How Sensitive is Young Firm Investment to the Cost of Outside Equity?

Evidence from a UK Tax Relief[1]

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We estimate the sensitivity of investment to the cost of outside equity for young firms. For estimation, we exploit differences across firms in eligibility to a new tax relief program for individual outside equity investors in the UK. On average, investment increases 1.6% in response to a 10% drop in the cost of outside equity. This average conceals substantial heterogeneity: 1% of eligible firms issue equity in response to a subsidy that would have doubled investors' returns, implying large fixed issuance costs for the majority of firms. Conditional on issuing new equity, however, firms invest eight times the issued amount. The results imply a large complementarity between outside equity and other funding sources.

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Only a small fraction of young firms accounts for the disproportionate contribution of young firms to aggregate output growth (Haltiwanger, Jarmin and Miranda, 2012; 2014). This fact fuels a longstanding debate on the determinants of young firm investment behaviour. On the one hand, the level and skewness in the cross-section of young firm growth can be explained by differences in productivity or entrepreneurial ability (e.g., Lucas, 1978; Jovanovic, 1982; Pakes and Ericson, 1989; Hopenhayn, 1992). On the other, frictions that increase the cost of outside capital, such as information asymmetries (e.g., Myers and Majluf, 1984) and non-pecuniary benefits of control (c.f., Blanchflower and Oswald, 1992; Moskowitz and Vissing-Jorgensen, 2002; Hurst and Pugsley, 2011) may affect investment. These two explanations have different predictions regarding the extent and degree to which firms respond to changes in the cost of outside capital. While in a frictionless world all firms adjust investment, financial frictions introduce a wedge between the cost of inside and outside capital that hinder investment adjustments. The extent to which investment responds to changes in the cost of capital is informative about the relative importance of these two rationales in explaining aggregate young firm growth. However, estimating the elasticity of investment to the cost of capital is challenging because changes in rates of return are seldom exogenous to the investment opportunities facing firms (e.g., Caballero, 1994; Guiso et al., 2012).

In this paper, we use variation in the access to individual investors' tax relief programs across UK firms of different sizes, to estimate the sensitivity of young firm investment to the cost of *outside* equity—the most expensive source of capital in the presence of information asymmetries (Myers and Majluf, 1984). The Seed Enterprise Investment Scheme (SEIS), introduced in 2012, offered tax reliefs for investments in young firms with less than £200,000 in assets. These reliefs would have increased by 100% the realized returns of equity investors in the average eligible firm (from 6% to 12%). For estimation we use a difference-in-differences approach that compares the new equity issuances and investments by eligible and not-eligible firms with assets close to the £200,000 threshold (measured in 2011).

There are three main findings. The first is that the vast majority of eligible firms did not issue new equity in response to the subsidy. About 1% of eligible firms issued new equity, a 16.67% increase relative to the baseline probability of new equity issuance in the sample. This finding suggests that young

UK firms face high outside equity costs—i.e., there is a wedge in the cost of inside and outside equity (e.g., non-pecuniary benefits of control, search costs, rationing). The alternative explanations that individuals were not aware of the subsidy or that the program involves large transaction costs (e.g., paperwork, legal fees) are not widely supported: the government used an aggressive publicity campaign; public awareness is reported in entrepreneurial surveys, and estimated transaction costs are small. We absorb potential productivity differences across industries parametrically, yet, technological frictions to young firm investment (e.g., lumpy investment) is a complementary explanation that cannot be fully ruled out. Given that eligible firms are restricted to £200K in size (and the subsidy is capped at £150K per firm), however, very large degrees of technological frictions would be required for such frictions to be a first order explanation of the finding (e.g., the size of the "lumps" would need to exceed (at least) 75% of firms' assets).

Our second main finding is that conditional on issuing equity, firms invest 8 (3) times the issued amount (in fixed assets). This investment adjustment is economically significant: it corresponds to a 36% (64%) rise over the unconditional mean, and to roughly twice the average equity (inside and outside) multiplier in the sample. This result implies a large complementarity between outside equity and other non-equity funding sources (e.g., bank loans). Under additional assumptions of little opportunistic behaviour by entrepreneurs and investors, this result suggests that at least some young firms in the UK are financially constrained (cf. Banerjee and Duflo, 2005). The equity multiplier is not necessarily explained by investment in assets that can be pledged as collateral. Indeed, eligible firms with low asset tangibility (c.f., Almeida and Campello, 2007) mostly invest their equity issuance in current assets, but they still continue to complement the subsidized equity with non-equity capital to finance the full investment. Securing outside equity thus appears to allow firms to lever-up, perhaps by decreasing the borrowing need or by providing reputational collateral (c.f., Holchberg et al., 2014).

Third, we use cross-sectional cuts to provide further suggestive evidence of high outside equity issuance costs across firms. In particular, we split the sample into firms with at least one outside equity investor before 2012 ("pre-issuers") and those with no such investors prior to the subsidy launch. We find a higher take-up rate for pre-issuers, especially for those with institutional investors such as venture

capital firms. This finding suggests that some of the costs of issuing outside equity are fixed, and the subsidy is not high enough for all firms to cover such fixed cost hurdle. These additional findings further support the notion that technological frictions across firms are unlikely to be the only explanation behind the results. Consistent with this interpretation, interviewed entrepreneurs mentioned that finding equity investors for the first time can be elusive for firms that are not plugged into the business angel investor market[2], that the lack of formal secondary private equity markets affects the liquidity of individual equity claims in entrepreneurial firms, especially for those with no natural potential-buyers such as institutional investors, and that fear of losing control is a fundamental deterrent for seeking outside equity capital.

We use a back-of-the-envelope calculation of our findings to estimate the average elasticity of young firm investment to the cost of outside equity. We find that on average, investment (in fixed assets) increases 1.6% (2.5%) in response to a 10% drop in the cost of outside equity. Finally, we estimate the economic costs of financial frictions for young firm growth by calculating a counterfactual elasticity assuming that all eligible firms had taken the subsidy and invested (ignoring the equity multiplier). We estimate that absent frictions, the elasticity of investment to the cost of outside equity would have been at least 4 times larger.

Our paper contributes to several strands of the literature. First, it relates to research on small and young firms' contribution to output growth. Our results are consistent with the large heterogeneity across small and young firms documented by prior work: only a small fraction of young firms contribute to the prowess of these types of firms in explaining economic growth (Haltiwanger, Jarmin and Miranda, 2012; 2014; Hurst and Pugsley, 2011). Our contribution is to estimate the impact of distortions in financial markets that may impede business start-ups (which have dramatically fallen in the US since 2007; Haltiwanger, 2011) and high-growth firms. Our findings suggest that they are very relevant for at least a subpopulation of young businesses—likely the high-growth young firms that contribute significantly to growth.

[2] Two types of institutions have recently emerged that mitigate these costs: equity crowd-funding platforms where firms explicitly publicize their tax-relief-eligibility status and SEIS-specialized investment funds. However, their development is still incipient remain underdeveloped (e.g., platforms only cater to businesses with tangible products with a business model that is easily conveyed online).

We also contribute to the literature that measures the sensitivity of investment to the cost of capital. As summarized by Chirinko et al., (2001), a large body of work in the macroeconomics literature has attempted to pin-down this elasticity. However, this prior work faces potential econometric issues such as the endogeneity of the user cost of capital (see Cummins et al., 2004) and measurement error (Goolsbee, 2000; Cummins et al., 2006). To date there is little consensus over the value of the elasticity, with published estimates ranging from zero to negative two. Our main contribution to this literature is to provide an estimate using a cleaner set-up, free of parametric or modelling assumptions regarding the use cost formula (cf. Schaller, 2007). Our work also complements the development literature, which explores how responsive is investment to rates of returns in developing countries such as the works by Banerjee and Munshi (2004), Foster and Rosenzweig (1996), Goldsetin and Udry (1999) and Dufflo et al., (2003). Our contribution to this literature, is to focus on a subset of firms—young businesses in develop economies—that remains understudied and yet is generally recognized to be the main engine of growth an innovation.

Third, our paper contributes to studies on capital structure. Similar to the work by Gordon and MacKie-Mason (1990), Graham (1999), Campello (2001) and Panier et al., (2014), we use changes in tax policy as a source of variation in the relative cost of different sources of capital to explore capital structure decisions by firms. We contribute to this literature by focusing on young businesses and complement recent work by Robb and Robinson (2014) documenting limited use of outside equity among these companies. Our data allow us to confirm the limited usage of outside equity for the universe of firms in the UK (relative to the sample in Robb and Robinson (2014) based on the Kauffman survey)—the second largest private equity market worldwide. Our second contribution to this literature is to provide estimates of the magnitude of frictions in outside equity markets that can help explain such limited usage.

Finally, our work also relates to the literature on financial restrictions and entrepreneurship (see Kerr and Nanda, 2009). Most of the rigorous evidence in this literature focuses on subsistence entrepreneurship in developing countries (e.g., De Mel, McKenzie and Woodruff, 2008). Yet a central question for policymakers is whether transformational ventures (see: Schoar, 2010; Levine and Rubinstein, 2013) indeed hold the potential for economic growth. We provide rigorous evidence on the

returns to investment for the universe of young firms in the UK. Because our variation stems from changes in government programs, our work closely relates to papers such as Hombert et al, (2016) among others that explore the impact of public programs on entrepreneurship.

The rest of the paper proceeds as follows. In Section 1, we provide a detailed description of the institutional setting in this paper and describe the data used in the analysis. We describe the empirical strategy and present the results in Section 2. In Section 3 we discuss the interpretation of results and connections to existing literature. In the final section we conclude.

1. Institutional Setting and Data

1.1. Tax Incentives for Individual Investors in UK Young Firms

The UK government has several programs to decrease the cost of capital for young firms. Annually, £13 billion are spent on such programs, more than the fiscal budget of the police and close to the universities' budget (Hughes 2008).

The newest of such programs is the Seed Enterprise Investment Scheme (SEIS), which was launched in 2012. The SEIS offers *outside* individual investors who purchase new full-risk ordinary shares (i.e., shares with the same rights as those held by the founders) in *small, young* firms a three-way subsidy: income tax relief (e.g., for every £100 invested, investors get £50 back), capital gains and inheritance tax exemption (e.g., for every £100 pounds in after-tax profits, investors receive £139 through the SEIS) and loss relief (e.g., for every £100 pounds in after-tax losses, investors lose only £76 via the SEIS).

Outside investors correspond to those that do not have a "substantial interest" in the company—i.e., do not directly or indirectly possess or are entitled to acquire more than 30% of voting and ownership rights in the firm. Eligible outside investors may not hold the substantial interest at any time since the company's incorporation and the third year anniversary of the date that the SEIS shares were issued. Eligible outside investors or any of his associates must also not be an employee of the company or any of its subsidiaries (after the SEIS shares are issued).[3] This restriction does not apply if the investor is a director in the company. Outside investors are entitled to income tax relief of 50% on investments

[3] Associates do not include brothers and sisters.

(deducted from tax liability) up to a maximum annual relief of £100K, capital gains tax exemptions (and deferrals) as well as loss relief, provided the shares are held for a period of at least three years (and of up to five years).[4] Investors cannot receive any compensation from the firms for raised equity such as a loan or wage—employees are not eligible SEIS investors in the firm.

Eligible small, young firms correspond to unquoted businesses with gross assets not exceeding £200,000 before the share issue, and that have been trading for less than 2 years.[5] These firms roughly correspond to 25% of UK firms and amount to circa 3.2M businesses (during the 2009-2014 period). Additional requirements include a permanent establishment in the UK, fewer than 25 employees, and independence: cannot be controlled by another company and must be in control of any subsidiaries.

Companies can raise a maximum of £150K under SEIS in any three-year period.[6] A share issue under SEIS can be followed with further issues of shares under EIS. However, at least 70 per cent of the monies raised by the SEIS must have been spent before doing the new issue. Companies must use the funds raised through the program for the purposes of a *qualifying* business activity within 2 years of the share issue, including carrying on a research and development (intended to lead to a qualifying trade). The SEIS rules specifically require the money raised under SEIS to be "spent"—which means the money must actually be paid out to independent, unconnected third parties for commercially supplied good or services.

The SEIS is not unique to the UK: several European countries have similar tax incentive programs including, Spain, Portugal, Finland, Belgium, France, Germany and Netherlands. The UK public is likely aware of the program. While it launched on 2012, the SEIS is actually an extension of the venture capital scheme, which has been offering tax incentives for equity investors in small UK firms for more than 20 years. In addition, the government has aggressively advertised this initiative. For example, during its launch, the government partnered with Telefonica and sent all users of this mobile company a text message inviting people to learn more about the SEIS. Crowd-funding equity

[4] There is no relief for dividend taxes.
[5] There is no limit on assets after the issue. Where the SEIS company has subsidiaries, these limits apply to the total assets of the group. All forms of property that appear on the company's balance sheet are treated as assets for the purpose of this rule, and HMRC will normally determine the value of the company's assets by reference to the values shown on the balance sheet.
[6] SEIS is a form of state aid under EU rules.

platforms such as SEEDRs and Crowdcube have also aggressively advertised the incentive. These platforms run educational campaigns about the tax relief. They also encourage user-businesses to advertise their SEIS (and EIS) eligibility in these sites in order to attract individual investors. Finally, business angels themselves claim to extensively use the tax relief programs. A recent ERC report on business angels in the UK found that circa 90% of surveyed angels invested through the EIS or SEIS, and almost 80% of the total investments in angels portfolios were made under these schemes with over half (55%) investing in EIS and a quarter (24%) in SEIS. One investor went as far as saying "I give myself a specific amount of money to invest each year and that sum is related to tax thresholds under the current Government schemes to encourage investment[7]".

The following example explains how the SEIS subsidizes the cost of outside equity for qualifying companies in the UK. Assume an "outside" individual invests £100 in a firm that has no debt and that generates a profit (within 3 years) of £10 or -£10. Assume also that the investor sells his shares after the 3-year period for a price that reflects the realized profits: £110 or £90, respectively. The capital gains tax is 28% and the income tax rate is 45%. Before the SEIS, the after-tax return on the investment would equal $\frac{(110-100)\times(1-0.28)}{100} = 0.07$ and $\frac{(90-100)\times(1-0.28)}{100} = -0.07$, in the case of positive and negative profits, respectively.

After the SEIS launch, the after-tax return on the same equity investment increases on three accounts for outside investors. First, the outside investor would need to disburse only £50 to make the same £100 investment as, via the deduction on the income tax liability, the government effectively provides an outside investment matching scheme. Second, the outside investor would not need to pay any taxes on future capital gains. Finally, the outside investor can offset the loss against income tax at the marginal rate (as opposed to the capital gains tax).

In particular, in the case the firm generates £10 in profits, the after-tax return on the outside equity investment would be $\frac{50+(110-100)*(1-0)}{100} = 0.60$. This return corresponds to an extra 53p per invested pound relative to inside equity holders. In the case the firm generates a loss of £10, the after-

[7] See http://www.enterpriseresearch.ac.uk/nation-angels-assessing-impact-angel-investing-across-uk/.

tax return on the outside equity investment would equal $\frac{50+(90-100)\times(1-0.45)}{100} = 0.45$. This return corresponds to an extra 51.70p per invested pound relative to inside equity holders, effectively turning the loss into a positive return for the outside equity investor.[8]

In Table 2 we make a rough calculation of the potential equity capital pool in 2012 from individual investors available to use the relief. We use the distribution of the UK population across annual income thresholds. We then assume that 25% of the UK population with total annual income higher than £100K invest in (third-party) private companies. We also assume that the investment rate is constant across income thresholds and make the final conservative assumption that it corresponds to 10% of the lower limit income in each income threshold. We then estimate the total potential investment by income threshold as: 10% of the lower limit in the annual income threshold multiplied by 25% of the corresponding UK population. The equity capital pool so constructed equals £1.8 billion.

In practice, £360 million of funds have been approximately raised through the scheme since its launch.[9] Relative to the potential of the policy this amount appears modest, yet relative to the size of the private equity market in the UK it appears relevant. The most natural benchmark corresponds to the business angels' equity market. Unfortunately, there is very limited information about transactions by these investors in the UK. Thus, we provide as a benchmark using the venture capital market. In 2013 alone, funds raised through SEIS amounted to £140 million. Considering the per-firm equity subsidy limit of £150K, this value suggests a high volume. Indeed, the number of investments in 2012 and 2013 where roughly 1,000 and 2,000, respectively. These numbers compare to venture capital activity in the same year, which amounted to a total investment of £6,000 million through roughly 700 deals.

1.1. Data

The data source used in this study is the Financial Analysis Made Easy (FAME) database, provided by Bureau Van Dijk (BVD). This dataset contains accounting variables in the balance sheet, profit & loss account, and statement of cash flow for all private and public incorporated companies in the United Kingdom. According to the Companies Act 2006, all UK limited companies are legally obliged to keep

[8] For more examples see: https://www.crowdcube.com/pg/eis-tax-relief-for-investors-44.
[9] The number includes investments claimed by April 2016.

accounting records and file their annual accounts with Companies House (i.e., it is a criminal offence to fail to deliver the return on time—company can face being struck off the company register). Directors are personally responsible for ensuring that accounts are delivered (quality must also be ensured so as to be scanned electronically).

Bureau Van Dijk collects this information from Companies House, where companies file their annual financial statements within 10 months of their fiscal year-end (April 25th of every year). Financial statements must be prepared in accordance with United Kingdom accounting standards, and all statements with annual sales exceeding 1,000,000 pounds are audited. Importantly, FAME keeps historical information for up to 10 years (in the web version or one particular disk) if a firm stops reporting financial data. Our original extract from this database encompasses a 6 year period from year 2009 to 2014, taken from the August 2014 FAME disk. We complemented this extract with online data for the years 2013 and 2014, as online records are frequently updated.

In terms of disclosure, large firms are required to file detailed financial statements, while small firms only report selected financial information. All limited firms are required to report their total assets in their Company Accounts, but reporting the revenues, employment and research and development is mandatory only for larger firms. To illustrate, in our original extract, only 5% of firms with non-missing total assets reported employment and only 15% reported sales. By comparison, 96% reported fixed assets. Even in the analysis sample of relatively larger firms around the medium-sized asset threshold of £15M, employment and sales coverage is still reported at 25% and 15%, respectively. For this reason, we only focus on exploiting SME eligibility threshold with respect to total assets and use this as the key running variable in our baseline specifications. Note that this approach generates an efficiency issue. The fact that we use only one of the criteria for determining eligibility does not violate the assumptions for the Difference-in-Difference exercises; it just reduces the precision of our estimates (and changes the interpretation of the estimate in the heterogeneous treatment model).

We exclude from the sample all foreign companies, assurance companies, guarantees, limited liability partnerships, public companies, public investment trusts, and "other" types. We do so to ensure that our sample contains only UK limited liability companies for which the Companies Act applies, and can potentially benefit from the tax incentives. We also exclude any firm-year observation that has

missing or negative book value of assets. Importantly, because the vast majority of the SME companies in our sample may have no sales, or may choose not to report sales (i.e., the can file abbreviated accounts), we do not restrict the data to audited annual filings (i.e., those with annual sales exceeding £1K) as is common in other work based on FAME data (see: Brav, 2009; Michaely and Roberts, 2012). All outcome variables are winsorized at the most extreme 1% in either tail of the distribution to mitigate the leverage of outliers. We check that results are similar using different levels of winsorizing for the dependent variables: 0.5% and1.5% levels.

1.4. Variable definitions

The main variables used in the analysis are: trading years and total assets (gross assets) to determine tax relief program eligibility, proxies for equity capital issuance to measure take-up, and fixed assets to measure firm investment. We also use complementary information on ownership structure and company directors.

FAME has information on registration dates, which we use to construct trading proxies as we have no details on trading years—companies can be registered and not trade for a few years. We consider firms registered from 2009 onwards. This restriction allows 2009 registered firms that had at least one non-trading year to be included in the sample.

We retrieve information of total assets from the balance sheet—summing up the accounts of fixed assets and current assets. We construct two variables with the information on these accounts: *Total Assets* and *Beginning-of-Period Total Assets*—the latter corresponds to total assets one year prior (which determine eligibility in any given year).

We restrict the analysis sample to firms that survive at least until 2012 with beginning-of-period assets in 2012 between £100K and £300K, based on a £100K bandwidth around the threshold. There are 28,641 "automatic qualifiers" with beginning-of-period assets under the £200K small firm threshold in 2012. The control groups of firms whose eligibility status did not change in 2012 is made up of 11,169 firms with beginning-of-period assets above the £200K threshold.

The restrictions based on beginning-of-period assets in 2012 allow us to focus on firms close to the qualifying threshold during the SEIS launch-year. They also allow a more manageable sample size given that the distribution of UK firms by asset size is highly left-skewed; median assets are below

£1K, hence, sample size would surpass 15M observations unless we impose some additional restrictions. We make sure results continue to hold when we use asymmetric bandwidths around the threshold to allow for a more balance sample: 50% above (as opposed to 72%) the £200K mark, and in a smaller subsample of a £50K bandwidth around the threshold, as documented in the Appendix.

The book value of equity is reported in the account Shareholders' Funds of the Annual Accounts. Naturally, changes in shareholders' funds can reflect retained earnings as well dividend payments, new share issuances, or repurchases. New share issuances—the object of interest—are specified in a separate form that is not recorded by FAME. We thus use additional information in FAME from companies' Annual Returns to construct our proxies for new share issuances. The Annual Return (Form AR01—old Form 363), which all companies have to complete, provides a snapshot of company information including details of its directors and secretary, the registered office address, shareholders and share capital. We use two accounts from this snapshot: i*ssued capital*—the nominal face value of total outstanding shares (for which the company has requested and received full or part payment) and *share premium account*—the difference between the value at which the shares were issued by the company (or paid up share capital) and their nominal worth. We refer to the sum of these two accounts as *Issued Equity*. We construct two measures of capital issuance based on *Issued Equity*. The variable *New Equity* measure the year-to-year change in *Issued Equity*, and the dummy variable $D(New\ Equity > 0)$ indicates instances of positive year-to-year changes. New equity issuances correspond to rare events in our sample (i.e., the accounts i*ssued capital* and *share premium account* are very strongly auto-correlated). Appendix 2 includes a detailed example on the construction of these variables based on Storemates, a London-based start-up that issued equity through the SEIS tax relief program.

Finally, we measure firm investment with the year-to-year changes in fixed and total assets: Δ *Fixed (Total) Assets.* In some parts of the analysis, we measure investment as the year-to-year change in the natural logarithm of fixed and total assets (plus 1).

In addition, we also collect further information about ownership structure and company directors retrieved from filings of Annual Returns as well as additional forms recording changes of directors and shareholders. The full list of shareholders and company directors must be recorded in the

first Annual Return filing after incorporation, and every third Return thereafter. In addition, any details on share transfers and company directors must also be provided by firms. Based on this information we construct measures of *Non-related owners*, *institutional owners* and *manager-owners*. *Non-related owners* correspond to non-original owners (i.e., not listed in the firm's first available Annual Return filing) whose last name differs from that of all original owners. *Institutional owners* correspond to any non-individual owner such as Venture capital firms and equity crowdfunding platforms (if acting on behalf of participants, as SEEDRs in the UK is). Finally, *manager-owners* are those directors who are originally reported in the first Annual Return filing (see Wang, 2016).

We considered using *Sales*, which corresponds to the profit & loss account item turnover, and *Employees* as outcomes measures. However, the coverage of these variables is very limited—only 5.55% and 1.81% of observations are non-missing—and hence we did not include them in our final sample.

Table 3 presents summary statistics for the main sample used in the analysis. We report firm-year characteristics in the table. Visual inspection reveals a striking fact for UK SMEs: the overreliance on non-equity capital sources: mean (median) book value of equity (i.e., shareholders' funds) in the SEIS sample is £56,482 (£30,003) relative to an average (median) asset size of £221,605 (£160,299). This finding is consistent with prior studies for US firms based on Kauffman Survey respondents (see Robb and Robinson, 2015).

The average firm in the SEIS baseline sample has average beginning-of-period assets in 2012 of £169,732 and average total assets and fixed assets over the period of £221,605 and £63,489, respectively. For this firm the value of issued equity is £10,260 (the median is 100) and the likelihood of new stock issuance is 6.31%.

2. Empirical Strategy

Our empirical strategy uses the launch of the SEIS program as a source of variation in the cost of outside equity. To identify the effect of the outside-equity cost on equity issuance and investment, we exploit cross-sectional variation in access to the SEIS across firms of different size. We classify firms (that were founded after 2008) during 2012 into two groups: automatic qualifiers and non-eligible firms,

according to their total assets reported in 2011—below £200K (and above £100K), or above £200K (and below £300K), respectively.

We compare equity issuance and investment trends across automatic qualifiers and non-eligible firms by estimating the following *difference-in-difference* equation:

$$(1) \quad k_{it} = \alpha_i + \gamma_t \times Industry\ FE + \beta Small_i \times Post_t + \varepsilon_{it}$$

The variable $Small_i$ is a dummy indicating automatic-qualifiers, $Post_t$ is a dummy equal to one in the years 2012-2014, and k_{it} is the outcome variable—proxies for equity issuance or investment in fixed and total assets. We include separate year effects for each industry (we use the 2-digit NAICs classification).

The coefficient of interest is β, which measures the average change in the outcome variable after the SEIS launch for automatic qualifiers, relative to bigger firms that did not qualify to the tax incentive program in 2012. We expect a positive β.

This difference-in-difference estimation identifies the causal effect of the cost of outside equity on firm outcomes as long as: (i) firms could not manipulate SEIS eligibility status during the program's launch in 2012 and (ii) both, automatic-qualifiers and non-eligible firms, would have evolved similarly in the absence of the tax relief program.

Our sample is restricted to firms that were alive in 2012 and that reported their total asset size in 2011. For this group of firms, the first assumption is satisfied as eligibility depends on total assets reported 1 year prior to SEIS' launch. While there was an active discussion about the program prior to 2012, there was uncertainty about its final approval. More importantly, the exact level of the qualifying threshold—£200K in assets—was not known by the public beforehand. In Figure 2 we plot the distribution of total assets in 2011 to test this assumption. Reassuringly, we find no evidence of bunching below £200K. Also of note, potential participation in other government programs in the UK to sponsor entrepreneurship is not generally subject to qualifying restrictions based on the £200K asset size mark.[10]

[10] Examples of these programs include several investment funds administered by the British Business Bank: Enterprise Capital Funds (early-stage venture capital) and VC Catalyst Fund (later-stage venture capital).

Regarding the second identification assumption, eligible firms are restricted to have been trading for less than two years to qualify for the tax relief. Hence, we cannot compare pre-trends in equity issuance and investment across automatic qualifiers and non-eligible firms. Instead, in robustness checks we address the concern that estimates of equation (1) capture a differential pre-trend between automatic qualifiers and non-eligible firms by running multiple placebo tests and falsification exercises, which we explain in more detail in the robustness section.

Finally, we remark that the bigger, non-eligible firms are not a standard "control" group in our empirical strategy, since there are at least three reasons why they may also be affected by the program introduction. First, the potential increase in equity to the small firms during the introduction of SEIS may theoretically happen at the expense of the other UK firms. In such a case, then our estimates do not identify the overall effect of the policy on aggregate equity issuance or aggregate entrepreneurial investment. Instead, we exploit the policy change as an exogenous source of potential differential growth in equity issuance for different types of firms, and trace whether there is in practice a corresponding differential increase in equity issuance and investment for automatic qualifiers relative to non-eligible firms.

Second, bigger firms that did not qualify for the SEIS program in 2012 (because their 2011 assets were too high) can conceivably change their assets in order to qualify in 2013 or 2014 (if they so desire, and still qualify—which depends on the time they have traded). This potential strategic behaviour by firms generates a downward bias in our estimates but does not invalidate the identification assumption that small and slightly bigger firms that did not qualify for the program in 2012 would have evolved similarly in the absence of the tax relief program.

Third, we only focus on exploiting the eligibility threshold on total assets, but disregard others such as the restriction on number of employees due to limitations of our data (only 25% of firms report employee numbers). It is then possible that some of the firms classified as automatic qualifiers are not eligible because they have more than 25 full-time employees. This misclassification generates an efficiency issue and reduces precision (and changes the interpretation of the estimate in the heterogeneous treatment model), but does not invalidate the identification assumptions.

3. Results

3.1. Equity

Table 4 summarizes results for the SEIS tax incentive launch. Panel A in the table presents the results of estimating equation (1) for the indicator dummy and the value of equity issuance. The standard errors in all regressions are adjusted for heteroskedasticity and clustered at the firm level. Across all columns the estimated coefficient for $Small_i \times Post_t$ is positive and statistically significant. The interpretation of the estimate in column 2 is that after the SEIS launch, the probability of equity issuance by young and small firms (relative to young and slightly bigger firms) increased by 0.012 corresponding to a 20% increase over the sample mean (0.06). This estimate implies that only 1% of eligible firms issued new equity. This low take-up rate suggests that frictions facing entrepreneurial firms in the UK are sizable. Both demand and supply frictions can be at play. For example, Hurst and Pugsley (2011) document that the majority of small firms have no desire to grow—non pecuniary benefits of control are highly valued by entrepreneurs. On the other hand, several papers estimate sizable financial constraints for entrepreneurs (Evans et al. (1989); Holtz-Eakin et al. (1994); Holtz-Eakin et al. (1994); de Mel et al. (2008); Kerr et al. (2009); Hombert et al. (2014); Adelino et al. (2015); Schmalz et al. (2013)).

Column 5 in Panel A estimates the average increase in equity issuance to be £1,785. This estimate is sizable: compared to the sample mean of £1,412 represents an increase of 26%. Taken together, the estimates in columns 2 and 6 imply that *conditional* on issuing new equity, small and young firms issued on average roughly £146K in equity after the SEIS launch. We calculate the confidence interval of the ratio using bootstrap (Efron, and Tibshirani,1986); the confidence interval ranges between £52K, £544K.

We then explore the effect on the number of owners. The incentive is open only to outside investors that do not hold a substantial interest in the firms, hence, the prediction, and indeed our finding as shown in Table 5, is that the number of owners increases. The interpretation of the coefficient in the first column is as follows: conditional on equity issuance, firms take-on 6.6 new owners on average. The number of institutional owners also appears to increase—roughly one in every 14 of eligible firms secures a new institutional owner, but the effect is not statistically significant.

3.2. Investment

In Panel B of Table 4 we explore the effect of the outside equity subsidy on investment in fixed and total assets by eligible firms. The interpretation of the estimate in Column 2 is as follows: investment in fixed assets increases by £4,909 after the SEIS launch, for young, small firms, relative to slightly bigger, young firms that were not eligible to the program in 2012. This estimate is sizable—it corresponds to a 64% increase relative to the sample mean of £7,638. Column 5 in Panel B estimates an increase of £14,804 in total assets, which amounts to a 36% increase over the sample mean. Taken together, the estimates in column 2 of Panel A and column 2 (5) in Panel B imply that *conditional* on issuing new equity, small and young firms invested in fixed (total) assets on average £409,083 (£1,212,723) after the SEIS launch. The confidence interval ranges between £147,383 and £1,220,540 (£626,291.4 and £3,719,246).

Investment in fixed and total assets exceeds the size of the new equity issuance: they are 2.75 and 8.23 times larger. These estimates thus suggest that companies complement their new outside equity issuance by securing other sources of financing (e.g., loans). In future versions of the paper we may provide direct evidence for debt issuances—currently our data extract from FAME has poor debt coverage.

These investment responses are also large relative to the average investment increase after equity issuances by young firms in the sample. On average, an additional pound in new equity increases total assets (fixed assets) by £2.88 (£1.25) for young firms (of all sizes) in the UK during the 2009-2013 period. The higher equity multiplier we estimate likely relates to the limited use of outside equity by the firms in the sample. Indeed, it is likely that most of the equity issuances used to construct the average equity multiplier pertain to inside equity. In future versions of the paper we may provide more precise benchmark estimates of outside-the-program, outside equity multipliers using information on changes in investors.

Results in Panel B of Table 4 are consistent with large complementarities between outside equity and other non-equity funding sources (e.g., bank loans). Under additional assumptions of little opportunistic behaviour by entrepreneurs and investors, this result suggests that at least some young firms in the UK are financially constrained. Otherwise, eligible firms would have simply issued the equity and use it to replace any other costlier sources of financing. Instead, the fact that equity issuances

lead to investments of bigger sizes suggests that "subsidy-takers" were financially constrained (cf. Banerjee and Duflo, 2005).

While closely monitoring by the government (e.g., companies and investors are thoroughly checked for eligibility and the usage of the funds is scrutinized), lock-up periods, and restrictions on the subsidy loss claims (i.e., can only be claimed in the event of liquidation) deterred some obvious opportunistic behaviour by entrepreneurs, risk-shifting was certainly possible (as has occurred in other countries using similar incentives) and somewhat consistent with some of the findings (e.g., eligible firms are less likely to survive). We find little evidence of gaming, though, at least as detected and reported in the press. That the subsidized equity issuances are complemented by debt also suggests that the potential risk-shifting was at least not very obvious ex-ante. By allowing firms to lever up, debt holders, which are not covered by the relief, effectively endorse the investments. Nonetheless, further welfare claims are challenging in this context, and would require more detailed data on project choice.

In Table 6 we explore the timing of the effect by estimating an extended version of equation (1) using indicator variables for the different years in the sample. The indicator variable for year 2010 is excluded to avoid multicollinearity. The point estimates for all outcome variables roughly doubles from 2011 to 2012.

3.3. Extensions and Robustness Checks

We run several robustness checks. We estimate equation (1) after we collapse observations into firm-level single pre-period and post-period observations in order to mitigate the concern of understated standard errors (Bertrand, Duflo, and Mullanathain, 2004). Columns (3) and (6) in Panel A of Table 4 show that the magnitude and significance of results are unchanged.

Second, we run placebo tests for companies with beginning-of-period assets in 2012 close to the £200K threshold but too old to qualify for the SEIS program (i.e., registered in 2008). Reassuringly, we find no significant effect from the SEIS launch for these older companies. Results are summarized in Table 7. We use complementary falsification tests. In particular, we run 200 regressions were we randomly select a threshold (different from £200K) and define automatic qualifiers and non-eligible firms following an analogous approach as the main analysis. We restrict sample to firms with asset size in 2011 in a window of £100K in either side of the random threshold, and classify firms into automatic

qualifiers and non-eligible if their assets in 2011 are below or above the random threshold, respectively. A summary of results are presented in Table 8. Reassuringly, we cannot reject the null of no effect (in either equity or investment) in more than 95% of the cases—which is what would be expected had the threshold been picked up randomly. The only variable with a higher rejection rate is investment in fixed assets. Results from this additional falsification tests further suggest that our findings are not picking up a trend in the data.

Finally, in unreported regressions we also analyse a similar text relief program for mid-size firms in the UK—the Enterprise Investment Scheme. Similar to our findings here, we find evidence of very limited take-up. In future versions of the paper we may report this analysis.

4. Discussion

The basic results presented in Section 2 suggest that young firms face sizable frictions. In this section we provide a summary of the potential frictions. We then cut the data in different dimensions to explore empirical support of some of these frictions in the data.

4.1. Financial frictions

Some of the frictions faced by young firms may be financial in nature. For example, information asymmetries between firms and investors are vast, information illiteracy is common, search costs are high, the market is highly illiquid, and founders usually have substantial non-pecuniary benefits of control or investment.

Only private firms are eligible for the tax incentive. Information about these firms is very limited. One potential way to get around information asymmetry is by issuing preferred shares or debt: the cost of issuing ordinary equity may be prohibitive. However, the tax relief is restricted to the issuance of ordinary shares (excluding convertible debt). It is thus likely that even though the incentive increases average expected returns, this increase is still not enough to cover the wedge between the inside and outside cost of capital.

Relatedly, information frictions pointing to unawareness of alternative non-bank-debt financing sources may also explain the limited use of equity. In 2015, 40% (38%) of surveyed smaller businesses were still not aware of Venture Capital (Business Angels) as a finance type, and of those aware, only 22% (18%) knew of a specific fund (individual) to approach. Other unawareness, entrepreneurs may be

equity averse, or the culture of issuing equity may not have developed. Indeed table 1 shows how UK firms are traditionally highly levered.

The first difficulty in securing an investor is actually finding one. The eligibility requirements rule out some obvious choices such as the founder herself/himself, her/his employees, or any investor with substantial interest. In the UK there are no formal markets where firms can search for investors. The closest to these are crowdfunding equity platforms, where firms can advertise their business plans and attempt to lure in investors. These platforms however, are still underdeveloped and tend to work only for certain types of firms with reduced financial needs and easy-to-understand products or technologies. Likewise, it is harder for potential individual investors to know about firms seeking to find equity investment.

There are no formal secondary markets for trading stakes in early stage private firms in UK either. Hence, even if the tax incentives increase expected returns conditional on exit, the lack of sufficiently quick o sufficiently abundant exit opportunities, may prevent investors form participating in the market. Indeed, the model of "buy and hold" of VC investment is unlikely to be appropriate for individual investors. Secondary markets would provide liquidity to investors, effectively shortening their exit horizon without forcing the business into an early trade sale or IPO (see Gompers (1995)). A 2010 study by Nesta estimated the average time to exit from a UK VC investment in 2009 at 5.7 years, which may be too long for individual investors. The study also showed that the time to exit has been on the rise since 2001, reflecting in part increasing lack of exit opportunities. Indeed, the likelihood of exit via an IPO fell significantly in the previous decade in both Europe and the USA, whilst the time-to-IPO increased (BVCA, 2013). Recent evidence for the US shows that investment holding period for business angels is 4.5 years on average, with the bigger wins commonly taking up 9 to 10 years to complete (Wiltmande and Brooks, 2016).

In addition, entrepreneurs may extract non-pecuniary benefits from control and are therefore reluctant to issue equity despite its decreased cost (see Jarvis, 2000; Moskovitz and Vissing-Jorgensen, 2002; Vos *et al.*, 2007). Indeed, the 2013 SME Journey Towards External Finance survey revealed that "most respondents have concerns regarding equity finance, as they do not want to give up control of their business to third parties". In the same line, a complementary explanation is that the main driver of

business angel investment is not financial returns, but the private benefits they extract from helping grow companies they like (see Moscovitz and Vissing-Jorgessen, 2002). In such a case, even if the tax incentives increase financial returns (and in the extreme, turn negative NPV projects into positive NPV opportunities), business angels need not find it attractive to invest in entrepreneurial firms.

4.2 Technological Frictions

The frictions faced by young firms may also be technological. For example, high adjustment costs or investment irreversibility may imply that firms only respond to the changes in the user cost of capital if they are big enough to offset such costs (see Caballero 1999). Indeed, if investment is irreversible, and some firms are at a point where they would like to switch to a different technology but cannot, the estimates of the user cost elasticity will be biased towards zero (firms hitting the irreversibility constraint will be within an inaction region where zero investment in optimal). For these firms already invested in certain technologies or fixed assets, small changes in the cost of capital will leave investment unaffected and only very large drops will trigger investment. In addition, it may also be likely that companies need much larger investments to invest in profitable investment opportunities (Banerjee and Newman, 1993; Aghion and Bolton, 1997)—firms may have already exhausted the opportunities that require smaller investments. In addition, these larger investments may also require considerable due-diligence and monitoring, for which the skill and time of venture capital firms, relative to business angels, is a must. However, the incentive is restricted to individual investors and exclusion of venture capital funds may also explain limited usage.

We absorb potential productivity differences across industries parametrically, yet, technological frictions to young firm investment (e.g., lumpy investment) is a complementary explanation that cannot be fully ruled out. Given that eligible firms are restricted to £200K in size (and the subsidy is capped at £150K per firm), however, very large degrees of technological frictions would be required for such frictions to be a first order explanation of the finding (e.g., the size of the "lumps" would need to exceed (at least) 75% of firms' assets).

4.2. Heterogeneity Across Firms with Different Ownership Structure

We cut the data in different ways to explore the nature of the frictions facing UK entrepreneurial firms. First we consider two sample cuts based on the ownership structure of firms prior to the SEIS launch.

In particular, we classify firms into those with and without at least one institutional owner and those with and without at least one non-related owner, using novel data on the ownership structure of private firms. Using detailed information on owners extracted from firms' annual returns filed at Companies House, we distinguish individual owners from institutional owners, founder-owners from new-owners, and new unrelated owners from new related owners. Institutional owners correspond to all non-individual owners and include financial, industrial or insurance companies, mutual or pension funds, private equity firms, foundations, public authorities and venture capital firms. Founder owners correspond to those owners that are mentioned in the first available annual returns' filing by the firm. New owners, instead, correspond to third parties that purchase shares in the companies after its registration. We further classify the new owners into related and unrelated, based on whether they share or not the same family name (last name) as one of the founder-owners in the firm.

We hypothesize that firms which have already secured outside owners face lower financial frictions that those that haven't. For example, having an outside owner mitigates search costs—this owner can help the firm a new investor. It can also mitigate liquidity costs—this existing owner may be a potential buyer of the new owner's stake after the three year lock-up period. A comparison in the reaction between these types of firms can be informative about whether some of the frictions these firms are financial.

We provide evidence in Table 9 consistent with financing frictions. The table shows that firms with institutional owners and unrelated owners prior to 2012 are more likely to take-up the tax incentive and issue higher values of equity. Firms with institutional owners also invest larger quantities in fixed and total assets. This finding suggests that some of the costs of issuing outside equity are fixed, and the subsidy is not high enough for all firms to cover such fixed cost hurdle. These additional findings further support the notion that technological frictions across firms are unlikely to be the only explanation behind the results.

4.3. Heterogeneity Across Firms with Different Asset Tangibility

We consider one additional sample cut based on the nature of investments in the firm. In particular, we split the sample into firms above and below median asset tangibility as measured by the ratio between

beginning-of-period fixed assets to beginning-of-period total assets in 2012 (see Almeida and Campello, 2007).

In Table 10 we explore the heterogeneity of the effects across firms with different degrees of asset tangibility. Panel A shows that both types of firms increase their equity issuance. The extensive response (i.e., dummy of equity issuance) appears strongest for high-asset-tangibility firms, although the estimates are not statistically different as shown by the value of the t-statistic for the difference reported in the bottom row.

Panel B in Table 10 summarizes differences in the investment response across high and low asset-tangibility firms. Consistent with the notion that pledgeable assets provide access to credit, the first two columns show that high-asset-tangibility firms increase their investment in fixed assets, and this increase is much higher than the equity issuance increase. Consistent with differences in technology between high and low assets tangibility firms, low asset-tangibility firms increase, instead, their investment in more intangible assets such as working capital, as implied from the positive and significant increase in their total assets reported in column 4.[11] Interestingly, the increase in investment in total assets of low-tangibility firms is similar to that of firms with high asset tangibility. This finding suggests that even low-asset tangibility firms appear to be able to lever up the equity issuance. The implication is that the equity multiplier is not necessarily explained by investment in assets that can be pledged as collateral. Indeed, low asset tangibility firms invest their equity issuance in current assets, but they still continue to complement the subsidized equity with non-equity capital to finance the full investment.

5. Estimating the magnitude of frictions and their economic costs

We now use back-of-the-envelope calculations to estimate the magnitude and economic cost of financial frictions facing young UK firms.

To quantify the magnitude of the frictions, we begin by estimating the expected return to equity investors in the SEIS-eligible firms of our sample (i.e., those firms with beginning-of-period assets

[11] In unreported regressions we explore heterogeneity across industries and location. Consistent with the results on asset-tangibility, we find the effect is concentrated in the manufacturing industry for firms located in the East midlands of England.

between £100K and £200K in 2012) as the ratio between cash flows to equity investors and total assets, as we did in the examples we summarized in Section 2. We calculate the cash flow to equity investors as profits adjusted by the capitals gains tax. The distribution of the cash flow ratio is summarized in Table 11, and depicted in Panel A of Figure 3. For every pound in total assets, equity investors receive 6p (net of capital gains taxes).

We then construct a *counterfactual* cash flow that incorporates benefits to individual equity investors from the SEIS tax scheme. In particular, we replace the cash flow with profits that are exempt of capital gains tax, and that are increased by the income tax rebate (50% of issued equity) and by the loss relief for those companies with negative profit. We are careful to incorporate in the calculation the cap on SEIS equity investment; see online appendix 3 for the details in the calculation. Table 11 estimates a sizable counterfactual increase in average cash flow ratios: SEIS equity investors would obtain on average 12p for every pound of total assets.

We conclude that the magnitude of the frictions in entrepreneurial markets must be such that investors are willing to forgo a 6 pp equity investment subsidy—(i.e., a 113% change in the cost of outside equity) in entrepreneurial firms.

To quantify the economic cost, we start by calculating the implied sensitivity of entrepreneurial investment to the cost of outside equity based on our findings in Table 4. We estimate such sensitivity as the ratio between the estimated percentage change in investment in fixed (total) assets (see Panel C in Table 4) and the estimated percentage change in the cost of outside equity as reported in Table 11. Column 1 in Table 12 summarizes these calculations. The implied sensitivity of investment in fixed (total) assets to changes in the cost of outside equity is -0.24 (-0.16). That is, given a 1% decrease in the cost of outside equity, entrepreneurial firms increase investment in total assets by 16%.

Then, we estimate the counterfactual sensitivity if all the eligible firms took-up the incentive, issued the maximum allowed equity £150K and invested it fully in fixed (and total) assets. We thus ignore the potential effect of leverage. An investment of £150K relative to average fixed (total) assets of £63.5K (£221.6K) corresponds to a 236% (68%) increase. The counterfactual sensitivity of investment in fixed (total) assets to changes in the cost of outside equity is thus -2.36 and -0.68. If

entrepreneurial firms faced no frictions, given a 1% decrease in the cost of outside equity, they would increase investment in total assets by 68%.

A comparison between the actual and counterfactual sensitivities provides a measure of the economic cost of frictions facing entrepreneurial firms in UK. In the absence of these frictions, entrepreneurial investment in total assets would have increased roughly 4 (i.e., 0.68/0.16) times more given the same subsidy to outside equity investors.

5.1. **External Validity**

Is the UK special? What can we learn from this analysis for entrepreneurial markets more broadly? The UK is relatively special on two accounts.

First, entrepreneurial firms appear more levered than small in US and in other European countries. The average leverage ratio of the firms in the sample is 0.83. This number compares to the average 0.45 estimated by Robb and Robinson (2014) for US entrepreneurial firms in the Kauffman sample and 0.7 estimated by Bethmann et al., (2016) for other European firms. This high leverage is consistent with survey evidence from the SME Finance Monitor, which shows that only 44% of SMEs use external finance, relative to 85% of mid-cap businesses (BBB, 2015). The same survey reveals that less than 1% of small businesses apply to private equity finance in a given twelve month period Conditional on applying, only a very small proportion of applications secure equity financing—VC funds in UK invest in circa 2% of applicants (BIS, 2009). The overreliance on bank debt can also be seen in Table 1, which shows that bank lending is the single largest source of external finance for SMEs in the UK. In terms of volume, private equity deals for SMEs amounted to £2.2 billion in 2014, compared to £53 billion in gross lending flows to SMEs in the same year. Despite the limited historical use of private equity among UK SMEs, this type of financing has recently become an increasingly important funding source for high-growth businesses. Over the 2011-2014 period, the number (value) of seed and growth equity deals for UK start-ups strongly increased by 236% (200%) and 206% (142%), respectively. Over the same period the number of venture stage deals grew at a comparatively lower rate although still significant: they increased by 101% and their value by 46%. The difference in growth rates likely reflects the mostly fixed nature of due diligence costs: since they account for a greater share of smaller deals, PE funds gravitate towards larger deal sizes and lager/less risky firms. During the same

period equity crowdfunding platforms have grown to become the largest funder of seed stage businesses in terms of number of businesses funded—deals sizes are still low. Finally, according to estimates by the UK Business Angel Association in 2014, private investors are now the single largest source (in value) of early-stage capital in the country, accounting for between £800 million and £1 billion of early-stage UK investments.

Second, the UK has been lagging behind other OECD countries in terms of productivity over the last decade. While the UK performs relatively well in terms of creating new start-up businesses, it has traditionally been less effective in growing them. According to a recent OECD report (2014), the UK ranks 3rd among 14 OECD countries in terms of the proportion of young (i.e., less than 2 years old) start-up businesses. In contrast, it ranks 13th when it comes to the proportion of start-up businesses with 1-9 employees that grow to at least 20 employees within three years. A common belief is that SMEs hold the key to unlocking the well documented UK productivity gap: other G7 countries are estimated to be 20% more productive than the UK (ONS, 2015; see also: Pessoa and Van Reenen, 2013).

These two institutional features of UK may explain why we estimate such sizable frictions in entrepreneurial markets as well as sizable economic costs. It is thus hard to conclude from the analysis that similar costs may apply for other more developed markets such as US. The flip side of this argument though, is that one interpretation of our results is that precisely these frictions we document are part of the explanation behind the productivity slow-down (Hsieh and Klenow, 2014; 2009). Also, our results are overall consistent with the fact that only a small fraction of young firms accounts for the disproportionate contribution of young firms to aggregate output growth in the US (Haltiwanger, Jarmin and Miranda, 2012; 2014). This consistency suggests that the results in this paper may not only pertain to the UK context.

Finally, this is not the first paper to find that investment does not respond to changes in rates of return. Goldstein and Udry (1999) find that only 18% of the land in Ghana is cultivate in pineapple despite de 1,200% returns they estimate. Duflo et al., (2003) finds that only 15% of maize farmers in Kenya use fertilizer despites estimated returns of 100%. This is also not the first paper to estimate low-take of subsidies or lack of response to changes in incentives. For example Miguel and Kramer (2004) document a 57% entirely free de-worming program in Kenya. In addition, there is widespread evidence

that individuals and firms are generally unresponsive to tax changes, which may also explain the limited take-up (see Graham, 2008).

6. Conclusions

This paper estimates the sensitivity of entrepreneurial investment to the cost of equity. We use variation in access to tax relief programs for individual equity investors in the UK as a source of exogenous variation in the cost of equity for entrepreneurial firms. We examine firms that became eligible to the programs in 2012, and firms of similar size whose eligibility status did not change.

We estimate a large heterogeneity in firms' response: the vast majority of eligible firms do not take-up the incentive, but conditional on issuing equity, firms appear to max out the program's equity issuance quota and invest even larger amounts in assets. We interpret the findings as suggestive of substantial frictions facing young firms: in a frictionless market all firms would have adjusted their investment until marginal productivity equals the cost of capital.

We cut the data in several ways to explore the nature of such frictions. We find suggestive evidence that some of these frictions are financial in nature such as: costly search, illiquidity and the existence of non-pecuniary benefits of control.

Using back-of-the-envelope calculations, we quantify the magnitude of such frictions and their economic cost. We find that the frictions are so high that investors are willing to forgo an estimated 6pp subsidy in outside equity investment in entrepreneurial firms. In the absence of these frictions, the sensitivity of investment to the cost of outside equity would be at least 4 times larger.

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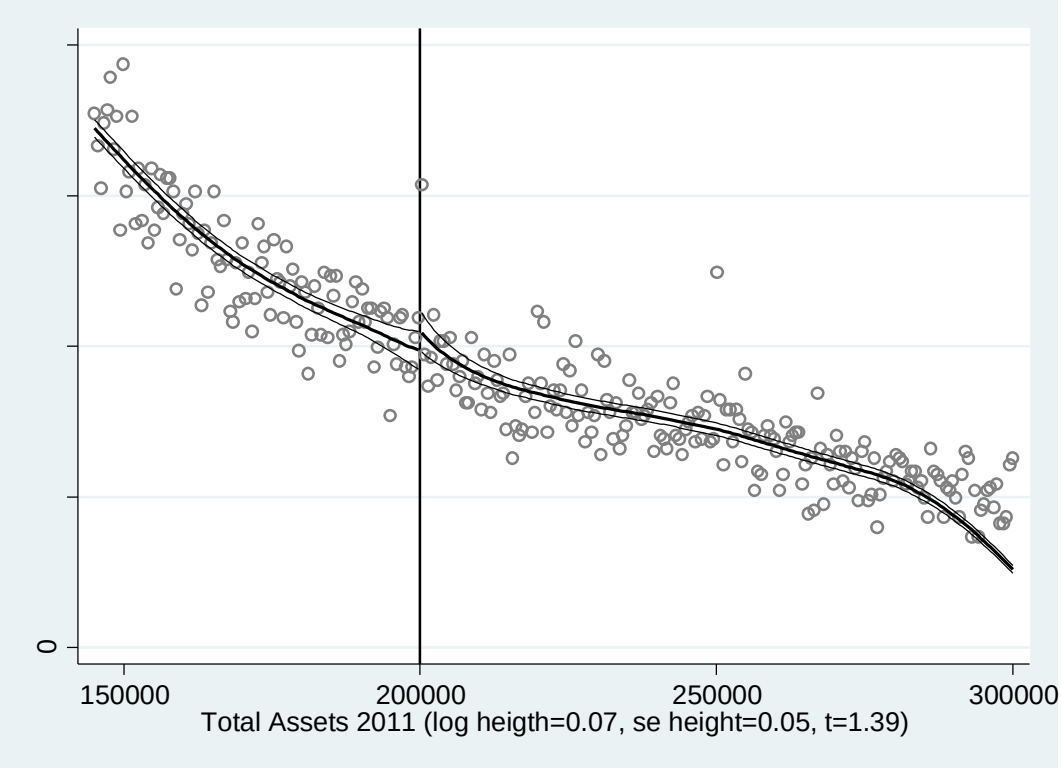
Figure 1—Distribution Total Assets in 2011



The figure plots the distribution of total assets in 2011 for the firms in the sample—i.e., firms with total assets in 2011 between £100K and £300K that survived until 2012. The x-axis title includes the results from the McCrary test for discontinuity in this distribution at the asset threshold of £200K before the policy change. We cannot reject the hypothesis that the distribution is continuous at the £200K threshold: the discontinuity estimate (log difference in density height at the £200K threshold) is 0.07 with standard error of 0.05.

Table 1- Sources of External Finance for UK SMEs (in £B)

Type of Source		2011	2012	2013	2014	2015	
Bank Lending[a] ***Source: Bank of England***	**Outstanding Amount**	189	176	166	167	163	To Nov 2015
	Net Flows		-8	-4	-4	2	
	Gross Flows[b]		38	43	53	53	
Private Equity[c] ***Source: BBB & Beahurst***	**Gross Flows**	1.04	1.32	1.62	2.20	2.39	To Sep 2015
	Number of deals (known amounts)	279 (386)	625 (435)	863 (612)	1060 (804)	870 (699)	
Peer-to-peer Lending[d] ***Source: BBB & Alt Fi***	**Gross Flows**	0.02	0.06	0.25	0.72	1.26	To Dec 2015
Total Lending[e] ***Source: FAME***	**Outstanding Amount**	796.19	789.83	857.29	810.24	.	To Aug. 2014
	Net Flows	-10.13	22.28	4.22	4.37	.	
Total Equity[e] ***Source: FAME***	**Nominal Face Value Issued Stock**	435.05	436.72	466.47	443.05		
	Net Flows	12.28	6.26	-2.85	16.19	.	

The table presents estimates of external sources of finance for UK SMEs. The information contained here should be viewed as indicative as data and definitions are not directly comparable across different sources. SMEs are defined according to number of employees (less than 250) for Bank of England, BBB & FAME estimates. For Beahurst data, (a) Statistics taken from BBB (2015) based on data from Bank of England. Amounts include both sterling and foreign currency loan and overdrafts. Net flows does not always reconcile with change in stock due to differences in statistical reporting. (b) Data excludes overdrafts (c) Statistics taken from BBB (2015) based on Beahurst data. Beahurst is a market data provider that records visible equity deals including crowdfunding deals. (d) Statistics taken from BBB (2015) based on Alt Fi data. Figures do not represent the entire market. (e) Authors' calculation based on FAME data. FAME data is only available until 2014. Total lending is defined as the book value of debt (sum of balance sheet accounts long term debt, short term loans and overdrafts, minus group loans short term). It consists of all sources of lending for firms, including bank and private lending. Total equity corresponds to the face value of outstanding stock (balance sheet account Issued Capital). It includes all sources of equity, external and internal (as well as public and private).

Table 2- Potential Equity Capital Pool for Qualifying Companies

Total income (lower limit)	Number tax payers	Average tax rate	Average tax liability	Average investment rate	Fraction of tax payers that invest	Potential Investment	Potential capital pool
£	# (in M)	%	£	%	%	£	£ (in B)
8,105	1.960	1.9	172				
10,000	6.690	5.6	703				
15,000	5.700	9.5	1,660				
20,000	7.210	12.4	3,040				
30,000	6.080	14.7	5,590				
50,000	2.250	22.3	14,800				
100,000	0.394	30.3	36,200				
150,000	0.135	33.5	57,000	10	25	15,000	0.51
200,000	0.134	38.3	110,000	10	25	20,000	0.67
500,000	0.024	42.2	287,000	10	25	50,000	0.31
1,000,000	0.008	43.6	597,000	10	25	100,000	0.20
2,000,000+	0.003	43.2	1,810,000	10	25	200,000	0.15
All Ranges	30.600						**1.84**

The table presents estimates of the potential equity capital pool for qualifying companies based on average tax liabilities for UK citizens in different income thresholds. We assume that only individuals with total annual income higher than 100,000 invest in private companies, and that the investment rate is constant across income thresholds and is 10% of annual income. To estimate the level of potential investment, we make the conservative assumption that annual income for all individuals in a pre-specified total income threshold corresponds to the lower limit income of the threshold. Source: HMRC, 2012, authors' calculations

Table 3- Summary Statistics Analysis Sample

	obs.	mean	sd	p50	p75	p99
Beginning-of-Period Total Assets in 2012	197,288	169,732	55,424	155,607	209,841	295,335
Shareholders' Funds	197,288	56,482	222,913	30,003	97,673	504,658
Fixed Assets	197,288	63,489	261,342	14,229	78,860	457,960
Total Assets	197,288	221,605	476,704	160,299	239,818	1.182e+06
Shareholders' Funds/Total Assets	197,288	0.185	0.900	0.226	0.635	1
Issued Equity	197,288	10,260	68,273	100	100	250,000
Δ Issued Equity	153,371	1,521	39,405	0	0	39,998
D(Δ Issued Equity)	153,371	0.0604	0.238	0	0	1
Δ Fixed Assets	153,371	10,885	219,882	0	1,255	259,629
Δ Total Assets	153,371	44,232	388,669	8,946	61,182	679,637
$Small_i$	197,288	0.713	0.453	1	1	1
$Post_t$	197,288	0.440	0.496	0	1	1
$Small_i \times Post_t$	197,288	0.617	0.486	1	1	1

The table presents summary statistics for the main variables in the analysis. Variable definitions are described in Section 1.6.

Table 4- Launch SEIS

Panel A –Equity Issuance

	(1)	(2)	(3)	(4)	(5)	(6)
	D(New Equity)			New Equity		
$Small_i \times Post_t$	0.011**	0.012***	0.012***	1411.495**	1785.111***	1896.207***
	(0.004)	(0.004)	(0.005)	(563.499)	(610.817)	(637.472)
Observations	122,851	121,770	41,872	122,851	121,770	41,872
R-squared	0.043	0.365	0.586	0.034	0.260	0.531
Mean Dep.Var.	0.06	0.06	0.07	1434.54	1412.03	1617.92
Firm FE	No	Yes	Yes	No	Yes	Yes

Panel B – Investment in Fixed and Total Assets

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ Fixed Assets			Δ Total Assets		
$Small_i \times Post_t$	2702.840	4909.755***	5699.848***	10120.978***	14804.454***	16692.248***
	(1,846.107)	(1,442.241)	(1,567.467)	(3,689.772)	(3,330.263)	(3,402.657)
Observations	122,851	121,770	41,872	122,851	121,770	41,872
R-squared	0.023	0.287	0.524	0.023	0.350	0.537
Mean Dep.Var.	7599.81	7638.39	6166.67	41069.00	41273.37	37148.81
Firm FE	No	Yes	Yes	No	Yes	Yes

Panel C – Logarithmic transformation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Δ ln(Issued Equity)			Δ ln(Fixed Assets)			Δ ln(Total Assets)		
$Small_i \times Post_t$	0.068***	0.075***	0.080***	0.281***	0.273***	0.313***	0.179***	0.172***	0.178***
	(0.021)	(0.022)	(0.024)	(0.050)	(0.054)	(0.057)	(0.037)	(0.038)	(0.041)
Observations	122,851	121,770	41,872	122,851	121,770	41,872	122,851	121,770	41,872
R-squared	0.034	0.254	0.477	0.071	0.308	0.528	0.131	0.368	0.561
Mean Dep.Var.	0.09	0.09	0.13	0.25	0.25	0.56	0.21	0.21	0.52
Firm FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes

The table presents results from estimating different versions of equation (1) for issued capital, investment in fixed assets and total assets, and the ratio of investment in fixed assets to total assets (lagged). $Small_i$ is a dummy indicating whether the firm had beginning-of-period total assets below 200K pounds in year 2012 (such that it qualified for the SEIS program), $Post_t$ is a dummy equal to one in the years 2012-2014, and the dependent variable is specified in the top of the column. All columns include separate year effects for each 2-digit NAIC industry. Columns 3,6 and 9 present results after collapsing the sample to a single pre and a single post period. The standard errors are presented in parentheses and are adjusted for heteroskedasticity and clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 5- Launch SEIS and Ownership Structure

	(1)	(2)
	Δ Number of owners	Δ Number of Institutional Owners
$Small_i \times Post_t$	0.066**	0.007
	(0.029)	(0.006)
Observations	100,308	100,308
R-squared	0.415	0.350
Mean Owners	0.07	0.01

The table presents results from estimating different versions of equation (1). The dependent variable is specified on top of each column. Small_i is a dummy indicating whether the firm had beginning-of-period total assets below 200K pounds in year 2012 (such that it qualified for the SEIS program), Post_t is a dummy equal to one in the years 2012-2014, and the dependent variable is specified in the top of the column. The standard errors are presented in parentheses and are adjusted for heteroskedasticity and clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 6- SEIS launch and equity issuance and investment dynamics

	(1)	(2)	(3)	(4)
Dep. Variable	D(Δ Issued Equity >0)	Δ Issued Equity	Δ Fixed Assets	Δ Total Assets
$Small_i \times D\_2011$	0.008	1555.218	4299.968	15506.812
	(0.011)	(1,582.351)	(5,255.720)	(10,309.201)
$Small_i \times D\_2012$	0.016	2471.558	9450.372*	31012.960***
	(0.011)	(1,586.591)	(5,448.331)	(10,468.029)
$Small_i \times D\_2013$	0.012	1940.941	9496.481*	29207.360***
	(0.011)	(1,664.214)	(5,320.472)	(10,297.417)
$Small_i \times D\_2014$	0.029***	5140.469***	6331.088	22487.564**
	(0.010)	(1,657.256)	(5,629.433)	(11,411.314)
Observations	121,770	121,770	121,770	121,770
R-squared	0.365	0.260	0.287	0.350

The table presents results from estimating an expanded version of equation (1) for issued capital, investment in fixed assets and total assets, across different subsamples as specified in the last rows. Small_i is a dummy indicating whether the firm had beginning-of-period total assets below 200K pounds in year 2012 (such that it qualified for the SEIS program), D_i is a dummy equal to one in the years i, and the dependent variable is specified in the top of the column. D_2010 is excluded to avoid multicollinearity. The standard errors are presented in parentheses and are adjusted for heteroskedasticity and clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 7-SEIS launch falsification test with older firms

Panel A - Equity Issuance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Variable	D(Δ Issued Equity >0)				Δ Issued Equity			
$Small_i \times Post_t$	-0.001	0.000	-0.001	0.001	803.710	803.572	539.056	828.178
	(0.004)	(0.004)	(0.004)	(0.004)	(537.929)	(535.466)	(550.839)	(569.382)
Observations	76,190	76,171	66,672	31,716	76,190	76,171	66,672	31,716
R-squared	0.005	0.290	0.320	0.607	0.001	0.206	0.256	0.469
Firm FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Mean Dep.Var.	0.06	0.06	0.06	0.06	774.78	774.98	795.63	907.45
Mean $Small_i$	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71

Panel B – Investment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Variable	Δ Fixed Assets				Δ Total Assets			
$Small_i \times Post_t$	-1720.923	-1200.810	-1774.760	-1408.536	-3772.703	-3797.922	-1220.326	-3913.306
	(2,466.639)	(2,306.408)	(2,561.434)	(2,420.974)	(5,877.051)	(5,772.369)	(5,324.508)	(5,863.002)
Observations	76,190	76,171	66,672	31,716	76,190	76,171	66,672	31,716
R-squared	0.000	0.243	0.244	0.506	0.001	0.224	0.259	0.467
Firm FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Mean Dep.Var.	3446.44	3448.29	2859.10	2705.47	22977.48	22992.72	23275.08	21062.96
Mean $Small_i$	0.71	0.71	0.71	0.71	0.71	0.71	0.713013	0.71

The table presents results from estimating an expanded version of equation (1) for issued capital, investment in fixed assets and total assets, across different subsamples as specified in the last rows. Small_i is a dummy indicating whether the firm had beginning-of-period total assets below 200K pounds in year 2012 (such that it qualified for the SEIS program), Post_t is a dummy equal to one in the years 2012-2014, and the dependent variable is specified in the top of the column. The standard errors are presented in parentheses and are adjusted for heteroskedasticity and clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 8-Placebo tests

Panel A- 600K-800K

	(1)	(2)	(3)	(4)
Dep. Variable	Average coefficient	Average standard deviation	Average p-value	Non-rejection rate at 5% level
D(New Equity)	0.0	0.0	0.5	0.5%
New Equity	-934.5	6322.4	0.5	0.5%
Δ Fixed Assets	5926.0	15026.9	0.5	14.5%
Δ Total Assets	7539.9	32954.4	0.4	2.0%
Ln (New Equity)	-0.1	0.1	0.4	2.0%
Δ ln(Fixed Assets)	0.1	0.3	0.6	0.5%
Δ ln(Total Assets)	0.0	0.2	0.7	1.0%

The table presents results from placebo tests, were we randomly select 200 thresholds in the interval £600K-800K (such that observations are outside our sample window around £200K). We restrict sample to firms with asset size in 2011 in a window of £100K to the right and £100K to the left of the random threshold. We classify firms into "placebo automatic qualifiers" and "placebo non-eligible" if their assets in 2011 are below or above the random threshold, respectively. Columns 1-4 presents summary results for the 200 placebo tests.

Table 9- Heterogeneity SEIS effect across ownership structure

Panel A – Indicator Variable New Equity Issuance

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	Outside Non-related Owners		Institutional Owner		Outside Owner	
	Yes	No	Yes	No		
$Small_i \times Post_t$	0.021	0.010**	0.035**	0.010**	0.014	0.007
	(0.025)	(0.004)	(0.016)	(0.005)	(0.014)	(0.005)
Observations	5,840	97,674	9,844	93,946	14,763	88,036
R-squared	0.471	0.342	0.447	0.341	0.421	0.335
t-stat. difference		0.45		1.55		0.83

Panel B - Value of New Equity Issuance

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	Outside Non-related Owners		Institutional Owner		Outside Owner	
	Yes	No	Yes	No		
$Small_i \times Post_t$	5935.301	1029.244*	7594.542**	543.107	3867.927*	302.150
	(4,043.360)	(575.005)	(3,721.144)	(471.970)	(2,235.515)	(455.311)
Observations	5,840	97,674	9,844	93,946	14,763	88,036
R-squared	0.375	0.263	0.281	0.294	0.280	0.291
t-stat. difference		1.27		1.95		1.42

Panel C – Investment Fixed Assets

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	Outside Non-related Owners		Institutional Owner		Outside Owner	
	Yes	No	Yes	No		
$Small_i \times Post_t$	6345.667*	4006.438**	10573.833	3304.987***	12169.794*	3162.209**
	(3,838.037)	(1,562.203)	(9,679.060)	(1,215.522)	(6,812.929)	(1,283.373)
Observations	5,840	97,674	9,844	93,946	14,763	88,036
R-squared	0.300	0.295	0.330	0.312	0.299	0.317
t-stat. difference		0.59		0.77		1.35

Panel D – Investment Total Assets

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	Outside Non-related Owners		Institutional Owner		Outside Owner	
	Yes	No	Yes	No		
$Small_i \times Post_t$	28427.717**	14493.717***	27197.525	14146.659***	27998.172*	13944.938***
	(12,100.371)	(3,593.818)	(21,489.526)	(2,760.823)	(14,500.289)	(2,834.389)
Observations	5,840	97,674	9,844	93,946	14,763	88,036
R-squared	0.300	0.295	0.330	0.312	0.299	0.317
t-stat. difference		1.16		0.63		1.20

The table presents results from estimating an expanded version of equation (1) for issued capital, investment in fixed assets and total assets, across different subsamples as specified in the top rows. $Small_i$ is a dummy indicating whether the firm had beginning-of-period total assets below 200K pounds in year 2012 (such that it qualified for the SEIS program), $Post_t$ is a dummy equal to one in the years 2012-2014, and the dependent variable is specified in the top of the column. Outside Non-related owners indicates whether the company has at least one individual owner whose last name differs from that of the owners included at registration. Institutional Owner indicates whether the company has at least one non-individual owner including: financial, industrial or insurance companies, mutual or pension funds,

private equity firms, foundations, public authorities or venture capital firms. The standard errors are presented in parentheses and are adjusted for heteroskedasticity and clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 10- Heterogeneity effect of SEIS launch by Asset Tangibility

Panel A –Equity Issuance

	(1)	(2)	(3)	(4)	(5)	(6)
Asset tangibility	High	Low	High	Low	High	Low
Dep. Variable	D(Δ Issued Equity >0)		Δ Issued Equity		Δ ln(Issued Equity)	
$Small_i \times Post_t$	0.014**	0.013*	2535.806***	848.163	0.100***	0.048
	(0.006)	(0.007)	(716.988)	(953.020)	(0.033)	(0.030)
Observations	59,677	61,487	59,677	61,487	59,677	61,487
R-squared	0.380	0.369	0.269	0.273	0.271	0.260
t-stat. difference		0.09		1.41		1.16

Panel B – Investment in Fixed Assets

	(1)	(2)	(3)	(4)
Asset tangibility	High	Low	High	Low
Dep. Variable	Δ Fixed Assets		Δ ln(Fixed Assets)	
$Small_i \times Post_t$	12131.814***	-4030.407**	0.321***	0.131*
	(1,951.831)	(1,984.254)	(0.080)	(0.070)
Observations	59,677	61,487	59,677	61,487
R-squared	0.399	0.224	0.375	0.285
t-stat. difference		5.81		1.78

Panel B – Investment in Total Assets

	(1)	(2)	(3)	(4)
Asset tangibility	High	Low	High	Low
Dep. Variable	Δ Total Assets		Δ ln(Total Assets)	
$Small_i \times Post_t$	14870.996***	15213.604***	0.230***	0.101**
	(3,652.415)	(5,677.439)	(0.057)	(0.051)
Observations	59,677	61,487	59,677	61,487
R-squared	0.384	0.353	0.373	0.387
t-stat. difference		-0.05		1.68

The table presents results from estimating an expanded version of equation (1) for issued capital, investment in fixed assets and total assets. $Small_i$ is a dummy indicating whether the firm had beginning-of-period total assets below 200K pounds in year 2012 (such that it qualified for the SEIS program), and the dependent variable is specified in the top of the column. The standard errors are presented in parentheses and are adjusted for heteroskedasticity and clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively

Table 11- Actual and Counterfactual Distribution of Cash flow Ratio

SEIS eligible firms in 2012

	mean	s.d.	min	max	P50
Real Cash Flow Ratio	0.06	0.29	-5.28	1.50	0.05
Counter-factual Cash Flow Ratio	0.11	0.32	-5.28	2.08	0.09

The table presents actual and counterfactual distribution of cash flow ratios. Panel A presents estimates for SEIS eligible companies in 2012 with beginning-of-period assets between £100K and £200KThe cash flow ratio is a measure of the cash flow to equity investors in the firm relative to firm size and corresponds to profits adjusted by capital gains tax over total assets. The counterfactual cash flow ratio incorporates the effect of the tax schemes on the cash flows to equity investors It includes capital gains tax exemption, loss relief against income tax (or capital gains tax) and investment rebates against income tax. For a detailed explanation see Section 4.1.

Table 12—Elasticity of Young Firm Investment to the Cost of Outside Equity

	(1)	(2)
	Actual	**Assuming 100% take-up**
ROE	0.06	0.06
Counterfactual ROE	0.12	0.12
ΔROE	0.06	0.06
%ΔROE	1.13	1.13
%Δ Fixed Assets	0.27	2.36
%Δ Total Assets	0.18	0.68
Elasticity investment fixed assets	-0.24	-2.10
Elasticity investment total assets	-0.16	-0.60

The table presents actual and counterfactual elasticity of investment to the cost of outside equity. Column (2) estimates the percentage in fixed and total assets under the assumption that all eligible firms take-on the maximum subsidy of £150K and invest in full in fixed and total assets. See details in text.

Appendix 1. Details of the Seed Enterprise Investment Scheme

Largely based on the following Acts: Taxes Management Act 1970, Taxation of Chargeable Gains Act 1992, Income Tax Act 2007, Finance Act (No.2) 2015; and HMRC manuals: Venture Capital Schemes Manual, 2016, VCM10010—Enterprise Investment Scheme, HS297 Enterprise Investment Scheme and Capital Gains Tax, CCM30100—Seed Enterprise Investment Scheme, HS393 Seed Enterprise Investment Scheme, VCM70100—Share Loss Relief, Capital Gains Manual, 2016 and Self-Assessment Claims Manual, 2016.

A.1. General Requirements for the investment:

- The shares must be ordinary shares paid in cash with no preferential treatment (see VCM33020),
- The purpose of the issue must be for a Qualifying Business (see VCM33030),
- The spending of the money raised must be spend within a pre-specified period (see VCM33040),
- There should be No pre-arranged exits (see VCM33060),
- The shares must not be issued for tax avoidance (see VCM33070), and
- No disqualifying arrangements – there needs to be a need for commercial purpose (see VCM33080).

A.2. Detailed requirements for issuing companies:

The Company must:

- perform a qualifying trading (see VCM34020 and VCM34030),
- carry on a qualifying business activity (see VCM34040),
- be a UK permanent establishment (see VCM34050),
- be in financial health (see VCM34060),
- have an unquoted status (see VCM34070),
- meet the control and independence status(see VCM34080),
- no partnerships (see VCM34090),
- meet the gross assets limit (see VCM34100),
- meet the number of employees limit (see VCM34110),
- have not done previous other risk capital scheme investments (see VCM34120),
- comply with the amount raised through the SEIS limitation (see VCM34130),
- comply with qualifying subsidiaries status (see VCM34140),
- meet the property managing subsidiaries limitation (see VCM34150).

Company obligations to notify HMRC

The company is obliged to notify HMRC within 60 days of any event as a result of which any of the following happens or will happen:

- the monies raised by a share issue will not be employed as required by ITA07/S175 (see VCM12060)
- the company ceases to be a qualifying company (see VCM13010)
- the company or a person connected with the company provides value to the investor or an associate (see VCM15030)
- there are repayments of share capital to non-EIS investors (see VCM15090)
- the company acquires a trade or assets from parties controlling the company (see VCM15110)
- the company acquires share capital from parties controlling the company (see VCM15110)

A.3. Detailed requirements for investors

- No employee investors (see VCM32020),
- No substantial interest in the issuing company (see VCM32030),
- No related investment arrangements (see VCM32040),
- No linked loans (see VCM32050),
- No tax avoidance (see VCM32060).

Investor obligations to notify HMRC

If an investor becomes aware of an event which should result in the withdrawal or reduction of relief, he or she is obliged to notify HMRC of that event within 60 days of it occurring. Events which the investor is obliged to notify are any which would result in relief falling to be withdrawn or reduced for any of the following reasons:

- the investor ceases to be a qualifying investor (see VCM11010)
- there is a loan linked to the investment (see VCM11030)
- the shares are disposed of before time
- there is a put option or a call option over the shares (see VCM15020)
- the investor or an associate has received value (see VCM15030)

A.4 Benefits to investors

A.4.1. Income tax relief steps

The relief reduces tax liability in accordance with the following steps (see ITA07/Ss22-32):

- total income chargeable to income tax is calculated,
- then personal allowances and other reliefs (such as loss relief) are deducted,
- Income tax liability is then calculated by applying the appropriate income tax rates to the result and
- reliefs are to be deducted in the following order: first of all, VCT relief, then EIS relief, then SEIS relief, then various others (as listed in ITA07/S27).

A.4.2 Size income tax relief

The relief takes the form of a reduction in the individual's Income Tax liability at the SEIS rate of 50% on the amount of the subscription (this excludes any costs incidental to the subscription) or, if that would exceed the liability for the year, whatever amount will reduce that liability to nil. The maximum investment on which an investor may claim relief for any year is £100,000.

Example:

Jenny invests £20,000 in the tax year 2012-13 (6 April 2012 to 5 April 2013) in SEIS qualifying shares. The SEIS relief available is £10,000 (£20,000 at 50 %). Her tax liability for the year before SEIS relief is £15,000 which she can reduce to £5,000 (£15,000 less £10,000) as a result of her investment.

An investor may elect to have part or all of an issue of shares treated as though acquired in the tax year preceding that in which the shares were actually acquired (see ITA07/S257AB(5). This is subject to the maximum annual investment limit for that earlier year (£100,000). The SEIS rate for the earlier year is then applied to the shares treated as acquired in the earlier year and relief given accordingly. As there is no SEIS rate for periods before 6 April 2012 an election under S257AB(5) will be effective only for shares acquired in 2013-14 and later tax years (see VCM35160 for how to make claims)

Where the investor wishes to treat some of the shares as issued in the year before the year in which they were issued (see VCM31130), it will be necessary to make two separate claims.

Example:

Mr Illingworth subscribes £50,000 for 50,000 shares which are issued to him on 30 September 2014. He receives form SEIS3 on 31 October 2014. He wants 20,000 shares to be treated as issued in the previous year.

His claim to relief on £30,000 for 2014-15 will be made after the end of the year on his tax return. In the meantime he completes the claim section of form SEIS3 to show a claim to relief on £20,000 for 2013-14, thus amending his tax return for that year. At the same time he uses the same means to obtain a coding adjustment for 2014-15.

A.4.3 Withdrawal or reduction of tax relief for investors
Withdrawal if:

- the investor becomes employed by the company without being a director of the company (see VCM32020)
- the investor's holding in the company becomes a 'substantial interest' (see VCM32030)
- the shares cease to be eligible shares (see VCM33020) or there is a put or call option over them (see VCM36030)
- the company ceases to meet the qualifying conditions (see VCM34000+)
- the company fails to spend the money raised by the share issue as required (see VCM33040)

Reduction before the end of the 3 years hold period:

- the investor disposes of any of the shares (see VCM36020)
- the investor or associate receives 'value' from the company or from a person connected with that company (see VCM36040)

The CGT exemption may be restricted if the amount of the Income Tax relief is reduced, or is withdrawn in full (see VCM40070).

A.4.4. Capital loss relief
An investor can claim a loss on the disposal of SEIS shares if the Income Tax relief is not withdrawn. The amount of the capital loss is reduced by the amount of the Income Tax relief still attributable to the shares disposed of (see VCM40100).

The disposal must be by way of a bargain at arm's length (see VCM74090) or by way of a distribution in the course of winding up or dissolving the company (see VCM74100).

(A 'bargain made at arm's length' is a normal commercial transaction between two or more persons. All of the parties involved will be trying to obtain the best deal for themselves in their particular

circumstances. Whether a particular outcome represents this 'best deal' is to be determined by reference to the particular circumstances of the disposal.

This does not mean that a bad bargain cannot be a bargain made at arm's length. For example Mr A may wish to sell his property quickly so that he can go and live in Malta. Mr B knows that Mr A wants to sell his property quickly so he offers him a low price for a quick sale. No-one else makes an offer. Mr A accepts the price Mr B has offered. This may not have been the best possible price which Mr A could have achieved if he had left the property on the market for longer but he was still trying to achieve the best deal possible for himself. It was a bargain made at arm's length.

Another example where a bad bargain could nonetheless be a bargain made at arm's length is where one party to the transaction has better information about the asset than another. For example Mrs S may sell a picture from her attic to Mr T for £500. Mr T, who is an art dealer, knows that the picture is worth £5,000. There has been a bargain with both people trying to get the best deal for themselves. Again, this is a bargain made at arm's length even if the price paid is not the 'market value' of the asset.) (CG14560+)

Example 1 – disposal of all shares

- In December 2012 an investor subscribes £100,000 for 50,000 shares in a SEIS company. Income Tax relief of £50,000 is given in 2012-13 applying the SEIS rate 50%.
- In January 2014 the investor sells all 50,000 shares for £60,000. Income Tax relief of £30,000 in respect of the £60,000 value received by the investor is withdrawn (£60,000 x 50%), see VCM36020. Income Tax relief of £20,000 is not withdrawn and remains attributable to the shares sold. The allowable loss is calculated as below.

Disposal proceeds		£ 60,000
Less cost	£100,000	
Reduced by Income Tax relief*	£ 20,000	£ 80,000
Allowable loss		£(20,000)

*This is the SEIS Income Tax relief not withdrawn which remains attributable to the shares sold. (see VCM40110)

Example 2 – part-disposal

- In December 2012 an investor subscribes £100,000 for 100,000 shares in a SEIS company. Income Tax relief of £50,000 is given in 2012-13.
- In January 2014 the investor sells 25,000 shares for £10,000. Income Tax relief of £5,000 is withdrawn, (£10,000 x 50%), see VCM36020. Income Tax relief of £7,500 attributable to the shares sold is not withdrawn. The allowable loss is calculated:

Disposal proceeds	£ 10,000

Less cost	£25,000	
Reduced by Income Tax relief*	£ 7,500	£ 17,500
Allowable loss		£(7,500)

*This is the SEIS Income Tax relief not withdrawn which remains attributable to the shares sold. (see VCM40120)

A.4.1. How to claim the losses

Share Loss Relief is given on a claim. The claim must be made on or before the first anniversary of the normal self-assessment filing date for the year of the loss (see ITA07/S132(4).Where the customer has received a notice to file a return, a claim must wherever possible

- be made in a return, or
- be made in an amendment to a return.

Where claims cannot be made in a return they can be made outside a return (see SACM3030).

Appendix 2 Example Storemates

Storemates is an online service that aims to match people needing affordable self-storage with people looking to turn their spare household space into extra cash (see: https://storemates.co.uk/).

Storemates raised £40,000 through SEIS on October 2012 (https://www.seedrs.com/storemates-co-uk) and £70,588 on July 2013 (https://www.seedrs.com/storemates-co-uk1). The funds were raised through the UK equity crowdfunding platform SEEDRs (https://www.seedrs.com).

In the table below, the information reported in rows (1)-(5) was extracted from abbreviated accounts filed by Storemates with Companies House during 2012-2015 (see https://beta.companieshouse.gov.uk/company/07726269/filing-history). The information reported in row (6) was retrieved from SEEDRs (see links in the paragraph above). Finally, information in rows (7) and (8) correspond to examples of the variables $New\ Equity$ and $D(New\ Equity > 0)$ used in the empirical analysis and calculated based on rows (1)-(5).

		2012	**2013**	**2014**	**2015**
(1)	Issued Capital (Called up share capital)	3	400	455	455
(2)	Share premium account		39,960	110,493	110,493
(3)	(1)+(2)	3	40,360	110,948	110,948
(4)	Profit and loss account	-1,994	- 35,321	- 62,398	- 92,690
(5)	Shareholders' funds	-1,988	45,399	159,498	129,206
(6)	SEIS issuance		40,000	70,588	
(7)	**New Equity (Δ (3))**	**0**	**40,357**	**70,588**	**0**
(8)	$\boldsymbol{D(New\ Equity > 0)}$	**0**	**1**	**1**	**0**

Appendix 3 –Summary Statistics for different subsamples

Panel A

	High asset tangibility			Low asset tangible			Institutional owner			No institutional owner		
	mean	sd	P50	Mean	sd	P50	mean	sd	P50	mean	sd	P50
Beginning-of-Period Total Assets in 2012	173,990	55,887	161,188	165,473	54,626	149,821	174,811	56,566	162,148	168,570	55,042	154,235
Shareholders' Funds	36,810	194,902	17,241	76,153	246,212	49,205	51,535	330,833	19,628	61,027	200,919	32,311
Fixed Assets	106,617	253,439	72,250	20,361	262,008	999	81,412	423,339	14,147	61,484	222,017	15,010
Total Assets	214,815	403,057	165,865	228,396	540,324	153,930	273,298	757,537	170,849	213,351	404,730	159,404
Shareholders' Funds/Total Assets	0.0898	0.853	0.124	0.279	0.936	0.404	0.0748	1.106	0.142	0.221	0.815	0.242
Issued Equity	9,769	60,016	100	10,750	75,632	87	17,842	101,841	20	7,343	52,471	99
Δ Issued Equity	1,516	36,059	0	1,526	42,502	0	2,577	57,526	0	1,181	32,504	0
D(Δ Issued Equity)	0.0618	0.241	0	0.0590	0.236	0	0.0737	0.261	0	0.0578	0.233	0
Δ Fixed Assets	12,051	191,162	-2,401	9,715	245,366	0	18,764	367,238	0	10,191	173,608	0
Δ Total Assets	36,884	305,847	3,425	51,612	456,876	18,886	62,922	633,109	5,760	40,857	321,542	9,117
$Small_i$	0.686	0.464	1	0.739	0.439	1	0.679	0.467	1	0.721	0.448	1
$Post_t$	0.425	0.494	0	0.454	0.498	0	0.444	0.497	0	0.446	0.497	0
$Small_i \times Post_t$	0.620	0.485	1	0.614	0.487	1	0.650	0.477	1	0.619	0.486	1
Observations	98,645			98,643			60,718			180,628		

Panel B

	Non-related owners			No non-related owners		
	mean	sd	P50	Mean	sd	P50
Beginning-of-Period Total Assets in 2012	172,401	55,840	159,377	169,514	55,389	155,338
Shareholders' Funds	64,767	288,033	26,730	57,012	224,837	30,224
Fixed Assets	75,802	346,539	16,605	63,915	266,611	14,262
Total Assets	251,450	618,592	168,032	222,269	484,191	160,479
Equity/Total Assets	0.170	0.924	0.190	0.188	0.892	0.227
New Equity	11,778	74,771	10	9,522	66,741	100
D(New Equity >0)	2,040	45,116	0	1,390	38,740	0
Δ Fixed Assets	0.0801	0.271	0	0.0566	0.231	0
Δ Total Assets	17,388	275,663	0	10,967	224,742	0
$Small_i$	55,600	502,088	7,126	44,016	395,084	8,668
$Post_t$	0.697	0.460	1	0.714	0.452	1
$Small_i \times Post_t$	0.454	0.498	0	0.443	0.497	0
Observations	53,746			188,030		

The table presents summary statistics across different subsamples used in the anal. Variable definitions are described in Section 1.6. Panel A presents detailed summary statistics for the main variables in the analysis. Panel B compares the analysis sample to the samples in other similar studies studying the capital structure of entrepreneurial firms.