explanation. The average investment in startups is slightly below 75 000 SEK. The minimum equity requirement in limited liability companies during the period was 50 000 SEK, and almost 75 percent of investments in the firm sum up to this minimum. Note that the table reports

the total amount of equity invested in the new firm by all founders together, i.e., the average equity round size, not the individual contribution.

Table 3 Average sum of investments by individual investors, over firm type. Means and quartiles.

| Firm type | Mean | p25 | p50 | p75 | Average number of investors (median) |
|---|---|---|---|---|---|
| Startup (age=0 or 1) | 73 127 | 50 000 | 50 000 | 50 000 | 1.3 (1) |
| Startup expansion (age=0 or 1 + equity issuance) | 2 871 088 | 99 900 | 303 460 | 1 000 008 | 8.6 (2) |
| Growth firms (age>=2 + equity issuance) | 1 178 176 | 84 000 | 299 700 | 1 000 000 | 14.2 (3) |
| Other | 488 221 | 20 250 | 50 000 | 52 160 | 2.5 (1) |
| Total | 545 868 | 50 000 | 50 000 | 90 000 | 4.3 |

Source: Swedish Tax Authority, the Swedish Companies Registration Office (Bolagsverket) and Statistics Sweden (Registerbaserad Arbetsmarknadsstatistik (RAMS) and Företagens ekonomi (FEK)). Calculations by authors.

The last column presents the average number of investors in each firm type. Each firm has on average 4.3 investors, but the difference is substantial between types. Startups have the lowest average, with 1.3 investors per firm. Startup expansions have, on average, 8.6 investors while growth firms have on average 14.2 investors. From the deviation between means and medians in parentheses, it follows that a small number of observations with a large number of investors bias the result. A closer look at the data, in in Table 18 Appendix, reveals that 99 percent of startups have fewer than 5 investors, and that all startups have less than 10 investors. Startup expansions and established firms have larger investor groups, but still almost 80 percent of established firms have fewer than 10 investors. Less than one percent of firms have more than fifty investors.[4]

If we look at individual investors, there are 24 723 individuals investing in 7817 firms. Around 10 percent of investors (3 216) have invested in more than one firm, and around 7 percent (2 411) have invested more than once in the same firm. Less than one percent (198) have invested more than once in more than one firm, and 36 investors have invested more than once in more than five firms.

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[4] It may be noted that even if relatively few firms have many investors, these firms constitute a large share of K11 claims, both in number and total investments.

Table 4 Investment amount, by investor and firm type. Means and quartiles

| Investor | Mean | p25 | p50 | p75 | Number |
|---|---|---|---|---|---|
| Invested once | 124 533 | 6 000 | 20 000 | 50 000 | 31 049 |
| Invested more than once | 166 085 | 10 000 | 27 285 | 101 100 | 2 411 |
| Startup | 55 818 | 25 000 | 50 000 | 50 000 | 6 937 |
| Startup expansion | 334 161 | 7 700 | 24 640 | 100 800 | 6 169 |
| Growth firm | 83 215 | 5 000 | 10 009 | 40 500 | 19 421 |
| Other | 195 200 | 4 080 | 11 189 | 50 000 | 1 113 |
| Total | 127 527 | 6 000 | 20 000 | 50 000 | 33 460 |

Sources: Swedish Tax Authority, the Swedish Companies Registration Office (Bolagsverket) and Statistics Sweden (Registerbaserad Arbetsmarknadsstatistik (RAMS) and Företagens ekonomi (FEK)). Calculations by the authors.

The investment amounts claimed by each individual investor are summarised in Table 4. Investors that invested more than once in a firm, invested, on average, 13 percent more than investors who invested once in the firm. The average amount claimed for investments in startups is close to SEK 50 000, and 92 percent of individual K11 claims for investments in startups do not exceed SEK 50 000. The median investment is lower in startup expansion than in startups, possibly because the non-founder investors generally invest less than the founders. There are, however, more large investments in startup expansion firms, which increases the average investment. There are many individual investments in growth firms, but the amounts are lower in growth firms compared to startup expansion firms. The median investment is around SEK 10 000, and 75 percent of investments are less than SEK 40 500. We can conclude that the firm founders take advantage of the programme, but instead of increasing equity capital investments, the tax relief is largely used as a rebate on minimum start-up capital.

In the next chapter, we will take a closer look at the investors that claimed the tax relief.

# 4.  The investors

Previous research has established that individual, or informal, investors vary considerably with respect to their personal characteristics. A number of studies have attempted to develop typologies of informal investors, an undertaking that is challenging since these investors are largely anonymous and there are no official listings (Avdeitchikova, 2008). A recent study by Bach, Baghai, Strömberg and Warg (2022) have used unique Swedish equity issuances data to identify business angels and the investments they make as individuals or via legal vehicles.[5] Although the time periods do not match, their findings will be used as a brief reference to the investors in our data for some indication of the quality and capacity of the investor targeted by the policy.[6] Next follows a summary of the investor and investment characteristics most relevant for our analysis. For a full comprehension of the Swedish business angel population, we recommend reading the article by Bach et al.

## 4.1  The Swedish business angels and their investments

Bach et al. (2022) find that individual investors, including business angels, founders, employees, and "informal" equity investors, provide at least 13 percent of the equity capital and participate in more than 37 percent of all equity issues.[7] About 30 percent of the equity issuances in which individual investors are present are either employees or have family members that are. In the remaining group individual investors, angel investors are defined as individuals who invest their own money in at least two different firms in which they are not employed and to which they have no family connection. The investments by individuals who invest in one unrelated firm only are found to be heterogenous, sometimes like insider investors and sometimes like angel and repeat investors. The identified business angels, investing in at least two unrelated firms, invest to a large extent using an investment vehicle or via the non-financial company they run. These investments would not be eligible for the investor tax relief if it were already introduced but were enjoying other tax benefits at the time.

On average, angels in Bach et al.'s sample, invest in 2.6 companies and participate in five company rounds. The targets are primarily young firms, with a mean age of 5-6 years. The total assets are on average SEK 152 million, with a significantly lower median of SEK 17 million, reflecting a few large outliers. More than 75 percent of the target firms are unprofitable, and most firms have little or no revenue and less than ten employees. Most target firms, as well as angels, are located in Stockholm, Göteborg, and Malmö, the three city regions in Sweden, and for 57 percent of angels' investments the target firm is located in the same regions as the angel. The average equity round size with a participating angel was SEK 12.8 million, and the individual angel's contribution was, on average, SEK 1 million. These means reflect significant outliers, with the corresponding median round size being SEK 5 million and the median investment size SEK 120 thousand.

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[5] Whereas our study is based on register data of equity issuance, Bach et al.'s data is constructed from issuance filings, including the investors of the new shares. The register data only contain the equity issuing firms that was matched to investors identified in the investor tax deduction data.

[6] The time period in our study is 2014-2019, whereas Bach et al. examine the period from 2004 to 2014.

[7] The sample is limited to not yet listed, early-stage, firms that could be identified and matched to external register data.

The demographics of the business angel group in the sample display an overweight of male angels (81%). On average, the business angels are 50 years old at their first angel investment. Regarding the personal characteristics, Bach et al. find that business angels belong to the very top of the highest percentiles of the wealth distribution. In contrast, the labour income of business angels is high, but not in the very top of the income distribution. The average angel investor has a gross annual income of SEK 580 647, with the median angel income at the 90th percentile of the Swedish working population. Business angels have a different professional and educational background than the working population, as well as in comparison with other wealthy, non-angel, individuals. Business angels have longer work experience, and more experience of management, financial industry, and startups. Sixty-seven percent have a post high school education and 8 percent have a PhD, compared, respectively, to 45 percent and one percent in the general population. Half of the business angels have an education in the social sciences, law and business administration; 26 percent in engineering, manufacturing and construction; 12 percent in health and welfare, and only 6 percent in the natural sciences, mathematics and ICT. The corresponding shares in the population and top one percent of wealthy individuals are 24, 18, 19, 6 percent, and 34, 20, 26 and 5 percent, respectively. Bach et al. also report statistics on social origin, talent, investor asset allocation, and so forth, which we will not summarise.

## 4.2    The investors claiming investor tax relief

The demographics and occupational and educational orientation of the investors in our sample is summarised in **Fel! Hittar inte referenskälla.**. As in the sample of business angels in Bach et al.'s data, the share of women is around 20 percent. About 8 percent of investors are foreign born, which is slightly less than their share in the population. A high proportion (67 percent) of investors have post-secondary education, the same share as in Bach et al. Around three quarters of investors are gainfully employed, 6 percent of investors holds a managerial position and 28 percent of investors were a CEO at the time of the investment.

Table 5 Descriptive statistics, all investors

|  | Mean | SD |
|---|---|---|
| Age (years) | 51,4 | 15.8 |
| Women | 21% | 0.4 |
| Foreign born | 8% | 0.3 |
| Post-secondary education | 67% | 0.5 |
| In gainful employment | 76% | 0.4 |
| Managerial position (not CEO) | 6% | 0,2 |
| CEO (as main employment) | 28% | 0.5 |
| Combinator | 20% | 0.4 |
| Labor income (hundreds SEK) | 4 190 | 6 263 |
| Capital income (hundreds SEK) | 3 598 | 53 541 |

Sources: Swedish Tax Authority and Statistics Sweden (Longitudinal integrated database for health insurance and labour market studies (LISA)). Calculations by the authors.

The average annual labour income in the investor group is a little less than SEK 420 000, which is in the 90th percentile in the income distribution in the population older than 15 years (working-age individuals) and in the upper quartile among the employed. The average capital income in the group is SEK 360 000, which ranks the average investor over the 90th percentile in the capital income distribution.[8]

To summarise, the investors skew older, more educated and with higher income than the population. This is as expected since most of the variables are positively correlated with income, and a high disposable income increases the probability that the individual has the capital to invest in high-risk ventures.

The occupations held by investors that are employed are reported in Table 6. Around a quarter of the investors have no occupation, e.g., retirees, and a further 6 percent are firm owners or self-employed without occupation specified. Among the rest, the most common occupation is a professional in ICT and engineering, followed by managers and other professionals.

Table 6 Investors by occupation (top 10)

| Occupation | % investors | % emp 16+ |
|---|---|---|
| ICT architects, systems analysts, and test managers | 7% | 3% |
| Occupation unknown | 6% | 5% |
| Engineering professionals | 4% | 2% |
| Accountants, financial analysts, and fund managers | 3% | 1% |
| Insurance advisers, sales and purchasing agents | 3% | 3% |
| Organisation analysts, policy administrators, and human resource specialists | 3% | 2% |
| Physical and engineering science technicians | 3% | 2% |
| Financial and accounting associate professionals | 2% | 1% |
| Managing directors and chief executives | 2% | 1% |
| Office assistants and other secretaries | 1% | 4% |
| Sales and marketing managers | 1% | 1% |

Sources: Swedish Tax Authority and Statistics Sweden (Longitudinal integrated database for health insurance and labour market studies (LISA). Calculations by the authors.

A more detailed outlook for educational attainment and field of education is presented in Table 7. Around 5 percent of investors have less than an upper secondary education, almost 30 percent have an upper secondary education, and two thirds of investors have a post-secondary education. In the subgroup of investors with a post-secondary education, we find that engineering, manufacturing and construction together with social sciences, law and business administration are the most common fields of education, with one third of investors each. In the latter group, a closer look (not reported in the table) reveals that

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[8] Source: Statistics Sweden: Longitudinal integrated database for health insurance and labour market studies (LISA)). Calculations by authors.

around three quarters of these investors have business administration as their educational field.

Table 7 Educational orientation by education level

| Educational orientation | Education level | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| General education | 93% | 20% | 0% |
| Education science and teacher training | 0% | 0% | 6% |
| Humanities and art | 0% | 3% | 4% |
| Social sciences, law and business administration | 0% | 21% | 33% |
| Natural sciences, mathematics and Information and Communication Technologies (ICTs) | 0% | 1% | 9% |
| Engineering, manufacturing and construction | 0% | 40% | 34% |
| Agriculture and forestry; veterinary | 0% | 4% | 2% |
| Health and welfare | 0% | 3% | 9% |
| Services | 0% | 6% | 3% |
| Unknown | 7% | 2% | 0% |
| Share of investors by education level | 5% | 28% | 67% |

Note: (1): Less than upper secondary education + unknown (2) Upper secondary education (3) post-secondary education
Sources: Swedish Tax Authority and Statistics Sweden (Longitudinal integrated database for health insurance and labour market studies (LISA). Calculations by the authors.

The geographical allocation of investments is presented in Figure 4. The highest ratio of investment to population is found in Stockholm County, with 2.8 investors per 1000 inhabitants. The lowest ratio is found in Gävleborg County, with one investment per 1000 inhabitants.

A further geographical breakdown indicates that the rate of investment per 1000 inhabitants is high in high-income municipalities. The top and bottom five municipalities are presented in Table 8. Three of the top five municipalities are high income municipalities. However, the investment per 1000 inhabitants is high also in some lower income municipalities.

Figure 4 Investments per 1000 inhabitants, by county population 2016
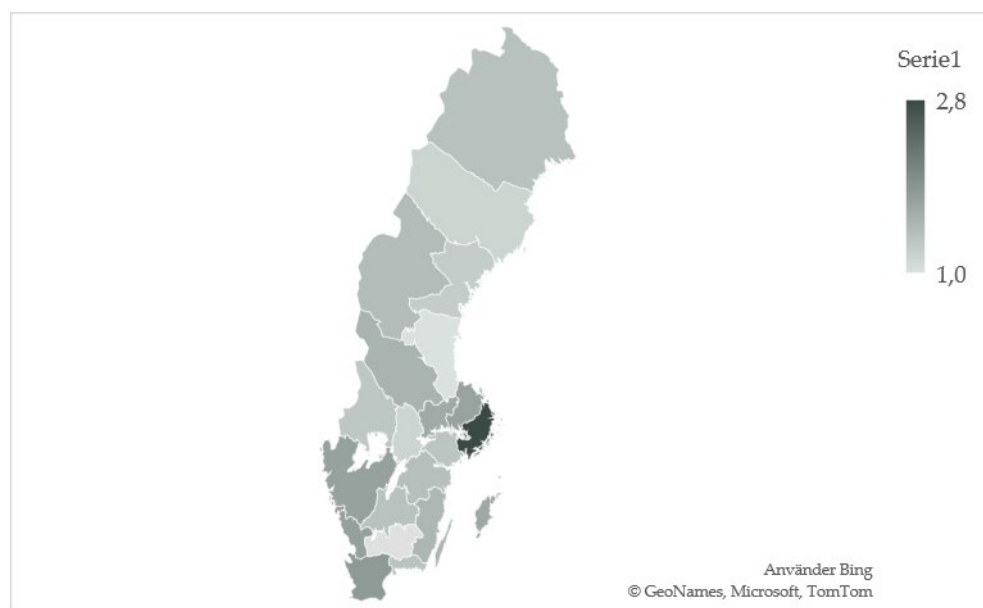


Sources: Swedish Tax Authority and Statistics Sweden (Longitudinal integrated database for health insurance and labour market studies (LISA), Population statistics (RTB) and Företagens ekonomi (FEK)). Calculations by the authors.

Table 8: Municipalities with the highest and lowest investment per 100 inhabitants, and average income per inhabitant ranking across municipalities.

|   | Municipality | Invest/1000 inh. | Rank |   | Municipality | Invest/1000 inh. | Rank |
|---|---|---|---|---|---|---|---|
| 1 | Danderyd | 9.2 | 1 | 287 | Åsele | 0.3 | 286 |
| 2 | Dals-Ed | 8.6 | 282 | 288 | Överkalix | 0.3 | 287 |
| 3 | Arvidsjaur | 6.5 | 116 | 289 | Orsa | 0.3 | 288 |
| 4 | Lidingö | 6.2 | 2 | 290 | Filipstad | 0.3 | 289 |
| 5 | Lomma | 5.9 | 8 | 291 | Eda | 0.1 | 290 |

Note: Rank is income/inhabitant.
Sources: Swedish Tax Authority and Statistics Sweden, Population statistics (RTB) and Gross pay based on administrative sources (LSUM). Calculations by authors.

Investor characteristics may also differ between those who invest in smaller groups, and those who invest in larger investment groups. Firms may expect more investor involvement from a smaller investor group. Basic investor characteristics by investor group size can be found in Table 9.

Table 9 Investor characteristics, by investor group size

|  | Number of investors | | |
|---|---|---|---|
|  | <5 | 5-10 | >10 |
| Age | 44.3 | 52.6 | 54.4 |
| Women | 22% | 14% | 21% |
| Foreign born | 12% | 6% | 6% |
| Post-secondary education | 62% | 73% | 68% |
| In gainful employment | 91% | 72% | 70% |
| Manager (not CEO) | 6% | 7% | 6% |
| CEO in the last five years | 63% | 34% | 28% |
| Combinator | 29% | 17% | 16% |

Sources: Swedish Tax Authority and Statistics Sweden (Longitudinal integrated database for health insurance and labour market studies (LISA) and Företagens ekonomi (FEK)). Calculations by authors.

The average age of investors in investment rounds with 10 investors or less are younger than investors in larger investor groups. The smaller investment groups also have a higher proportion of investors in employment, and a larger proportion of investors have also been CEO of a company before this investment. A large proportion of investors are also employed in the firm.

Table 10 Investor experience the five years preceding the investment, by investor group size

|  | Number of investors | | | |
|---|---|---|---|---|
|  | <5 | 5-10 | >10 | Total |
| Years as self-employed | 1.21 | 1.09 | 0.93 | 1.02 |
| Years as self-employed while also holding other employment | 1.04 | 0.84 | 0.84 | 0.89 |
| Years as CEO | 1.33 | 1.06 | 0.87 | 1.01 |
| Years working in industry (NACE level 2) | 1.67 | 0.40 | 0.19 | 0.63 |
| Years working in industry (NACE level 3) | 1.45 | 0.34 | 0.15 | 0.53 |
| Years in managerial position) | 0.65 | 0.67 | 0.56 | 0.59 |

Note: Self-employed refers to working as a sole trader (företagare) or working in an LLC owned by the investors (anställd i eget AB).
Sources: Swedish Tax Authority and Statistics Sweden (Longitudinal integrated database for health insurance and labour market studies (LISA) and Företagens ekonomi (FEK)). Calculations by authors.

If we look at the previous experience of the investors by investor group size in Table 10, we can note that investors in smaller investor groups have more experience than investors in larger investor groups. That holds for management experience as well as relevant industry experience. On average, an investor in a small investor group has around 17 months previous industry experience and 16 months experience as CEO of a firm. Investors in the largest investor groups have less than one year's industry and firm leadership experience in the five years prior the investment.

Table 11 Investor by investment round type. Means.

|  | Startups | Startup expansion | Growth firm | N/C |
|---|---|---|---|---|
| Age | 43,1 | 52,3 | 54,3 | 48,2 |
| Women | 25% | 18% | 19% | 33% |
| Foreign born | 13% | 6% | 6% | 15% |
| Post-secondary education | 57% | 70% | 69% | 68% |
| In gainful employment | 93% | 73% | 70% | 80% |
| Manager (not CEO) | 4% | 7% | 7% | 4% |
| CEO in the last five years | 68% | 35% | 29% | 39% |
| Combinator | 32% | 18% | 16% | 20% |
| Employed in firm | 51% | 5% | 4% | 16% |

Note: The round type N/C is the unclassified firms that are neither new nor have an equity issue.
Sources: Swedish Tax Authority and Statistics Sweden (Longitudinal integrated database for health insurance and labour market studies (LISA) and Företagens ekonomi (FEK)). Calculations by authors.

Table 11 reports more details on the personal characteristics of investors investing in the three types of investment rounds, defined in the Appendix. Investors in startups are also referred to as founders, while investors at the later stages can be identified by the eligibility criteria as external investors. It can be noted that women and foreign-born individuals are more likely to invest in startups than in later investment rounds. Around a quarter of investors in startups are women, which is slightly lower than the share of firms started by women during this period, and this reflects that women are less likely to start limited liability companies compared to other legal forms of firms.[9] Investors in startups have post-secondary education to a lesser extent than investors in startup expansions or investors in growth firms. Among investors in startups, 57 percent have a post-secondary education, which is lower than investors in later-stage investments.

Investors in startups at firm establishment are younger, and employed to a larger extent in the firm, reflecting that employees are not eligible for investor tax relief at later stages. Here, an investor is considered an employee if the investor firm is the main source of income the year of the investment. A high share of investors in startups have previous experience as firm leaders, either as CEOs, self-employed or self-employed while also holding other employment (combinator). Investors in growth firms are on average older than investors in startups. A larger proportion has a post-secondary education, and a slightly higher proportion holds a managerial position but has to a lesser extent experience of firm management as a CEO or self-employed.

As described in 2.2, investors may provide not only equity finance, but also add expertise and managerial support that benefit the firm. The managerial and industrial experience of investors is presented in Table 12.

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[9] See Statistik över nystartade företag, Tillväxtanalys.

Table 12 Investor experience, by investment round type. Means.

|  | Startup | Startup expansion | Growth firm | N/C |
|---|---|---|---|---|
| Year as self-employed | 1.23 | 1.01 | 0.95 | 1.05 |
| Years as self-employed while also holding other employment | 1.09 | 0.90 | 0.81 | 0.99 |
| Years as CEO | 1.31 | 1.04 | 0.89 | 1.10 |
| Years working in industry (NACE level 2) | 1.89 | 0.33 | 0.26 | 0.78 |
| Years working in industry (NACE level 3) | 1.63 | 0.27 | 0.22 | 0.68 |
| Years in managerial position | 0.56 | 0.70 | 0.58 | 0.34 |

Note: Self-employed refers to working as a sole trader (företagare) or working in an LLC owned by the investors (anställd i eget AB).
Sources: Swedish Tax Authority and Statistics Sweden (Longitudinal integrated database for health insurance and labour market studies (LISA) and Företagens ekonomi (FEK)). Calculations by authors.

Investors in startups have on average more experience than investors in startup expansions or established firms; they have about 3 to 5 months longer in a managerial position and almost 1.5 years more industry experience. In Table 13, the sample is restricted to investment rounds with 10 investors or less. Now, the difference in aggregate experience between founders and investors at later stages is smaller, but still significant, especially for industry experience. A tentative interpretation of the statics in Table 12 and Table 13 would thus be that the average external investor does not seem to bring additional skill to the firms.

Table 13 Investor experience in investment rounds with 10 or less investors. Means

|  | Startup | Startup expansion | Growth firm | N/C |
|---|---|---|---|---|
| Year as self-employed | 1.2 | 1.0 | 1.2 | 1.3 |
| Years as self-employed while also holding other employment | 1.1 | 0.9 | 0.9 | 0.9 |
| Years as CEO | 1.3 | 1.1 | 1.3 | 1.3 |
| Years working in industry (NACE level 2) | 2.0 | 0.7 | 0.6 | 1.3 |
| Years working in industry (NACE level 3) | 1.7 | 0.5 | 0.6 | 1.2 |
| Years in managerial position | 0.6 | 0.9 | 0.7 | 0.4 |

Note: Self-employed refers to working as a sole trader (företagare) or working in an LLC owned by the investors (anställd i eget AB).
Sources: Swedish Tax Authority and Statistics Sweden (Longitudinal integrated database for health insurance and labour market studies (LISA) and Företagens ekonomi (FEK)). Calculations by authors.

## 4.3   Concluding comparison

One main interest of our analysis is to understand the precision of the Swedish angel investor tax credit programme, i.e., that the policy targets high-skilled, wealthy individuals. The findings in section 3 and 4 indicate that the program meet these targets with low precision.

At a glance, the investors claiming investor tax relief do not differ much from the identified business angels in Bach et al. (2022). Demographically, the average age and the share of female investors comply. The share of investors with a post-secondary education and the number of CEO:s is also in the same order. All investors are located mainly in the three city regions. Among the business angels, the share of economists and social scientists is close to two-fold while the share of engineers is significantly lower. Although both groups belong to the top percentile in the labour and capital income distribution compared to the working population, the business angel group is on average clearly wealthier.

However, the investment behaviour is clearly distinct. On average, angels in Bach et al's sample, invest in 2.6 companies and participate in five company rounds. The investors claiming tax relief invest on average in 1.37 firms and participate in 1.44 investment rounds during the time period. The investors that could be classified as business angels in our data invest on average in 2.7 firms and participate in 2.9 investment rounds.[10] The average equity round size with an investor claiming tax deduction amounted to SEK 545 868, with a significantly lower median of SEK 50 thousand. The total amount of equity invested by an investor is SEK 127 527 and SEK 20 thousand, respectively. For investors at later stages, the mean is about SEK 143 711 and median SEK 13 536. Corresponding amounts for the business angels in Bach et al.'s data is SEK 1 million and SEK 120 thousand.

Bach et al identifies business angels at 11 percent in the equity issuance data that invest as individuals. With the same definition, for individuals who invest in at least two different firms the share in our data is 10%. Accordingly, these professional business angels could be among the investors claiming investor tax relief. Then again, in our data these individuals investing in equity have on average less experience in management, industry or as self-employed. Furthermore, most tax-claims belongs to rounds with large investor groups, with a few firms attracting many investors, arguably with little personal involvement by each investor.

Another large group of tax-claims are related to startups with most founders in gainful employment and one third with a combinator position. Although the average experience of industry, self-employment and management are substantially larger in this group, we cannot rule out that a large share of these newly established firms are meal-tickets, such as corner shops, or a firm that the owner runs while holding an employment. That most equity capital investments in startups stop at the minimum level SEK 50 000 does not conflict with this reasoning.

Although sophisticated business angels, and driven entrepreneurs, might have benefited from the investor tax relief introduction, the majority investors targeted by the programme most likely do not belong to these groups.

In the next section, we will examine the aggregated developments of equity financing.

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[10] Individuals who invest in at least two different firms. We also limit the maximum number of investments to 10 rounds to exclude potential crowd-funding investors

# 5. External equity financing of small businesses

Next, we provide descriptive evidence concerning the effect of the 2014 investor tax deduction reform on the external equity financing of small businesses. We use data on the population of firms that raised external capital by issuing new shares. The data covers the period 2004-2019 and includes information on all firms that issued and sold new shares, the amount of investment raised and other related information. Given the reform's focus, we would ideally like to assess the impact of tax incentive on the number of individual investors or amount of external capital raised from individual investors. However, the dataset does not include information about the source of the investment, i.e., buyers of the equity. This means that we can only assess the impact of the tax incentive on total external capital, which is a combination of individual and institutional investors. Given that the external capital from individual investors, the group targeted by the reform, constitute a certain fraction of the total external capital in the economy, there is a risk that small positive effects of the reform could be hidden in the aggregation and may not be detected. With this limitation in mind, we provide descriptive evidence on the development of external finance raised by small businesses for the years before and after the reform.

Figure 5 provides trends on the share of firms and the average amount raised from external sources by eligibility status. A visual inspection of the trend in Panel A shows no indication of an increase in the share of externally financed firms after the introduction of the investor tax reform. Instead, we find a general downward trend except for the year around 2018 and 2019. In Panel B, we examine whether the reform led to an increase in the amount of investment per firm. However, we find no clear evidence that suggests an increase in the amount of external finance following the reform.

Figure 5 Trends in the share and amount of external equity financing of small businesses
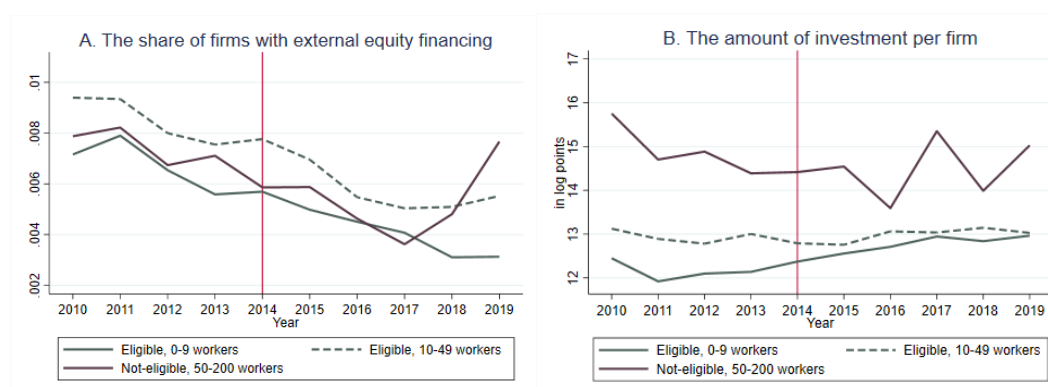


Note: In Panel A, the share of firms with external equity financing is obtained taking the ratio of the total number of firms with external equity financing and the number of firms, within a given eligibility group and year. In Panel B, the amount of investment per firm represents firms' average amount of money raised from external sources within a given eligibility groups and year.

The tax reform primarily intended to promote the equity financing of high-growth start-ups with low fixed assets to use as collateral. Thus, it would be interesting to examine whether the reform is effective in promoting the equity financing of high-growth start-up

and those characterised by a high share of intangible assets. In addition, restricting the analysis to such groups reduces the level of aggregation and improves our ability to detect effects. Figure 6 and Figure 7 present the development of external equity financing for firms with sales growth in the upper quartile within industry, young firms (firm age<7 years) and firms with a high intensity of intangible assets (industries with a share of intangible assets in the upper quartile). From the two figures, we find no indication that the introduction of the tax incentive led to an increase (level or trend) in the share or amount of external equity financing among high-growth, young and intangible-asset intensive firms.

Figure 6 Trends in the share of firms with external equity financing



Note: Panel A shows the development in the share of external equity financed firms by restricting the sample to those with annual sales growth in the top 25% within 2-digit industries. Similarly, the sample in Panel B is restricted to firms younger than 7 years old. Panel C is restricted to 2-digit industries with the share intangible asset in the top 25%.

Figure 7 Trends in the amount of external equity finance per firm



Panel A shows the development in the amount of external equity finance by restricting the sample to those with annual sales growth in the top 25% within 2-digit industries. Similarly, the sample in Panel B is restricted to firms younger than 7 years old. Panel C is restricted to 2-digit industries with the share intangible asset in the top 25%.

In sum, the aggregate developments in external equity finance do not display evidence of an increased availability of funding for early-stage ventures. In the next section, we will further examine the investment capacity of the investors, by investigating beneficiary firm performance.

# 6.    The beneficiary firms

Promoting angel and entrepreneurial activity is the main rationale for introducing a tax incentive for private investors. However, whether this policy instrument is effective in achieving its intended objectives is an empirical question and depends on several factors. As outlined in section 2.2, the effectiveness of the tax incentive depends in part on its ability to attract individual investors with the ability to identify and support early-stage ventures with high growth potential. As concluded in section 4.3, the characteristics and investment behaviour of the investors responding to the Swedish tax incentive do not necessarily signal professional investors. We also do not observe a surge in external equity investments, neither in amount nor in number of deals. Another factor that is key for policy efficiency is the supply of high-quality expansion ventures with financial constraints, and intrinsically, inefficient capital markets. Without qualified firms to invest in, the policy would subsidise marginal expansion ventures that would not be profitable without the subsidy.

This section investigates the performance of the firms backed by investors benefiting from the tax subsidy and compares with the firms backed by non-benefiting investors, such as VC-funds, pension funds, insiders and other institutional investors. We use a matched Difference-in-Difference (DiD) approach to account for pre-exiting unobserved heterogeneity between the groups (see section 6.3 for more details). If the above-mentioned conditions and the assumption of the DiD approach are satisfied, we would expect the beneficiary firms to be at least as good the non-beneficiary firms. A poorer performance of beneficiary firms, on the other hand, implies that the tax incentive is subsidising lower quality investment projects. One interpretation would be that the capital market is well-functioning and that the subsidised capital costs have induced investments in marginal, inferior, firms. Another interpretation could be that the targeted investors have a lower capacity to select high quality investment projects or lack necessary skills to bring additional value to the firm. We cannot distinguish between the two explanations.

The analysis in this section focuses on firms receiving investment at the expansion phase, i.e., firms aged 2 or more. This means that we exclude the firms that receive investment at firm establishment. We believe that the latter group is less interesting to investigate for our purposes, since most of the firms that receive investment at the founding stage do not have external investors. Among the newly founded firms for which we can identify their founder, we see that more than 90 percent of the firms are financed by the firms' founders. In addition, it is difficult to find valid controls since all newly started limited liability firms are eligible for the tax deduction irrespective of the source of the investment.

The next sub-sections describe the empirical strategy for causal identification, the data, and the results.

## 6.1    Identification Strategy

In general, identifying the causal effect of public support programmes on intended outcomes is challenging since it is not possible to observe the counterfactual outcomes. Ideally, one would like to compare the outcomes of beneficiary firms with the same

firms' outcomes in the absence of the programme. However, one cannot observe both states at the same time. Thus, a common approach is to use a comparison group of firms that do not benefit from the programme but have similar observable attributes like the beneficiary firms, known as *matching method*. The main challenge with the matching approach, however, is that participation in the programme is usually non-random, and the firms that benefit from the program could be systematically different from the non-beneficiary firms on attributes that are not observable to researchers, commonly labelled as *unobserved heterogeneity*. As a result, it is usually difficult to isolate the effect of the programme from other unobserved factors that correlate with programme participation and outcomes.

In the case of the investors tax deduction programme, the firms that benefit from it could be different from non-beneficiary firms for at least two main reasons. First, the fact that participating firms are willing to issue and sell new stocks show the firms' demand and ambition to expand their business compared to non-participating firms, which may include both firms with and without an ambition for expansion. Second, there could be unobserved pre-existing differences between participating and non-participating firms in terms of the managerial quality and capacity of the firms. Thus, the estimation of the programme's effect without addressing the above potential unobserved differences could result in a biased estimate.

In this study, we address the problem of *unobserved heterogeneity* in two ways. First, we exploit the eligibility criteria to identify control firms that have similar attributes in terms of most of the eligibility criteria, except the source of investment. That is, we identify comparison groups from the population of firms that issue new shares to finance their investment from non-eligible financial sources such as venture capital funds, pension funds and others (henceforth institutional investors). This allows us to identify comparison firms that have a similar demand for capital and ambition for growth, see also section 2.3 above for a broader methodological context. Figure 8 provides a graphical illustration of the selection of the beneficiary and non-beneficiary firms.

Figure 8 Graphical illustration on the selection of the beneficiary and non-beneficiary firms
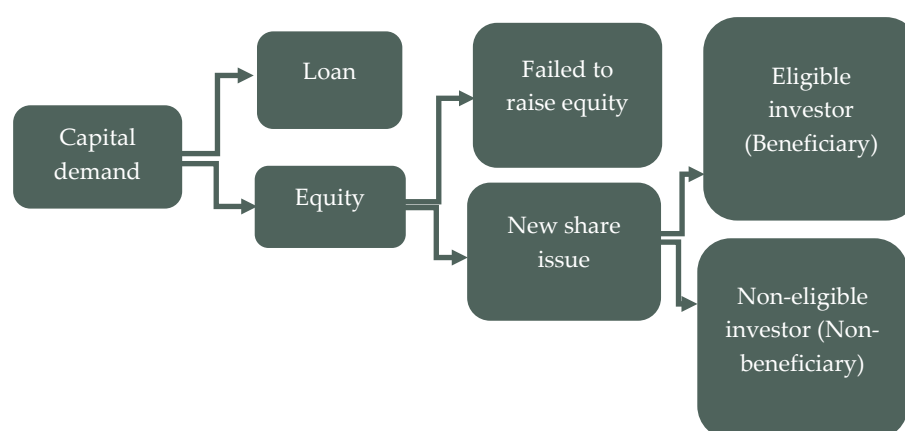


Second, we use a Difference-in-Difference (DiD) matching approach to address the remaining unobserved heterogeneity. The main advantage with the DiD method is that it

allows the beneficiary and non-beneficiary firms to differ in time-invariant unobserved attributes, e.g., pre-exiting differences in management quality and capacity. This is because the first-difference in the DiD approach removes any pre-exiting observed and unobserved characteristics that do not change during the observed time period. The main requirement in the DiD approach is that the groups should have similar trends in potential outcomes. To minimise the risk of bias due to pre-existing differences in growth trajectories, we use a matching method to select non-beneficiary firms that are similar to the beneficiary firms in terms of pre-investment attributes such as firm size (measured by sales and employment), growth potential (proxied by growth in sales and employment), fixed assets and single-digit industries.

The above empirical design would allow us to estimate treatment effect through a comparison of beneficiary (treated) and non-beneficiary (control) firms in a DiD format. Conditional on the assumption of parallel trends, we hypothesise that differences in outcomes could arise either i) due to differences in the type of the investors, which may differ in their ability to identify and support high-quality expansion projects; or ii) from the quality of the marginal expansion projects that are financed due to the reduction in the cost of investment.

An alternative empirical design would be to estimate the intention-to-treatment effect by comparing the performance of eligible firms with non-eligible firms before and after the reform year. For instance, Gonzalez-Uribe and Paravisini (2019) estimated the intention-to-treatment effect of the angel tax credit by exploiting the asset eligibility rule. In our context, one can in principle use the firm size eligibility rule based on the number of employees or turnover. The main advantage with this approach is that one can identify the effect of the marginal investment that is induced by the tax deduction. Unfortunately, this method is not feasible in the current study because the group of eligible firms that we can observe, e.g., using size threshold, is too large compared to the group of firms that would receive the treatment (benefit from the programme). Let's say we use the employment size eligibility rule and identify as eligible firms those with less than 50 employees, otherwise non-eligible. The main concern in our case is that the share of firms that receive external equity from individual investors, and thus get treated, is too low, i.e., less than 1 percent, compared to the population eligible firms (too few compliers). This means that there is a high risk that we may not be able to detect intention-to-treatment effects due to too much aggregation. This motivates our choice to estimate treatment effect using the DiD methods described above.

## 6.2　Data and sample restrictions

The analysis in this study mainly relies on three register datasets obtained from Statistics Sweden and the Swedish Business Register Office. The first dataset contains information about firms that received investment from individual investors and submitted a tax deduction claim for their investors between 2014 to 2019. We merge this dataset with individual investors' tax deduction claim to identify the investments that are approved by the tax authority, i.e., the beneficiary firms and investors. This is our main source of information about the firms that benefited from the programme, individual investors, the amount invested at the individual investor level as well as the total external equity at firm level. The second dataset comes from the Swedish Business Register Office (SBRO) and contains information on all firms that issued and sold new shares during the period

2004 to 2019. Thus, this dataset contains firms that receive investment from individual investors as well as institutional investors, such as venture capital funds, pension funds and others. The third dataset contains various firm level register data on firms' financial information and various background characteristics. The above datasets contain (anonymised) unique firm identifiers that allow us to link the various firm level registered data.

During the period 2014-2019, in a total of 4,767 investment rounds, firms received external equity from individual investors at their expansion phase, here defined as firms aged 2 or older. To this data, we make the following sample restrictions. First, to avoid a contamination effect from the previous year's tax deduction benefits, we restrict the sample to the first year of investment (treatment). This leaves us with 2580 unique firms in the dataset. Second, firms with missing financial or background characteristics during the year of investment or the year before investment are excluded, leaving us with 1958 observations. Third, we exclude 635 firms whose investors claimed a tax deduction, but where the firms' shares are not reported or registered at the SBRO within 1 year before or after the claim. We exclude these groups of firms because the year of investment claim (obtained from the tax agency) can not be reconciled with the registration of new share issues at the SBRO, which makes it difficult to identify the exact year of investment.[11] In addition, we exclude firms that do not qualify the eligibility criteria based on minimum annual wage expenditure, employment and sales. The final sample constitutes 1047 beneficiary firms. To this sample, we add comparison firms using the matching procedure discussed in the next section.

## 6.3    Difference-in-Difference Matching

We use a difference-in-difference (DiD) design to examine the effectiveness of the tax incentive for private investors. The empirical model specification is reported as follows:

$$Y_{it} = \beta_0 + \beta_1 Beneficiary_i + \beta_2 Post_t + \beta_3 (Beneficiary_i * Post_t) + X_{it}\theta + \varepsilon_{it}$$

Where $Y_{it}$ represents outcome variables, namely log turnover, value added and employment. The variable $Benefitiary_i$ is a dummy that takes a value of 1 if a firm receives investment from beneficiary investors and a value of zero if a firm receives investment from non-beneficiary investors. The variable $Post_t$ is a time dummy taking a value of 1 for the years following investment (including the year of investment); otherwise, the variables take a value of 0 (the years before investment). We can observe the firms for 3 years before investment and a maximum of 6 years after investment, depending on the year of investment.[12] The DiD estimates are obtained as an interaction between the dummies for beneficiary firms and the post investment period, shown by $(Beneficiary_i * Post_t)$. The vector $X_{it}$ represents model controls such as firm age, age squared, 1-digit industry fixed effects, 1-digit industry-year interaction and year of investment fixed effect.

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[11] It is possible that some firms with newly issued shares may not appear in the Swedish Business Registration Office database due to registration delays. In section 5, we checked the robustness of our results after adding these group of firms. However, the addition of the above group of firms does not change the main conclusion.

[12] For instance, firms that receive investment in 2014 can be followed up to 2019, i.e., for 6 years. While other firms that receive their first investment in 2019 will only be observed for 1 year. Since many firms in our sample are relatively young, the pre-investment observations are restricted to a maximum of 3 year.

The main parameter of interest is $\beta_3$, which measures the impact of the tax subsidised investment on firm performance. More specifically, it indicates the differences in returns to investments from beneficiary investment compared to investment from non-beneficiary investors.

An important assumption for causal interpretation of the DiD estimates is that the beneficiary and non-beneficiary firms would have parallel trends in the absence of the programme intervention. This assumption would be violated if the beneficiary and non-beneficiary firms have different growth trajectories. To minimise such risk, the selection of control firms is conducted in two steps. First, we identify firms that qualify most eligibility criterion for investors' tax deduction, except the financing source. That is, from the population of firms that issued new shares, we draw a sub-sample of firms that do not apply for investors' tax deduction[13], but qualify other eligibility criteria in terms of firm size (turnover<80 million and number of employees<50 at t<=0) and annual salary expenditure (salary expenditure>=300,000 SEK at t or t+1). Next, we apply a matching procedure to further improve the similarity of beneficiary and non-beneficiary firms. In particular, we try to minimise pre-existing differences in growth trajectory by matching on firm size (measured by sales and employment), growth potential (proxied by growth in sales and employment), fixed asset and single-digit industry.

There are different matching procedures in the literature.[14] This study uses Coarsed Exact Matching (CEM) since it is faster and easier to implement (Blackwell et al. 2009). In addition, it allows the researcher to have full control over the matching criterion (Iacus et al. 2021). The CEM matching algorism involves three steps. The first step is to divide (coarsen) each matching variable into bins. For instance, a matching variable industry could be divided according to a single- or double-digit industry classification. For continuous matching variables, Stata's cem command provides alternative methods to coarsen the variables based on the underlying distribution of the data. The choice of the matching variables is commonly guided by researcher's prior knowledge about the selection process and/or theory. The second step is to group firms into strata, where each treated and control firm within strata have the exact same values in their matching variables. Finally, from the data set, we drop stratum that do not include at least one treated and one control observation.

The following variables and cutoff points are chosen for the matching: number of employees$_{t-1}$ (cutoffs at 2, 4 and 10), log (turnover+1)$_{t-1}$ (CEM default bin-cutting algorism), first difference in log turnover$_{t-1}$ (cutoffs at -1, 0, 1 log points), first difference in log employment$_{t-1}$ (cutoffs 0, 2 log points), fixed asset (cutoff at the mean value) and industry (single-digit). Matching is conducted using observations at t-1, where t is the year the treated and control firms receive investment.

Table 14 shows the summary statistics of beneficiary and non-beneficiary firms before and after matching. Before matching, we see that the beneficiary firms have lower employment and sales, but higher growth in both outcomes. We also find that the

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[13] We anticipate that the above firms, in the control group, must have received investment from non-eligible financing sources such as venture capital, pension fund or others institutional investors.

[14] Propensity score matching (Rosenbaum and Rubin 1985), Mahalanobis distance matching (Mahalanobis 1936) and Coerced Exact Matching (Rubin 1980; Blackwell et al. 2009).

beneficiary firms are younger, have lower fixed asset, have lower value added and are to a lesser extent part of a company group. After matching, the comparability of beneficiary and non-beneficiary firms improves significantly, where none of the differences in pre-investment attributes are significant except for value added. In section 6.4, we will provide an indirect test on the parallel trend assumption by examining the pre-investment trends in turnover, employment and value added on the non-matched years, i.e., t-2 and t-3. Out of the total 1047 treated firms, 249 firms are excluded from the data due to a lack of similar control firms. The final sample constitutes 798 treated firms and 2246 control firms.

Table 14 Pre-investment mean characteristics of treated and control firms, before and after matching

| | Unmatched | | | Matched | | |
|---|---|---|---|---|---|---|
| | Beneficiary | Non-beneficiary | Difference | Beneficiary | Non-beneficiary | Difference |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Number of employment | 5.6 | 6.6 | -1.0*** | 5.7 | 5.7 | 0.0 |
| | (6.7) | (7.9) | | (7.1) | (7.2) | |
| Growth in employment (%) | 21.0 | 13.7 | 7.3*** | 21.4 | 21.2 | 0.0 |
| | (48.0) | (45.5) | | (42.8) | (44.3) | |
| Turnover (000' SEK) | 5711.0 | 10148.4 | -4.437.4*** | 6431.3 | 6762.4 | -331.1 |
| | (9836.0) | (13609.8) | | (10361.8) | (11267.4) | |
| Growth in turnover (%) | 49.6 | 24.2 | 25.4*** | 44.8 | 43.9 | 0.0 |
| | (224.8) | (182.7) | | (210.5) | (210.5) | |
| Age at investment | 7.9 | 9.2 | -1.3*** | 8.1 | 7.9 | 0.2 |
| | (7.2) | (8.5) | | (7.2) | (7.7) | |
| Fixed asset (000' SEK) | 1091.6 | 2646.6 | -1.555.0*** | 671.8 | 651.0 | 20.8 |
| | (6912.5) | (18418.7) | | (3859.5) | (4143.0) | |
| Value added | 1299.1 | 3670.1 | -2371.0*** | 1785.2 | 2698.5 | -913.4*** |
| | (7082.9) | (6465.5) | | (7356.5) | (6251.3) | |
| Share part of a group (%)[15] | 41.30 | 44.4 | -3.0* | 43.7 | 40.6 | 3.0 |
| | (24.2) | (24.6) | | (24.6) | (24.1) | |
| Observations | 1047 | 3548 | | 798 | 2246 | |

## 6.4 Results

Before presenting the results from the regression analysis, Figure 9 provides descriptive evidence on the development of beneficiary and non-beneficiary firms' average turnover, value added and employment for the years before and after investment. During the first three years before investment, we see that the levels of log turnover, value added and employment of the beneficiary and non-beneficiary firms are very close and follows a similar trend.[16] Following the investments from external sources, we find a stronger increase in turnover and value added among non-beneficiary firms compared to the beneficiary firms. It suggests that the investments backed by the beneficiary investors are of low quality. However, we find no difference in terms of employment in the years before and after investment, as can be seen from Panel C.

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[15] In the matched sample, the majority (76% among beneficiary and 62% among non-beneficiary firms) of the parent companies are micro firms with zero or 1 full employees. About 21% among beneficiary and 30% among non-beneficiary firms have a parent company of small or medium size, while about 2.9% of the beneficiary firms and 7% of the non-beneficiary firms have a parent company with a size larger than 200 employees.

[16] It shows that our matching procedure is successful in identifying non-beneficiary firms that are likely to have similar trend in the absence of the investments.

Figure 9 Development of firm turnover and employment before and after investment
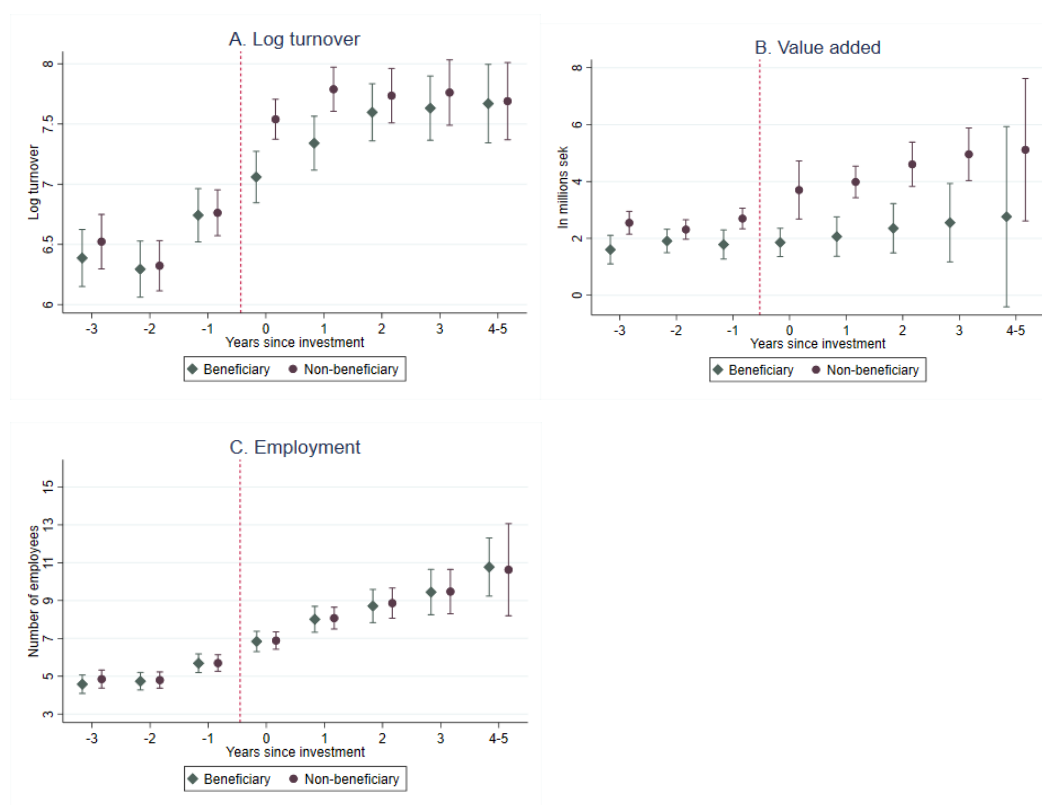


Note: The dots in Panel A, B and C, respectively, show the average values of log(turnover), value added and employment, while the corresponding vertical lines show the 95% confidence interval.

Table 15 provides the DiD estimates from the regression of equation 1. The first column shows the baseline result on turnover after controlling for quadratic age, 1-digit industry, industry-year interaction and year of investment fixed effects. The estimate shows that the returns to investment for beneficiary firms is 0.24 log points (about 24%) less compared to the non-beneficiary firms. Column 2 shows that the result is stable when adding more covariates, namely the amount raised from external sources and an indicator if a firm is part of a group. In column 3, we estimate the baseline model using a Tobit model to account for left censoring of the data at zero, but the result is not affected by the choice of the estimation method. Column 4-5 presents results on value added. Like the results on turnover, we find that investments that are backed by beneficiary investors perform poorly. Finally, column 6-7 present results on the number of employees. In line with the graphical evidence, we find no significant difference on the number of employees. Despite the similarity on employment, the better performance of the non-beneficiary firms in terms of turnover and values added suggests that the investment must have increased their labour productivity to a larger extent than the beneficiary firms.

Table 15 The impact of tax subsidised investment on firm performance

| Variables | Log(turnover) | | | Value added in millions | | Number of employees | |
|---|---|---|---|---|---|---|---|
| | OLS | | Tobit | OLS | | OLS | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| | | | | | | | |
| Beneficiary*Post | -0.240** | -0.262** | -0.268** | -1.447** | -1.512** | 0.003 | 0.020 |
| | (0.115) | (0.115) | (0.128) | (0.606) | (0.603) | (0.489) | (0.488) |
| Beneficiary | -0.101 | 0.206 | -0.096 | -0.807*** | 0.081 | -0.244 | -0.511 |
| | (0.135) | (0.151) | (0.151) | (0.266) | (0.323) | (0.300) | (0.353) |
| Post | 0.821*** | 0.826*** | 0.919*** | 0.732 | 0.750 | 0.471** | 0.475** |
| | (0.073) | (0.073) | (0.083) | (0.525) | (0.525) | (0.229) | (0.230) |
| | | | | | | | |
| Baseline controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Log(external equity) | No | Yes | No | No | Yes | No | Yes |
| If part of a group | No | Yes | No | No | Yes | No | Yes |
| Observations | 20,022 | 20,022 | 20,022 | 20,032 | 20,032 | 20,032 | 20,032 |

Note: Controls include age, age squared, 1-digit industry fixed effects, 1-digit industry-year interaction and year of investment fixed effect. Standard errors clustered at firm level are reported in bracket. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Figure 10 shows the DiD estimates for each year since investment, while using the year before investment as a reference year. We estimate versions of the baseline models shown in columns 1, 4 and 6 of Table 4, except that we now estimate effects for each year since investment. Starting from the estimates for the pre-investment years, the zero estimates on year t-3 and t-2 implies a constant difference, i.e., a parallel trend, in pre-investment outcomes between groups. The only exception is the estimate on value added at t-2, where the DiD estimate shows a positive estimate. Taking the overall evidence together, we can at least conclude that there is no indication of a pre-exiting growth advantage in favour of the non-beneficiary firms. However, following the investment from an external source, we find that the non-beneficiary firms outperform the beneficiary firms in terms of turnover and value added. The estimates on turnover show some heterogeneity on the effects of the investment over time. During the first two years, the returns to investment among the non-beneficiary firms is 0.4 log points (40%) higher compared to the beneficiary firms. This difference, however, drops over time reaching to 0.07 log points (7%) after 5 years. On value added, we see that the non-beneficiary firms show a superior performance on all post-investment years, where estimates increased from 0.9 on year zero to 1.5 million kronor on year zero. In terms of percentage, this is equivalent to a 20% (0.9/4.46*100) and 24% (=1.5/6.35*100) increase in value added on year zero and five, respectively. Finally, the estimate on employment shows no heterogeneity on the effect of the investment by years since investment (Panel C).

Figure 10 The impact of tax subsidised investments on firm performance, by years since investment
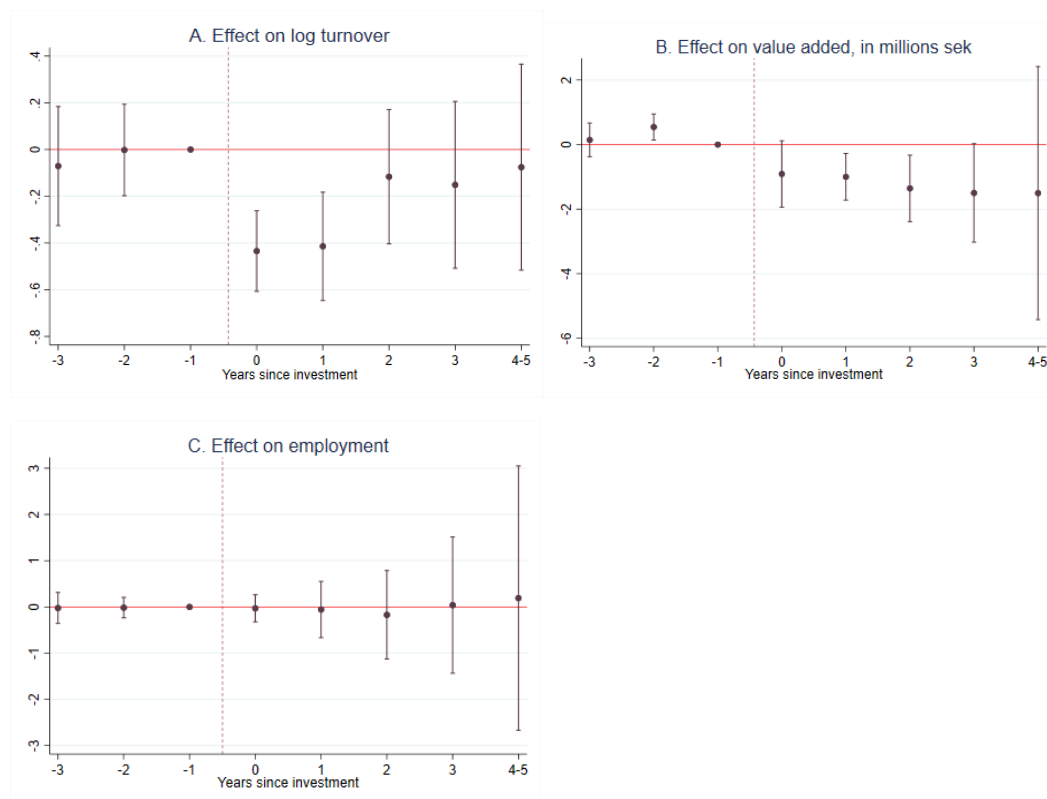


Note: The dots in Panel A, B and C show the estimated coefficients on turnover, employment and value added, respectively. The model is estimated using OLS after adding baseline model controls. We use t-1 as our reference year, and thus it is omitted from the regression. The vertical lines connected to the estimated coefficients represent a 95 percent confidence interval.

The underperformance of the firms backed by beneficiary investors casts doubt about the effectiveness of the tax subsidy programme. If the tax incentive is addressing the credit market imperfections to boost financing for high quality expansion firms with financial constraints, then we would expect beneficiary firms on average to be at least as good as the non-beneficiary firms. The above findings imply that the additional investments induced by the tax incentive, if any, are not reaching the targeted firms, i.e., those with high growth potential.

As argued in the introduction of section 6, one implication could be that the programme supports bad investments and marginal inferior firms that would not be backed without the subsidy. A second and third implication relates to the capacity of the private investors targeted by the policy. Beneficiary investors could lack the skills to select qualified investment projects, and we find no evidence that supports the presence of value added by the beneficiary investors topping what the institutional investors can provide. A reason could be that sophisticated investors are less responsive to these types of tax incentives. Rather, the tax incentive may have attracted (additional) investors with limited experience. This conclusion is aligned with Denes et al. 2021, who also found similar results for the US angel investor tax credit using a survey of angel investors, showing that the investors that are induced by the tax incentive mostly constitute inexperienced investors lacking an entrepreneurship background.

# 7.    Conclusion

This evaluation study provides an analysis of the investor tax deduction programme that was introduced in Sweden in 2014. Tax incentives to improve the after-tax return of private investors were implemented to stimulate investment activity with the purpose to foster innovation and high growth entrepreneurship. During the first six years, around 6000 tax credits were claimed annually and about SEK 60 million were awarded each year.

There is still limited knowledge of the tax-driven effects on beneficiary investors and firms. In theory, effective tax incentive policies boost financing by reducing the perception of financial risk and decreasing the cost of investment. Most previous evaluations report that the number of investors and investments, as well as the investment amounts, are increasing, while the effects on beneficiary firms are mixed. The outcome on community level, growth effects and entrepreneurial activity are largely reported as weakly negative. Recent evaluations find consistently that targeted investors are less experienced and new to angel investments. There is also agreement on the importance of well-devised policy design. Our study contributes to this literature by analysing tax policies incentivising investment in innovative entrepreneurship in the Swedish context.

Using a difference-in-difference approach we estimated the performance of the firms backed by investors benefiting from the tax subsidy and compared this with the firms backed by non-benefiting investors. For identification, we exploited investor eligibility for the tax subsidy. We further investigated the investor and investment characteristics and aggregated equity investments in small businesses.

One main interest of our analysis was to understand the precision of the Swedish angel investor tax credit programme, i.e., that the policy targets high-skilled, wealthy, individuals. Another intention was to explore the effectiveness of the tax relief design in promoting firm growth and innovative entrepreneurship. Our findings imply that the attempt to stimulate business angel and entrepreneurial activity through tax relief has not delivered the anticipated results. The programme seems to direct funds toward companies with low growth prospects. We also do not observe a surge in external equity investments, neither in amount nor number of deals. The descriptive analysis indicates that the majority of investors targeted by the programme are most likely not sophisticated business angels or driven entrepreneurs. This implies that the targeted investors may not be sensitive to the policy.

The tax deduction is only offered to external investors for equity investments after firm establishment. This design would offset the risks of crowding-out investments that would have been made anyway. There is also less risk of information asymmetry and too low monitoring activity that insider investing could result in (Kaplan and Strömberg, 2001). Still, the average amount invested is very small and the level of managerial and industry experience by investors is low, which indicates investors that are new to angel investment. A positive interpretation could be that the programme has encouraged new investors to invest low-scale and that this push would induce larger and more experienced equity investments in the future. A negative implication could be that

individuals are incentivised into excessive risk-taking. A follow-up study including interviews with these later-stage investors could shed light on these investors and their investment behaviour.

As discussed in section 2.2, to motivate a regressive policy that reallocate income from taxpayers to already wealthy individuals, it is absolutely key that the programme delivers additionality. Our results lead us to conclude that the investor tax deduction programme seems to contribute to a poor allocation of funds in the economy.

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# Appendix

## From K11 claims to the data set

This chapter summarises the descriptive statistics on equity investments in small firms that were subject to investor tax deduction applications in Sweden between 2014 and 2019. Individual investors make a claim for the deduction by completing a form (K11) attached to the regular income statement. The individual must complete a K11 form for each investment for each year the individual claims the tax deduction. In addition, firms that fulfil eligibility criteria for the tax deduction, and received an investment in equity capital, are expected to report all investments made by individual investors in a form (KU28) attached to the firm's income statement. This requirement does not exist for legal persons that buy new stock.

There are considerable differences between investors self-identified on the K11 form and the investors identified by the KU28 form. The overlap in the data is illustrated in **Fel! Hittar inte referenskälla.Fel! Hittar inte referenskälla.**. There are 8 652 firms for which individuals have claimed a deduction (K11 claims), while 3 329 firms report having individual investors (KU28 reports) during the period 2014–2019.[17] Around a third of firms with K11 claims have also completed KU28 forms. Around 18 percent of firms that completed KU28 for the investors have no corresponding K11 claim, which means that no individual investor submitted a claim for the investment. There can, of course, be many reasons for this discrepancy. Among these are the following:

• The individual does not pay tax in Sweden;
• The individual chooses to not claim the deduction; and
• The individual has made several investments, and claim a deduction only for a few, because of eligibility criteria.

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[17] These numbers are calculated so that an investment is a unique combination of a firm, individual and year. Multiple forms for the same person, firm and year are treated as one. K11 and KU28 forms with missing personal or firm identification numbers, as well as investments of 0 SEK, are excluded.

Figure 11 Investments according to different tax authority sources
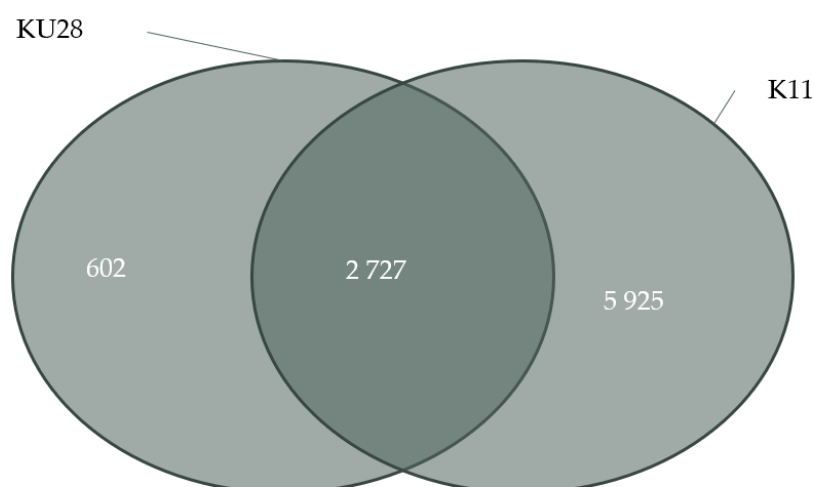


Source: Swedish Tax authority. Calculations by the authors.

Figure 1 and Figure 2 are based on the full sample of K11-firms. However, not all firms can be included in the analysis. Out of the totally 8 652 firms, 326 firms are not found in relevant firm registers. This means that the firm is inactive and has not turned in an annual report or it has not paid a salary over 100 SEK before 2020. A total of 415 firms have K11 claims, but they have either issued new shares before 2013 (the programme start) or the investor claims have not been approved. The presumed reason for this is that the firms do not meet the eligibility criteria. In 40 cases, the last active year of the investment was the year before the first K11 claim in the firm. That leaves 7 817 firms and 24 723 natural persons making 36 102 investments (K11 claims) in the dataset.

# Identifying and classifying types of investment rounds

Tax deduction for investments by individuals in SMEs can be either (1) investment in equity in a new firm or (2) expansion capital in an existing firm. We have no information on which type each investment belongs to, so we use the register of newly-issued shares from the Swedish Companies Registration Office.

Table 16 Classification of firms into types

|  |  | Equity issuance [1] | |
|---|---|---|---|
|  |  | **YES** | **NO** |
| **First annual report at least one year before first K11-claim** | **New** | Startup expansion | Startup |
|  | **Established** | Growth firms | N/C |

1. The firm has issued equity if at least one equity issuance is registered with the Swedish Companies Registration Office after 2012. Definitions by authors.

An ideal strategy would be to classify a firm as "new" if the first annual report is the year of the first claim, which would classify a firm as issuing new shares if there is a record of

this in the equity issuances database. The problem with this classification strategy is that the year of the equity issuing registration and the K11 claims do not match. The year of an investment round is not definite since the time span from a decision to issue new shares in the board of directors and the final investment paid can be up to three years. In addition, the firm can decide to increase the amount of stock every year. Individuals can claim a K11 tax deduction for an investment made the year before the claim. This information is not available in our dataset. Individuals can also make a K11 claim for investment in new shares, not yet registered.[18] This means that an investment round is not definitely fixed in time and several rounds can occur concurrently. For this reason, it is not possible to classify each investment to a definite type or stage. Instead, *firms* are classified into types. The classification scheme is described in Table 16. Note that the category labels may not correspond to how these terms are used in the finance literature. We use this classification in the Appendix for convenience but in the rest of the report, we refer to new firms and equity issuing firms, respectively.

The classification if the firm is new is simple: a firm is considered established if the first annual report (or first year where salaries were paid) predates the first KU11 claim by more than a year: e.g., if the first K11 claim is dated 2014, and the first annual report is dated 2012 or earlier. If the firm has an equity issuance registered with the Swedish Companies Registration Office any year between 2013 and 2020, the firm is considered an expansion. If the firm is **not** new, that is the first annual report was more than one year before the first K11 claim, and the firm did **not** have an issue of new stock registered with the Swedish Companies Registration office between 2013 and 2020, then the firm is considered "unable to classify" (*N/C*). We separate startups and startup expansion for analytical reasons. Since insiders can benefit from the investor tax relief when the firm is established and not when shares are issued in later stages, the investor population will differ if one firm has issued shares and the other not.

Around 6 percent of firms (445 firms) are considered unable to classify. One reason for this could be that a new issue of stock has not yet been registered with the Swedish Companies Registration office. These firms that are unclassifiable are excluded from further analysis.

Table 17 Investment by firm type

| Type of investment round | Firms | % | Claims | % |
|---|---|---|---|---|
| Startup | 5 295 | 68 | 6 985 | 19 |
| Startup expansion | 718 | 9 | 6 705 | 19 |
| Growth firm | 1 359 | 17 | 21 266 | 59 |
| Other | 445 | 6 | 1 146 | 3 |
| Total | 7 817 | 100 | 36 102 | 100 |

Source: Swedish Tax Authority, the Swedish Companies Registration Office, and Statistics Sweden (Registerbaserad Arbetsmarknadsstatistik (RAMS) and Företagens ekonomi (FEK)). Calculations by the authors.

The distribution of firm types and the number of investments (K11-claims) is reported in Table 17. Almost 70 percent of the firms are startups, while almost 20 percent of firms are

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[18] For a valid K11 claim, only a valid payment and a board decision are necessary. Communication with Skatteverket.

established growth firms. Around 10 percent of firms are startup expansions: firms that have a start year close to the first K11 claim that have subsequently increased equity capital by issuing new shares. The number of investments (K11-claims) are more evenly distributed between startups and established firms. Established firms gain around 60 percent of individual KU11 claims, while new firms constitute almost 40 percent. This means that the number of investors in each firm is higher among established firms than in startups.

Table 18 Number of investors per firm type

| Firm type | Mean | <5 investors | <10 investors |
|---|---|---|---|
| Startup | 1.3 | 99% | 100% |
| Startup expansion | 8.6 | 70% | 86% |
| Growth firms | 14.2 | 64% | 79% |
| Other | 2.5 | 98% | 99% |
| Total | 4.3 | 90% | 95% |

Sources: Swedish Tax Authority, the Swedish Companies Registration Office (Bolagsverket) and Statistics Sweden (Registerbaserad Arbetsmarknadsstatistik (RAMS) and Företagens ekonomi (FEK)). Calculations by the authors.

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