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Abstract

We examine the effect of incorporation in stimulating small business investment. Exploring a 2006 UK tax reform that lowered the tax gain to incorporation and reduced the after-tax internal funds for small companies, we present three main results. First, a one-percentage-point reduction in the tax gain decreased the number of new incorporations by 4.5 percent. Second, on average, a £1 reduction in the post-tax internal funds of newly-incorporated firms would reduce their investment by 90 pence, consistent with them facing severe financial constraints. Third, this impact on investment gradually diminished after incorporation, consistent with incorporation improving access to external finance.

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Many countries have used taxes to stimulate investment. For example, the United States, Germany and the United Kingdom have all used forms of accelerated depreciation allowances - sometimes targeted at smaller companies, and sometimes temporary - to encourage higher investment.[1] However, another potential channel for stimulating investment has received little attention, which is to encourage businesses to incorporate. Greater incorporation could lead to higher investment if incorporation helps to alleviate financing constraints for small businesses. This paper explores this possibility. We present empirical evidence based on a 2006 UK tax reform that created a substantial change in the incentive to incorporate for one group of unincorporated firms. We use confidential tax return data on the population of UK companies, merged with financial accounting data, to address three main questions. First, to what extent do decisions by small firms to incorporate depend on the tax gain or loss from incorporation? Second, does incorporation improve access to external finance? And third, even for firms that incorporate primarily for tax reasons, would a reduction in the tax liability lead to higher investment in the short to medium term?

We present evidence that, in the UK, the tax gain from incorporation has a significant impact on incorporation decisions. We also present evidence that newly incorporated firms face financial constraints to their investment, but that these constraints gradually diminish after incorporation, consistent with them gradually gaining greater access to external finance. On average, a £1 reduction in the corporation tax liability induces newly incorporated firms to increase their investment by 90 pence, although the size of this response declines as the period since incorporation lengthens, and access to external finance improves. We further find that all newly incorporated firms - even those that appear to be more motivated by tax minimization - tend to respond to lower taxes by increasing their investment.

In the UK, incorporated firms (hereafter, companies) face different regulatory and tax requirements compared to unincorporated firms. First, they are obliged to register the new company with Companies House, providing - and keeping up to date - information on the company's name, registered address, the names and addresses of directors, and details of shareholders and share capital.[2] Second, they are obliged to file with Companies House at least basic financial accounts on an annual basis. All this information is publicly and easily available. Third, they are obliged to pay corporation tax on the company's profit; there may also be personal income tax due on dividends paid to shareholders. Note that in the UK there is no equivalent to US S-corps, which have look-through tax treatment, attributing profit to shareholders who are taxed under the personal income tax.[3]

[1] For recent empirical evidence on the impact of these incentives, see, for example, Zwick and Mahon (2016) for the US and Maffini, Xing and Devereux (2016) for the UK.

[2] Companies House is the United Kingdom's registrar of companies and is an executive agency and trading fund of Her Majesty's Government.

[3] Other types of entity exist - for example, limited partnerships. However, we exclude these from our

For at least two reasons, banks may prefer to lend to companies rather than unincorporated firms. First, incorporation reduces the information asymmetry between the small business and its lenders. The regular disclosure of company information to the public increases transparency to external investors and other stakeholders (Healy and Palepu, 2001). Through incorporation, the government becomes an implicit guarantor of the quality of the information for the new company, thereby improving the credibility of its financial statements and signaling a higher quality of information. Second, the greater formality and costs involved in being incorporated can help to signal a long-term commitment of the business and enhance its reputation.[4] Such reputation gains can potentially mitigate the conflict of interest between borrowers and lenders and lead to a lower cost of external finance (Diamond, 1989).[5] Both factors become more significant the longer the firm has been incorporated - as more information becomes available, and the longer the firm has had to operate in a more formal setting.[6] As a preliminary step, we quantify the negative association between a firm having corporate form and the likelihood of it failing to obtain external finance, using data from surveys in 2008 and 2009 of the finances of UK small and medium sized firms (SMEs). Conditioning on firm size, age and the industry sector, incorporation reduces the probability of being denied access to sufficient external finance by over 12 percentage points.[7]

We formalize this positive effect of incorporation in stimulating small business investment in a simple pecking order model of corporate finance. In the model, the cost of external finance is higher than that of internal finance.[8] Incorporation lowers the cost of external finance by reducing the information asymmetry between the small firm and its lender. In this context, a reduction in the corporation tax rate has two effects on small firms. First,

analysis.

[4]Freedman and Godwin (1992) reports that small business owners in the UK often quote the greater credibility associated with the limited company status, which indicated that the business was "serious", as one of the key factors that influence their choice of legal form.

[5]Of course, there are other important advantages of incorporation such as limited liability and separation of ownership and control. But the value of limited liability can be quite restricted for small companies, as they are commonly required to provide personal security as collateral for commercial borrowing. In a recent survey of SME finance, more than 70 percent of newly incorporated firms in the UK were required to provide personal security on loans and overdrafts above a modest level. In the U.S., nearly 70% of commercial and industrial loans to small businesses are made on a secured basis (Berger and Udell, 1990). The same argument extends to separation of ownership and control. It is less likely to benefit most private companies given that 45 percent of all UK companies are managed by the owner and that 90 percent of them have less than 10 employees(BIS, 2015).

[6]Banks may also benefit from building a relationship with new companies, requiring them to provide additional private information or to operate in certain ways (Petersen and Rajan, 1994).

[7]This empirical evidence is corroborated by cross-country evidence that corporations report fewer financing and growth obstacles than unincorporated firms in 52 countries (Demirguc-Kunt, Love and Maksimovic, 2006).

[8]The observed cash-sensitivity of investment may also arise in the presence of agency costs, where the decision to spend a marginal unit of internally generated funds is consistent with the utility maximization problem of top management (Jensen, 1986). We do not consider this case as it is less relevant in the sample of small, owner-managed firms on which we focus here.

a lower average tax rate affects the choice of legal form, by increasing the tax gain from incorporation. This implies that some firms that were previously unincorporated will choose to incorporate. Second, the lower corporate tax rate affects corporate investment through two channels. Ceteris paribus, the cost of capital would fall, creating an additional incentive to invest. In addition, for companies that have exhausted internal finance, the lower tax payment would increase their internal funds to finance investment. We call this the cash flow effect of the tax on investment, which arises with a nine month lag due to the UK rules for when small companies must file and pay corporation tax. We show that the cash flow effect of the tax is strongest for newly incorporated firms and diminishes over the period of incorporation with improved access to external finance.

Our empirical analysis uses rich data from UK corporation tax records from 2002/03 to 2008/09. The dataset provides detailed information on UK companies and their tax positions and facilitates a precise identification of companies who were affected by a 2006/07 tax reform. By replacing a progressive marginal tax schedule with a flat rate of 19 percent for small companies,[9] the 2006 reform increased the average tax rate and liability for companies with taxable profit up to £50,000. This led to a reduction in the tax gain from incorporation for such small businesses.[10] The increase in tax liability also implied a reduction in the after-tax cash flow available for investment for companies that were financially constrained.

We conduct our empirical analysis in two steps. First, we identify the causal effect of tax incentives on the incorporation decision of small firms in a difference-in-differences design in fixed-effects non-linear count models, using the post-2006 period where the tax rate was the same for all small firms to form a counterfactual of the distribution of taxable profits had there been no tax advantage of incorporation before 2006. The difference-in-differences estimates indicate that the number of newly incorporations increases by around 4 percent for a one percentage point increase in the tax gain from incorporation. This basic finding is robust to a number of alternative specifications, the inclusion of additional control variables, the exclusion of a bunching region where companies may manipulate their level of taxable profits, and industry-level regressions controlling for industry-specific invariant unobservables and time-varying characteristics. We further identify a group of companies in which their owner-manager minimizes the total tax liability, and find that the "tax minimizers" are more responsive to changes in the tax gain. This difference suggests that "tax minimizers" are fully aware of the tax system and are more likely to benefit from the tax incentives.

[9] Prior to 2006, companies paid no tax on the first £10,000 of corporate profit. The marginal tax rate is 23.75 percent on the next £40,000 and 19 percent for profits between £50,000 and £300,000.

[10] For virtually all companies, the corporation tax liability was lower than the equivalent amount of tax that they would have paid had they not been incorporated. This was also true even when taxation of dividends was included in the comparison. Hence there was generally a tax gain from incorporation, unlike in many other countries.

Second, we identify the positive effect of incorporation on small firm investment in a dynamic investment model. We find that an exogenous increase in corporate tax payment (based on profit arising in the previous period, but affecting cash flows in the current period) leads to a reduction in firm investment. Identification relies on the cross-section variation across small companies with taxable profits below £50,000 that were primarily affected by the 2006 tax reform, which allows a within-year comparison of investment for companies in different profit bands. We find that on average, small companies allocate 20 pence of a £1 reduction in their taxes to investment. More importantly, newly incorporated firms allocate 90 pence of a £1 tax saving to investment. This is consistent with them facing serious financial constraints, which gradually diminish after incorporation.

We perform a wide range of robustness checks. For example, to test whether duration post-incorporation is not merely a proxy for total firm age, we control for characteristics of the firm at the point of incorporation. We show that the effect of duration post-incorporation dominates that of pre-incorporation period. We also control for other factors that may affect the relationship between investment and available internal funds, and which may also be correlated with duration post-incorporation, such as firm profitability and its growth rate.

Our results suggest that the financial constraints faced by newly incorporated companies diminish over the period since incorporation. Since a relaxation of financial constraints supports greater investment, the evidence is consistent with incorporation ultimately stimulating investment. However, it might be objected that a tax incentive to incorporation may induce incorporation by firms that do not seek to grow and invest, but are instead concerned primarily with the tax gain. We address this concern by examining whether the group of "tax minimizers" behave differently to other companies with respect to investment, and find that they allocate similar amount of tax savings to investment as the "non-minimizers".

By identifying the positive effect of incorporation on small business investment, our empirical findings shed new light on the different channels through which a lower corporation tax rate can stimulate investment. First, it induces more firms to incorporate. Second, it leads to greater investment by small companies, including those induced to incorporate by the additional tax saving. In the short and medium term this occurs through a large part of additional cash saved from a lower corporation tax payment for additional investment. In the longer run it occurs through reducing the cost of external finance, so that the availability of internal funds becomes less important for more established companies. Understanding this positive relationship between incorporation and investment has important policy implications, given the number of government programs aiming to promote small business activities through financial and fiscal subsidies.

Our paper contributes to several strands of literature in corporate finance and investment.

First, it complements the literature on financial constraints and corporate investment.[11] We find that incorporation stimulates small business investment and that the incentive effects of incorporation are most pronounced for newly incorporated firms facing a higher level of information asymmetries (Petersen and Rajan, 1994). Second, our paper relates to a large empirical literature that has found significant effects of corporate tax policy on business investment (Cummins et al., 1994; Caballero, Engel and Haltiwanger, 1995; House and Shapiro, 2008; Yagan, 2015; Zwick and Mahon, 2016), and a smaller literature on taxation and the choice of organizational form (Gordon and Slemrod, 2000; Goolsbee, 2004; Liu, 2014). Third, it complements the literature on firm dynamics and investment (Cooley and Quadrini, 2001; Clementi and Hopenhayn, 2006), by relating the empirical regularity between company age and investment to the underlying determinants of financing costs.

Our paper proceeds as follows. Section 1 documents the empirical connection between incorporation and access to external finance. Section 2 outlines a conceptual framework to consider the impact of incorporation on firm investment. Section 3 describes the 2006 tax reform. Section 4 introduces the linked tax-accounting data. Section 5 estimates the effect of tax incentives on incorporation. Section 6 estimates the impact of incorporation on investment. Section 7 concludes.

1 Incorporation Facilitates Access of External Finance

We start by providing descriptive evidence consistent with the hypothesis that incorporation facilitates access to external finance for small and medium sized firms (SMEs), by documenting that there is a negative association between having corporate form and the likelihood of failure in securing external finance. The data we use are from recent surveys of SMEs' finances in the UK in 2008 and 2009,[12] which includes 2,452 SMEs with detailed information on the availability of credit, the types of finance used and basic firm and balance sheet characteristics.[13] Around 47% of firms in the sample either applied for external finance or indicated a consideration to do so in the past three years, but the rate of success varies considerably.[14] In particular, around 19 percent of firms that sought external finance failed

[11] The early empirical work on corporate investment, e.g. Meer and Kuh (1957), stressed the availability of finance. Influential empirical work by Fazzari, Hubbard and Petersen (1988) suggested that heterogeneity in the sensitivity of investment to cash flow for firms with financial constraint is related to the cost premium for external finance. Subsequent studies have made this argument while identifying quasi-experimental variation in cash flows or credit supply (Lamont, 1997; Rauh, 2006; Chaney, Sraer and Thesmar, 2012; Zwick and Mahon, 2016).

[12] Surveys in both years conducted by Warwick Business School. For more information see http://www.esds.ac.uk/doc/6314/read6314.htm.

[13] The basic descriptive data for these firms are summarized in Appendix Table B.1.

[14] We use three indicators to evaluate whether a SME has failed to obtain any external finance: *Denied*, *Depressed*, and *Discouraged*. The indicator *Denied* takes value of 1 if the SME applied to a bank or financial

to obtain sufficient external finance.[15]

For small firms, having corporate form is a key factor in lowering the probability of failure in obtaining external finance. We identify this important association by estimating the likelihood of failure in accessing external finance in a probit model:

$$y_{it} = \gamma_1 + \gamma_2 LLC_i + \gamma_3 Age_{it} + \gamma_4 LLC_i \times Age_{it} + \gamma_5 \mathbf{X}_{it} + \rho_t + \upsilon_{it}, \quad (1)$$

where y_{it} denotes various outcome indicators in obtaining external finance. The key variable of interest is LLC_i, which is a dummy variable and takes the value of 1 for limited liability companies and zero for other, non-corporate ownership type.[16] The variable Age_{it} is the number of years since the firm was established, $\mathbf{X}_{it}$ are other firm-level controls including the size of the business approximated by total asset and a set of 2-digit SIC industry dummies. The latter is included to control, for example, for the fact that different industries are associated with a different degree of asset tangibility and borrowing capacity. ρ_t is a set of year dummies and υ_{it} is the error term. We estimate equation (1) in a probit regression by pooling all the firms that have applied for or considered applying for external finance in 2008 and 2009. We cluster standard errors at the firm level to control for potential serial correlation of errors.

Table 1 presents the average marginal effects estimated from the probit model of (1). The dependent variable in column (1) is the overall likelihood of failure in obtaining sufficient external finance. Evaluated at the mean, having a corporate form reduces the probability of failing to raise sufficient external finance by 12 percentage points. The effect of firm age (the number of years in business) is considerably weaker – one more year in business, on average, decreases the probability of being denied for external finance by 0.3 percentage points.[17] The estimated marginal effect of the interaction term between LLC and firm age is similar to that of firm age but takes the opposite sign, suggesting that the benefit of being older almost disappears at the time of incorporation.

institution for any overdraft or commercial lending and was turned down outright, and 0 otherwise. The indicator *Depressed* equals 1 if the SME was offered less than what was requested for external finance, and 0 otherwise. The indicator *Discouraged* equals 1 if the SME did not apply for any external finance in the fear of being turned down, and 0 otherwise. We further combine the information in the three indicators by summing them up to an indicator of overall failure, which takes value of 1 if any of the three indicators equals to 1.

[15] We test whether firm characteristics of the two subsamples have equal means and report the t statistic and p-value in Appendix Table B.1 columns (10) and (11). Firms in need of external finance are more likely to be a limited liability company (LLC) and have higher turnover and total asset, but they are not statistically different in age or employment. A small number of firms reported the total interest rate charged on their loans, and the average interest rate is not statistically different between the two groups.

[16] Non-corporate businesses include sole proprietorship, partnership, limited liability partnership and other forms. They account for about 43 percent of firms in the sample.

[17] Note that the *age* variable is the total number of years in establishment and does not capture the duration since incorporation.

The next three columns report a qualitatively similar effect of incorporation on individual indicators of failure: *Denied*, *Depressed*, and *Discouraged*, respectively. Evaluated at the mean, incorporation reduces the probability of an application for external finance being denied by 5 percentage points (column (2)), the probability of obtaining less external finance than requested by 3 percentage points (column (3)),[18] and the probability of discouraging an application by about 3 percentage points (column (4)).

The strong and negative correlation between incorporation and the likelihood of failure in obtaining sufficient external finance indicates that having corporate form enhances access of external finance by SMEs in the UK. Given this positive cross-sectional association between incorporation and improved access to external finance, we now formalize the effect of incorporation on firm investment in a simple pecking order model.

2 Conceptual Framework

In this section, we present a simple conceptual framework in which incorporation reduces the cost of external finance and encourages small companies to undertake more investment. Consider a firm that aims to maximize its shareholder value, V_t, defined as

$$V_t = D_t + \beta E(V_{t+1}) \tag{2}$$

where β is the shareholder's discount factor, $\beta = 1/(1+\rho)$, and ρ is the shareholder's discount rate. For an unincorporated business, D_t is the cash taken out of the business by the owner in period t. For a company it is the dividend paid to the shareholder in period t. We assume that the owner of the firm has no other wealth to invest in the business, and also has no access to equity finance. Investment must therefore be financed by retained earnings or borrowing.

The dividend, or cash removed from the business, is equal to

$$D_t = F(K_{t-1}) - I_t + B_t - [1 + r(x_{t-1}, B_{t-1})] B_{t-1} - T_t \tag{3}$$

where $F(K_{t-1})$ is the value of the firm's output, which depends on the capital stock at the end of the previous period, K_{t-1}, I_t is new investment in period t, B_t is new one-period debt issued in period t. The rate of interest on debt is a decreasing function of the information that banks have about the business at the beginning of the period, x_{t-1}, $r_x < 0$ and an increasing function of the amount of debt, $r_B > 0$. For simplicity, we assume that $r_{BB} = 0$. However, we assume that $r_{Bx} = \partial r_B / \partial x < 0$ - that is, the rate of increase in the interest rate

[18] The effect of incorporation on the probability of obtaining less external finance than requested is imprecisely estimated, however.

with respect to the level of debt is moderated by incorporation. This is because complying with the regulation for companies to produce annual accounting information increases the formality of the business and also increases the credible information available to banks, partly because of an implicit government guarantee on the quality of the information. Both factors reduce the interest rate through x_t. Further, we assume that the longer the period of such compliance the more credible information is available, and ceteris paribus, the higher is x_t.[19]

T_t is taxation, defined as

$$T_t = \tau \left\{ F(K_{t-1}) - \delta K_{t-1} - r\left(x_{t-1}, B_{t-1}\right) B_{t-1} \right\}. \tag{4}$$

The rate of depreciation relief for capital expenditure is assumed for simplicity to be equal to the true depreciation rate, δ. The equation of motion of the capital stock is $K_t = (1-\delta)K_{t-1} + I_t$.

There is a minimum level of dividends, $\overline{D}_t$; this could be zero, or it could be positive reflecting constraints on the owner's need for income from the firm. Debt is non-negative. Hence

$$D_t \geq \overline{D}_t \tag{5}$$

$$B_t \geq 0 \tag{6}$$

and there are shadow values associated with these constraints of λ_t^D and λ_t^B, respectively. We assume throughout that $D_{t+1} > 0$ and so $\lambda_{t+1}^D = 0$.

The firm chooses K_t and B_t to maximize V_t. The first order conditions are

$$K_t : 1 + \lambda_t^D = \beta \left\{ F_K(K_t)(1-\tau) + (1 - \delta(1-\tau)) \right\} \tag{7}$$

$$B_t : 1 + \lambda_t^D + \lambda_t^B = \beta \left\{ 1 + \left[r\left(x_t, B_t\right) + r_B B_t \right](1-\tau) \right\} \tag{8}$$

There are two financial regimes.

Regime 1: The firm pays dividends and investment is financed at the margin by retained earnings: $\lambda_t^D = 0$, $\lambda_t^B > 0$.

In this case, the marginal cost of debt finance is

$$1 + \left[r\left(x_t, B_t\right) + r_B \right](1-\tau) = \left(1 + \lambda_t^B\right)(1+\rho) \tag{9}$$

which we assume exceeds the cost of using retained earnings and so $B_t = 0$. In this case,

[19] This approach can be seen as a simple version of the set of models explored by Tirole (2006). To focus on the impact of incorporation we do not explicitly model the reasons why external finance is more expensive, which are examined in detail by Tirole. Instead, these factors are simply summarised by x.

the firm undertakes investment up to the point at which the marginal product of capital is equal to the standard user cost of capital, given this simplified tax system:

$$F_K(K_t) = \frac{\rho}{(1-\tau)} + \delta. \tag{10}$$

Regime 2: The firm pays the minimum dividend and investment is financed at the margin by borrowing : $\lambda_t^D > 0$, $\lambda_t^B = 0$.

In this case, from (8) we have

$$\left(1 + \lambda_t^D\right)(1+\rho) = 1 + \left[r\left(x_t, B_t\right) + r_B B_t\right](1-\tau) \tag{11}$$

and so investment is undertaken up to the point at which

$$F_K(K_t) = r\left(x_t, B_t\right) + r_B B_t + \delta \tag{12}$$

In this case, both the cost of finance and the cost of depreciation are deductible from tax, so the cost of capital is unaffected by tax. However, despite the tax advantage to the use of debt finance, we assume throughout that, due to informational constraints, $r\left(x_{t-1}, B_{t-1}\right) \geq \rho/(1-\tau)$ and so retained earnings is a cheaper source of finance than external debt.

2.1 Empirical strategy

Changing organizational form has two immediate consequences. First, we assume that, ceteris paribus, companies have a higher x_t - reflecting greater firm reputation and information available to lenders; that is $x_t^C > x_t^U$, where a C superscript indicates corporate form and a U superscript indicates unincorporated form. Second, we also assume - consistent with the UK tax system - that the tax rate for companies (τ^C) is lower than that for unincorporated businesses (τ^U); $\tau^C < \tau^U$. In our empirical work we investigate the impact of these two factors on the incorporation decision and on investment.

Leaving to one side any behavioral responses by the firm, both of these factors tend to increase firm value - the former through a lower borrowing rate and the latter through a lower tax rate. While we do not explicitly model the choice of organizational form, we investigate empirically whether the number of newly incorporated firms is related to the potential tax gains. Assuming that there are fixed costs of incorporation (F), unincorporated businesses will only incorporate if the potential gains from incorporation exceed these fixed costs, $V_t^C - V_t^U > F$. This is more likely for firms where the tax gain to incorporation is greater.

There are three possible channels by which changes in x_t and τ may affect firm investment.

First, conditional on being in Regime 1, there is a straightforward effect through the cost of capital as a result of facing a lower tax rate. Totally differentiating (10) yields

$$F_{KK}dK_t = \frac{\rho}{(1-\tau)^2}d\tau. \tag{13}$$

This is the normal case: given $F_{KK} < 0$, a reduction in the tax rate reduces the costs of capital, and so increases investment and the capital stock. This effect occurs when the firm has enough internal resources to finance its investment, and so the availability and cost of external finance is irrelevant. In the UK, since $\tau^C < \tau^U$ incorporation should lead to a lower cost of capital and hence higher investment. However, in countries where $\tau^C > \tau^U$, the reverse should hold. This channel by which incorporation affects investment therefore varies between countries depending on the relative tax rates. We therefore focus primarily on the more general channels described below.

In regime 2, there are two effects. One is the direct impact of a rise in x_t on the interest rate charged, which reduces the cost of capital in this regime. The second comes from a lower rate of taxation increasing available internal funds. This would make it more likely that the firm would be in Regime 1, able to finance its investment without hitting the dividend constraint. Further, conditional on remaining in Regime 2, additional internal funds would enable the company to borrow less and hence face a lower interest rate and lower cost of capital. In practice, taxes are paid 9 months after the accounting year end, so for a given profit in period $t-1$, a switch to corporate form in period $t-1$ would induce a change in tax and hence borrowing in period t. Hence, in this case, $dB_t = dI_t + dT_{t-1} = dK_t + dT_{t-1}$. Using this, totally differentiating (12) (and recalling that $r_{BB} = 0$) yields

$$\left(F_{KK} - 2r_B\right)dK_t = \left(r_x + r_{Bx}B_t\right)dx_t + 2r_B dT_{t-1}. \tag{14}$$

The change in x_t therefore has a direct positive effect on investment through reducing the cost of borrowing (since $r_B > 0, r_x < 0, r_{Bx} < 0$). In addition, a reduction in the tax liability from $t-1$, paid in period t, also has a positive effect on investment. The size of this latter effect also depends on x_t, through $r_B(x_t, B_t)$. Specifically,

$$\frac{\partial\left(dK_t/dT_{t-1}\right)}{\partial x_t} = \frac{2r_{Bx}F_{KK}}{\left(F_{KK} - 2r_B\right)^2} > 0. \tag{15}$$

That is, in Regime 2 a rise in x_t tends to reduce the sensitivity of investment to tax payments (since $dK_t/dT_{t-1} < 0$).

Our empirical strategy for investment primarily tests the third hypothesis in equation (15), that a rise in x_t tends to reduce the sensitivity of investment to tax payments.[20] This

[20] We cannot directly test the proposition that, ceteris paribus, a corporation undertakes higher investment

is done in two steps. We first test whether an exogenous increase in the tax payment has the negative effect on investment predicted in (14). We then use as a proxy for x_t the duration of the period since the company became incorporated, on the grounds that the longer is this period, the greater the information available to banks, and the longer the company has had to establish a reputation. We test the effect of this proxy on the impact of the increase in the tax payment on investment, by estimating whether the effect diminishes the longer the duration of the period since the company incorporated, as predicted in equation (15). Our empirical test controls for the other two channels described here, by including the cost of capital and the proxy for x_t separately in the estimation, and relies primarily on the quasi-experimental variation in tax savings to identify the effect of the incorporation on investment.[21]

3 The Policy Experiment

As in many other countries, the tax treatment of small business income in the UK depends on legal form.[22] Profits generated by non-corporate businesses, including sole proprietorships and partnerships, are passed through to their owners and are liable for income taxes and national insurance contributions (NICs). In comparison, profits generated in companies are first taxed at the corporate level and then taxed for a second time at the shareholder level as distributed dividends which are liable for dividend taxes with a partial credit for corporation tax paid. Total taxes for self-employment income, including NIC contributions, are often considerably higher than that for corporate income. A key feature of small companies in the UK is that there is often no distinction between the owner and the manager. In this case the distinction between business and personal income is less clear since income can be paid out to the owner-manager as a salary and therefore be liable for income taxes and NICs.[23]

The zero starting rate, which exempted the first £10,000 of corporate profit from tax, was introduced in 2002/03 as one of the key measures to "bringing down the barriers to enterprise and to support the drivers of productivity growth" (HM Treasury and HMRC,

than an equivalent unincorporated business, since we have data only on corporations.

[21] Note that we cannot identify the direct impact of the duration since incorporation on investment. To see this, note that the total age of the company (A_{it}) equals the firm age at the point of incorporation (I_i) plus the number of years since incorporation (x_{it}), i.e. $A_{it} = I_i + x_{it}$. By including a company fixed effect in the regression, the marginal impact of x_{it} is indistinguishable from that of A_{it}. In any case, other factors which vary over the firm life cycle may also affect investment (Cooley and Quadrini (2001) and Clementi and Hopenhayn (2006)) and may confound the direct effects of information and reputation that we aim to identify.

[22] The definition of the tax base, including the tax treatment of capital allowance and interest deductibility, is broadly the same for incorporated and unincorporated businesses in the UK.

[23] According to ONS statistics, more than 40% of companies in the UK are owner-managed.

2002).[24] It provided sizable tax savings for small businesses that incorporated, which led the government to subsequently restrict the benefit of the zero starting rate to profits that were retained by the company in 2004.[25] The zero starting rate was eventually replaced with a flat rate of 19 percent for corporate profits up to £300,000 in 2006/07. This resulted differential in changes in the average tax rates faced by small companies at different levels of pre-tax profit. As illustrated in panel A of Figure 1, the tax reform increased the average tax rate only for small companies with taxable profits up to £50,000. The size of the tax rate increase is continuously decreasing in the pre-tax profit, so that the largest increase is for companies with taxable profits below £10,000.

An important feature of the 2006/07 policy reform is that it embodied changes in the marginal tax rate as well as in average tax rates. As shown in Figure 1 panel B, the marginal tax rate increased from 0 to 19% for companies with taxable profit up to £10,000, decreased from 23.75% to 19% for companies with taxable profit between £10,000 and £50,000. In contrast with the continuous change in the average tax rate, there is a stepwise increase in the marginal tax rate for corporate profits up to £50,000.

4 Data

The analysis in this paper uses a comprehensive dataset to study business incorporation and investment. The dataset is based on administrative corporation tax returns covering the population of companies in the UK between 2002/03 and 2008/09.[26] The full tax dataset has around 10.7 million observations for 2.5 million individual companies (both private and public) and contains detailed and precise information on taxable profits and how they are determined. Because of the detailed information, we can identify precisely how firms' incorporation and investment incentives are affected by the policy reform. We merge the tax record with company accounts in the Financial Analysis Made Easy (FAME) database provided by Bureau van Dijk.[27] The accounting records provide additional firm-level information on the amount of total fixed assets, the number of employees, directors' renumeration,

[24] A 10% starting rate, which taxed the first £10,000 corporate profits at 10%, had been introduced in 1999/2000 and remained in effect until being replaced by the zero starting rate.

[25] Profits paid out as dividends in the next two years were effectively taxed at the standard small companies' rate, removing the main tax advantage for individuals to replace one form of cash income (salary) by another (dividend income).

[26] The financial year for corporation tax runs from 1 April to 31 March in the UK. The financial year for an individual corporate tax return is based on its financial period end.

[27] FAME covers all the registered firms in the UK that are legally required to file accounts with the Companies House. Overall, FAME provides basic information on all companies including registered address, firm status, and industry code, although the availability of financial information varies across firm sizes. We are able to match the tax return and company account for each company-year for approximately 90% of corporate taxpayers.

and the exact date of incorporation.

4.1 Data for Incorporation Analysis

The dataset we use for incorporation analysis is based on all companies that were newly incorporated between 2002/03 and 2008/09. We focus on standalone domestic businesses and exclude companies that belong to a larger group or report foreign earnings. We compute the annual distribution of the pre-tax profits of new companies by counting the number of new companies in income bins of £100 for each year during the sample period. The aim is to explore whether there is any systematic change in the distribution of the new companies in relation to changes in the tax saving from incorporation as a result of the 2006 tax reform. We also compute the average characteristics of newly incorporated companies within each income bin including their turnover, fixed assets, and the number of workers as proxies for other non-tax determinants of incorporation.

An advantage of linking the tax and accounting data is that for about 12 percent of companies we observe the amount of remuneration received by the director(s), i.e. a proxy of their personal income, from company accounts. This additional information enables us to construct a measure of total taxable income of the company, as the sum of its corporate taxable profit and the amount of salary paid to directors. We can then identify whether the allocation of total profit between business and personal income minimizes the overall tax liability of the company. Given that the marginal tax rate for salary is consistently higher than that for corporate profit, companies can minimize their overall tax liability by declaring a salary equal to the personal allowance for income tax and the reminder as corporate profit. We identify a company as a "tax minimizer" if it follows this tax-minimization strategy, i.e. companies that bunch below the personal allowance threshold in Figure 4. The percentage of tax minimizers is around 45 percent for all firms with total taxable profits below £100,000, and around 14 percent for all firms with corporate profits below £300,000.

4.2 Data for Investment Analysis

The dataset that we use to analyze the link between incorporation and investment is an unbalanced panel of standalone companies which undertook some positive investment between 2002/03 and 2008/09 and reported taxable profits of less than £300,000.[28] We call this the main *investors* sample. We use total qualifying expenditure for plant and machinery reported in the tax form to measure investment I_{it}. We scale I_{it} by beginning-of-period book

[28] We further restrict our sample to small companies with up to 500 employees. The total number of observations dropped based on taxable profit and employment account for around for 4.7 percent of the linked tax-accounting dataset.

value of fixed asset K_{it-1} to obtain a measure of investment rate (I_{it}/K_{it-1}).

Due to the nine-month lag between the accounting year end and the tax payment due date, an increase in the current-year average tax rate would reduce tax payment and available cash for small companies in the following year. Given this lag in tax payment, we calculate the firm-level average tax rate in year $t-1$ ($\tau^{avg}_{i,t-1}$), as the observed tax liability in year $t-1$ relative to taxable profit $\pi^{T}_{i,t-1}$, $\tau^{avg}_{i,t-1} = Tax_{i,t-1}/\pi^{T}_{i,t-1}$. In addition to changes in average tax rates, the 2006 tax reform also changed the marginal tax rate and the after-tax cost of capital for companies with taxable profits below £50,000. To control for the latter effect, we compute a measure of Jorgenson and Hall (1967) firm-level user cost of capital.[29] Table 2 presents some basic features of the key variables.[30]

We use three different samples to assess the robustness of our findings to sample selection The main *investor* sample includes firms that invested at least once during the sample period and accounts for 67 percent of total observations in the linked tax-accounting dataset. The *frequent investor* sample, which includes companies that invested in more than half of the periods throughout their lifetime during the sample period, accounts for 70 percent of observations in the *investor* sample. The *consistent investor* sample includes companies that invested consistently throughout their lifetime during the sample period and accounts for 20 percent of observations in the *investor* sample.

5 The Causal Effect of Tax Incentives on Incorporation

5.1 Changing Tax Incentives for Incorporation

To illustrate changes in the tax incentives to incorporate following the abolition of the zero starting rate, Figure 2 presents two series of the tax gain from incorporation around the time of reform. The tax gain from incorporation is expressed as the difference between the average tax rate for £1 corporate profit and the average tax rate charged had the same income been earned in an unincorporated business, i.e. $\tau^{avg}_{U} - \tau^{avg}_{C}$. At a given level of pre-tax income, a positive difference between the two rates represents positive tax savings from incorporation.

The calculation of the tax gain takes different assumption on how corporate earnings are paid out. First, panel A assumes that all the corporate profits are retained within the company or paid out as dividends to basic-rate taxpayer owners. Two things are worth noting. First, it is evident that across all years in the sample period, there is positive tax saving from incorporation except at the very low income level. Second, the abolition of the

[29] We describe the calculation of the user cost of capital in details in Appendix Section A.

[30] Note that by using the marginal tax rate corresponding to the observed profit level in a given period we introduce potential measurement error in the cost of capital for companies that are not persistently in a tax-loss or tax-paying position.

zero starting rate introduced differential changes to the tax gain from incorporation, with the largest reduction in the tax gain occurring to small firms with taxable profits up to £50,000 and particularly those with taxable profit below £20,000. In contrast, there is very little change in the tax gain for those above £50,000. We exploit this differential change in the tax gains across different levels of taxable income to identify the causal effect of tax incentives on incorporation.[31]

To examine how far dividend taxes for higher-rate taxpayers reduce the tax gain from incorporation, panel B assumes that all corporate profits are paid out to higher-rate shareholders. Overall, the level of tax gains is slightly lower for incomes above the basic taxpayer bracket, due to the 25 percent dividend tax faced by higher-rate taxpayers. There remains to be positive tax gain from incorporation at most income levels. The qualitative impact of the tax reform on the tax gain from incorporation remains the same, with a significant reduction occurring to small firms with taxable income up to £50,000 and minimum changes to those with income above £50,000.

5.2 Graphical Evidence

Figure 3 compares the distribution of newly incorporated firms by profit bins of £1,000 before and after the abolition of the zero starting rate, and demonstrates that changes in the number of newly incorporated companies are strikingly consistently with changes in the tax gains to incorporate. First, there is a noticeable reduction in the number of new companies from 2002/3-2003/4 to 2006/7-2007/8 mainly for companies with taxable profit up to £50,000.[32] The largest decrease in the number of new incorporations is concentrated between £0-£20,000, an income region with the most significant reduction in the tax gain from incorporation. In contrast, in the £50,000-£100,000 income range with no substantial changes in the tax gains to incorporate, the number of new incorporations remained stable around the time of policy change. Graphically, there is strong evidence that decrease in the tax savings from incorporation had some negative impact on the number of newly incorporated companies after the 2006/07 policy reform.

5.3 Empirical Methodology

To identify the causal effect of tax incentives on small business incorporation, we analyze changes in the distribution of taxable profit of newly incorporated companies due to changes

[31] Note that the subsequent reduction in the tax gains to incorporate at all income levels are due to an annual increase of 1 percent in the small company rate since 2007/08.

[32] The reduction in the number of new incorporations started from 2004/5 when the NCDR was in place to restrict the extent of tax-motivated incorporation.

in the tax gain from doing so. Specifically, we use the post-2006 period where the tax rate became the same for all small companies to form a counterfactual of the distribution in the absence of differences in tax between firms. We compare this counterfactual to the distribution of profits of companies that incorporated before 2006 when the average tax rate varied continuously between firms. To control for changes in the number of new incorporations due to non-tax reasons, we use the distribution of companies with taxable profits between £50,000 and £100,000 as a control group. There is little change in the tax saving from incorporation for companies in the control group, and therefore changes in the number of new incorporations in the control group are mainly driven by non-tax reasons and can be differenced out from changes in incorporation in the treatment group to identify the impact of taxes.

Quantitatively, we estimate the conditional expectation of new incorporations as a function of the tax gain from incorporation and other observable characteristics in the following form:

$$E(c_{it}|Tax\ Gain_{it}, X_{it}) = \exp(\gamma_i + \lambda_t + \beta_{tax} Tax\ Gain_{it} + \beta_x X_{it}), \tag{16}$$

where c_{it} is the number of newly incorporated businesses in income bin i of £100 at time t, γ_i is a set of income bin dummies to control for the effect of firm size on the choice of legal form, and λ_t is a full set of year dummies to capture macroeconomic shocks that are common to all companies in the same year. The key variable of interest, $Tax\ Gain_{it}$, represents the tax saving from incorporation as a percentage of pre-tax profit i at time t.[33] An additional error term, which represents temporary fluctuations in the unobserved determinants of incorporation, enters equation (16) additively in the log linear model or multiplicatively in maximum likelihood estimation (MLE).[34] Importantly, β_{tax} can be consistently interpreted

[33] It may be the case that firms instead evaluate the tax gain over their subsequent lifetime. In general, the tax gain (as a percentage of profit) in the first year may over- or under-estimate the lifetime gain. However, if firms expect to grow, Figure 2 shows that their tax gain in subsequent years will tend to be lower than in the first year. In this case, our estimated tax effect would be a lower bound on the true sensitivity of the number of newly incorporated firms with respect to the tax gain from incorporation.

[34] We use four different specifications to account for the discrete nature and skewed distribution of c_{it}. First, we take the natural log of the discrete counts and estimate the log transformation using Ordinary Least Square (OLS):

$$\ln c_{it} = \gamma_i + \lambda_t + \beta_{tax} Tax\ Gain_{it} + \beta_x X_{it} + \varepsilon_{it}.$$

We estimate β_{tax} using the standard fixed effect estimator, allowing for arbitrary correlation of the error terms in the covariance matrix.

The next three regression models, including the Poisson Generalized Linear Model (GLM), the Negative Binomial model (NB2), and the Poisson Pseudo Maximum Likelihood (PMLE) (Silva and Tenreyro, 2006; Cameron and Trivedi, 2013), estimate c_{it} in levels using Maximum Likelihood Estimation (MLE) with different assumptions of the variance structure for c_{it}. Specifically, denote ω_i the conditional variance of c_{it}. The Poisson Generalized Linear Model allows a linear dependence of ω_i on μ_i as $\omega_i = (1+\alpha)\mu_i$, where α is a scalar parameter that can be estimated empirically. The Negative Binomial model allows ω_i to depend on μ_i in a quadratic form as $\omega_i = \mu_i + \alpha\mu^2$. In the most general case, the functional form of ω_i is left unspecified in the Poisson Pseudo Maximum Likelihood estimator and the variance matrix is estimated using a robust

throughout the log-linear and MLE specifications as the semi-elasticity of the number of newly incorporated companies with respect to the tax saving from incorporation.

5.4 Baseline Results

Table 3 summarizes the baseline regression results from the alternative econometric models. The dependent variable in column (1) is the natural logarithm of number of newly incorporated firms by income bin and year, and the dependent variable in columns (2)-(4) is the number of newly incorporated firms in levels. Each specification regresses the dependent variable on the $Tax\ Gain_{it}$ variable and a set of firm-fixed effects and year fixed effects. The upper and lower panel show the regression results with tax gains from retained earnings ($Tax\ Gain_{it}^{re}$) and from dividend income ($Tax\ Gain_{it}^{\text{div}}$), respectively. In each panel, the estimated tax coefficient $\widehat{\beta}_{tax}$ is remarkably similar across different columns. Consistent with the theoretical consideration, we find a positive and significant effect of the tax which suggests that a higher tax gain to incorporate encourages more firms to incorporate.

Table 4 presents regression results using a set of specifications based on the Poisson Pseudo-MLE model and augmented in various ways as described below. All regressions include a full set of income bin dummies and year fixed effects and use the tax variable $Tax\ Gain_{it}^{re}$ calculated under the assumption that all profits are taxed as retained earnings.[35] Heteroscedasticity-robust standard errors are clustered at the income bin level. For comparison, column (1) presents the baseline results shown in Table 3 column (4) and does not include any other explanatory variables. To assess the robustness of the strong effect of the tax gain to controlling for potential serial correlation in the non-tax sources of heterogeneity in incorporation, column (2) collapses the annual counts into four periods that capture variation in the tax gains entirely driven by changes in average corporate tax rates.[36] The basic result is essentially unchanged.

Columns (3)-(5) assess the robustness of our findings to the influence of non-tax factors in the choice of business form by controlling for the average of total sales, total assets and number of workers for all newly incorporated firms in the corresponding income bin. These variables capture the average size of the newly incorporated companies. Together with the income bin fixed effects, the size variables allow us to better control for the effect that firms tend to incorporate as they grow larger and become more complex, perhaps also capturing the potential benefit of separation of ownership and control. This leaves the effects of the

estimator.

[35] Regressions using $Tax\ Gain^{\text{div}}$ show very similar results.

[36] The four periods refer to the pre-reform period of 2002/03-2005/06 and the post-reform years of 2006/07, 2007/08, and 2008/09 during which there was an annual increase of 1 percent in the corporate main rate. Specification in column (2) replaces the year fixed effects with a set of period fixed effects.

tax gain unchanged.

Column six checks the robustness of our finding to bunching around the £10k kink point, which represents a discrete jump in the marginal corporate tax rate from zero to 23.75 percent and induced large and sharp bunching of companies around the kink (Devereux, Liu and Loretz, 2014) . This can clearly be seen in Figure 3, and so also applies to new incorporations. Bunching around the kind point reflects behavioral responses to variation in the marginal tax rate, but to the extent that it also affects the distribution of new companies, the presence of bunching may indicate possible selection into the treatment group and a reduction in the number of new companies that are right above the kink point. If this is the case, there would be an upward bias in the estimated tax effect. We thus exclude observations in the bunching region, i.e. counts of newly incorporated companies between £8,000 and £12,000 to ensure that the observed incorporation response is not entirely driven by changes in the marginal tax rate that induced self-selection of bunchers into incorporation. The results are presented in column (6) and confirm the previous findings: the estimated coefficient on the tax gain remains positive, very similar, and statistically significant.

To examine whether our finding is robust to potential heterogeneity in the fixed cost of incorporation that may vary across different industries, columns (7)-(9) replace the dependent variable with industry-specific counts of newly incorporated companies ($\ln c_{ijt}$), where j denotes one of the 12 broad industry sectors based on 1-digit SIC code. Column (7) includes a full set of industry fixed effects, columns (8) controls for additional industry-specific time trends, and column (9) adds other non-tax control variables. The basic result again remains quantitatively unchanged. Appendix Table B.2 further presents the estimated tax coefficient ($\widehat{\beta}_{tax}$) from 12 individual industry-sector regressions.[37] The results generally support the view that tax savings exert a positive influence on the incorporation decision of small businesses across a wide range of industries.[38]

Throughout all the different specifications, the coefficient estimate for $Tax\ Gain_{it}^{re}$ is positive and statistically significant at 1% level. Various robustness checks by collapsing into broad time period, excluding the bunching regions, adding control variables or running regressions at the industry level produce little or no changes on the estimated tax coefficients. Quantitatively, our preferred results from Table 4 column (7) suggest that a one percentage point increase in the tax saving from incorporation increases the number of new companies by 4.3 percent, under the assumption that all profits are retained within the company. Should all profits be distributed to higher rate shareholders and be liable for dividend taxes, a

[37] The regressions in Panel A and Panel B use $Tax\ Gain_{it}^{re}$ and $Tax\ Gain_{it}^{\text{div}}$ as the key variable to capture the tax savings from incorporation, respectively.

[38] In the top panel of Table B.2, for example, we find that $\widehat{\beta}_{tax}$ has a positive sign for 11 of the 12 industry sectors and is precisely estimated for nine of them. Only one industry has an estimated tax effect that is negative and that is statistically insignificant.

one percentage point increase in the tax gain from incorporation raises the number of new companies by around 2.2 percent.

5.5 Stronger Incorporation Response by Tax Minimizers

In this section, we examine incorporation responses in the sub sample of companies for which we observe their total taxable income. There are two advantages of utilizing the additional information on total income in this sample. First, there is less measurement error in the tax gain from incorporation. This is because without knowing the amount of directors' remuneration, using corporate profit alone may underestimate the amount of total taxable income earned by the owner of the small company. In this case, the true tax gain from incorporation is measured with noise by the tax gain based on corporate profit. Second, as discussed before, the additional information on directors' remuneration allows us to identify companies that minimize their overall tax liability by declaring their personal income at the personal allowance threshold. We record this information in a dummy variable $Minimizer_{it}$, which takes the value of 1 if company i engages in tax minimization in year t and zero otherwise.

Table 5 summarizes the regression results using the Poisson PMLE model, with the tax variable in the upper/lower panel capturing the gain from incorporation based on retained earnings/dividend income.[39] The dependent variable in all specifications is the number of newly incorporated businesses ($c_{ij,\min}$) by the type of minimizers in income bin i and year j. Column (1) adds the dummy indicator $Minimizer_{it}$ in equation (16). Column (2) performs a difference-in-differences analysis by interacting the tax gain variable with the minimizer dummy to capture any differential effect of the tax between the two groups. Column (3) and (4) report regression results in the "minimizers" and "non-minimizer" subsample, allowing the two groups to be differentially affected by shocks across different income bin and year. All regressions include a set of income bin and year fixed effects.

Regression results in Table 5 reveal important heterogeneous effects of taxes on incorporation. Column (1) in the upper panel confirms the positive and significant effect of the tax gain on incorporation for companies with their tax incentives more precisely measured. Column (2) reveals a stronger tax effect for "tax minimizers". Allowing for differential effects of unobserved income bin and time heterogeneity between the two groups, the tax coefficient for "minimizers" in column (3) is three times larger than that for "non-minimizers" in

[39] We compute two series of average tax rates on the observed total taxable income and on the same amount of income had it been from an unincorporated business. The tax gain from incorporation is expressed as the difference between the two average tax rates and measures the amount of tax savings from incorporation as a share of total income before taxation. Accounting for taxation of dividend income at the shareholder level, we calculate two series of tax gains under the assumption that the corporate profit portion of the total income is retained earnings and paid out as dividends, respectively.

column (4). The results suggest that tax-sophisticated businesses are more responsive to the tax incentives in choosing their legal form.[40]

6 Diminishing Financial Constraints by Incorporation

In this section we test the hypothesis that financial constraints faced by small companies diminish over time after they become incorporated. We begin by showing that small company investment responds negatively to the lagged average tax rate, which we interpret as the excess sensitivity of investment to tax cash flow. Next we show that the excess sensitivity of investment to taxes diminishes with the duration of incorporation, which is consistent with financial constraints diminishing over time as newly incorporated businesses start to establish a track record of formality and providing publicly available information that is more credible. In particular, we show a similar effect of incorporation on relaxing financial constraints for "tax minimizers" and "non-minimizers", suggesting that incorporation stimulates investment in companies that incorporated primarily to benefit from large tax savings.

6.1 Empirical Specification and Identification

We employ the following empirical strategy to test our hypothesis. Consistent with the first-order conditions (10) and (12) in Section 2, we model investment in a flexible error correction model[41]:

$$\begin{aligned}\frac{I_{it}}{K_{it-1}} &= \beta_0 + \beta_1 \Delta \ln Y_{it} - \beta_2 \Delta \ln CoC_{it} - \lambda(\ln K_{it-1} - \ln Y_{it-1} - \sigma \ln CoC_{it-1}) \quad (17)\\ &\quad + \gamma_1 \tau^{avg}_{i,t-1} + \gamma_2 \tau^{avg}_{i,t-1} \cdot x_{it} + d_t + \eta_i + u_{it},\end{aligned}$$

where I_{it} denotes firm-level gross investment by firm i in year t, K_{it-1} denotes the beginning-of-period capital stock, Y_{it} the current output, CoC_{it} the cost of capital, d_t denotes a set of year fixed effects and η_i denotes a set of firm fixed effects that allow us to control for unobserved time-invariant heterogeneity such as firm-specific risk, collateral ability, and industrial structure that may be relevant for bank lending decisions.[42] To assess the importance of financial constraints, we include one-period lagged average tax rate (τ^{avg}_{t-1}) and its interaction with

[40] Conclusions based on regression results in Table 5 panel B are qualitatively the same.

[41] See, for example, Nickell (1985) and Bond et al. (2003), for a detailed derivation of the error correction model for firm-level investment analysis.

[42] Note that the parameter λ reflects the speed of adjustment of the capital stock towards its long-run level, assuming that desired capital stock in the presence of adjustment costs is proportional to the desired capital stock in the absence of adjustment costs. A key property of λ is that it should be positive, implying that firms with a capital stock level below their target will adjust upwards and vice versa.

the number of years since incorporation (x_{it}).[43] Identification relies on the cross-sectional variation in changes in CoC_{it} and in $\tau^{avg}_{i,t-1}$ given that only companies with taxable profits below £50,000 were primarily affected by the 2006 tax reform.[44]

The lagged average tax rate in equation (17) measures exogenous shocks to internal funds due to the tax reform, which allows us to test whether firms' investment tends to be more sensitive to its cash flow in the presence of financial constraints in the spirit of Fazzari, Hubbard and Petersen (1988). The key advantage of using $\tau^{avg}_{i,t-1}$ is that it represents a windfall change in internal funds due to exogenous variation in the total tax payment, which only arises when actual taxes are paid nine months after the accounting year end and thus should be uncorrelated with any change in firm-specific investment opportunities. This is similar to the approach used in Blanchard, de Silanes and Shleifer (1994), Lamont (1997), and Rauh (2006) which show convincingly that corporate investment respond to plausibly exogenous shocks to a firm's cash flow. The coefficient $\widehat{\gamma}_1$ measures the extent of financing constraints faced by the average company in the sample and is predicted to be negative. We allow the effect of taxes to vary continuously with the duration of incorporation by including the interaction term $\tau^{avg}_{i,t-1} \cdot x_{it}$. A positive coefficient $\widehat{\gamma}_2$ would imply a decreasing effect of financial constraints on investment over the period since incorporation.

Our identification relies on the differential changes in the average tax rate for small companies following the 2006/07 tax reform, which may have affected investment through two channels–by changing the cost of capital and by reducing the availability of cash due to a higher tax liability for financially constrained companies. The change in the cost of capital, as summarized in panel A of Figure 5, is the first and more conventional channel through which the tax reform may affect small company investment. Due to differential changes in the marginal tax rate across companies with different pre-tax profits, the cost of capital increased by 0.7 percentage points for those with taxable profits below £10,000, fell by 0.3 percentage points for taxable profits between £10,000 and £50,000, and remained unchanged for taxable profits above £50,000. These effects on the cost of capital are rather small.

We thus focus primarily on the cash flow effect of the tax reform, which arises from a higher tax liability for liquidity constrained firms. Panel B of Figure 5 shows that the increased tax liability leaves less internal funds available for investment for companies with taxable profits up to £50,000.[45] The differential changes in the tax liability imply that

[43] For each company, x_{it} is reported in company accounts and measures the duration of incorporation. This is an empirical proxy for x_{it} in Section 2, which is more general and captures the overall effect of incorporation.

[44] By including the average tax rate in levels, we take the view that internal funds enter the model only to account for short-term financial constraints and should only affect the timing of investment along the transition path between steady states.

[45] Unlike the discrete increase in the cost of capital, the increase in the tax liability is piecewise continuous

companies with profits up to £50,000 are a natural treatment group whose internal funds were reduced by the 2006/07 tax reform, relative to the control group of small companies with taxable profits just above £50,000 which had the same tax position.

6.2 Basic Findings

Table 6 presents regression results from various specifications based on equation (17), where the dependent variable is the qualifying expenditure on plant and machinery scaled by beginning-of-period fixed assets (I_t/K_{t-1}). We impose the constant return to scale restriction throughout by including $\ln(K/Y)_{t-1}$ as one control variable instead of two separate terms $\ln(K_{t-1})$ and $\ln(Y_{t-1})$. This is to reduce potential collinearity between the average tax rate and the output, which partially determines the level of the average tax rate. All regressions include a set of firm and year fixed effects. Heteroscedasticity-robust standard errors are clustered at the firm level.[46]

Column (1) reports a negative and significant effect of the tax-related cash flow on investment, and is robust to controlling for the duration of incorporation and the amount of non-tax cash flow in column (2). In both columns variation in the user cost of capital is controlled for with time-specific and firm-specific fixed effects. The estimated effects of conventional determinants of investment are highly significant and consistent with the basic neoclassical investment model. In particular, there is a significant and moderate adjustment of investment to reach the long-run target level of capital stock as indicated by the strong and negative coefficient of $\ln(K/Y)_{t-1}$.

Column (3) adds $\tau^{avg}_{i,t-1} \cdot x_{it}$ and tests whether the effect of the tax cash flow diminishes over the duration of incorporation. The estimated coefficient $\widehat{\gamma}_2$ is positive and highly significant, while the coefficient $\widehat{\gamma}_1$ remains negative. Taken together, the results suggest that the negative effect of financial constraints is most pronounced for new companies.[47] Evaluated at the mean tax rate, a one percentage point increase in the average tax rate would decrease the investment rate of newly incorporated firms (i.e. $x_{it} = 1$) by around 0.26 percentage points. The negative cash flow effect of taxes on investment decreases by about 0.01 percentage point for each year the firm remains incorporated, so that there is no significant impact of the tax-related cash flow on investment for those remain incorporated more than 25 years.[48] Quantitatively, on average newly incorporated firms allocate 90 pence of every

with the largest increase occurring at £10,000.

[46] We also examine the cash-flow effect of taxes on investment in a reduced-form stationary specification and the results are very similar and available upon request.

[47] We also test for possible nonlinearity in the relationship between investment and the financial constraints by including a quadratic term x_t^2 and interacting with τ^{avg}_{t-1}. The basic findings remain unchanged, while the coefficient on $\tau^{avg}_{t-1} \times x_t^2$ is small ($\widehat{\beta}_{\tau^{avg}_{t-1} \times x_t^2} = -0.00001$) and imprecisely estimated.

[48] An alternative interpretation of the negative coefficient might be that as companies grow they start to

pound in their tax saving to investment in the *investor* sample.[49]

Column (4) assesses the robustness of the estimates by including a control for the user cost of capital. While both the short-run and long-run effects of the cost of capital are estimated to be negative and highly significant, controlling for the cost of capital leaves the basic finding of a diminishing investment sensitivity to tax-related cash flow unchanged.

Column (5) in Table 6 checks the robustness of the findings to controlling for non-tax determinants of investment. While a change in the average tax rate due to the tax reform implies an exogenous change in firm cash savings, the average tax rate might serve as a proxy for other omitted variables that are potential determinants of investment opportunities. For example, since the average tax rate also depends on a company's profitability, a positive coefficient on $\tau_{i,t-1}^{avg} \cdot x_{it}$ may reflect that over time as a company becomes more profitable and has a larger cash balance. To rule out this alternative explanation, column (5) adds one-period lagged profitability, the long-term growth rate of sales[50], and their interactions with x_{it}. Once again**,** the basic findings on the effect of incorporation on investment remains unchanged.

The last two columns in Table 6 use alternative samples and confirm the robustness of the estimates in the frequent investors (column (6)) and consistent investors (column (7)) samples. Quantitatively, our findings suggest that on average companies in the *consistent investor* sample allocate 24 pence of £1 of tax savings to investment, with newly incorporated firms in this sample on average allocating 75 pence of £1 of their tax saving in the first year of incorporation. While this is a strong effect, it is somewhat smaller than that for the baseline *investor* sample, indicating that financial constraints may also have an impact on investment at the extensive margin and that the infrequency of investment by small companies may partly be due to lack of available funds.

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have access to alternative channels of external finance including bond issuance and become less dependent on banks. While this argument may be relevant for the U.S. capital market, it is unlikely to be relevant for companies in our data as the minimum issue size for corporate bonds in the UK is around £100-200 million.

[49] For every firm in the sample of consistent investors, we calculate the increase in taxable profit as a result of one percentage point increase in the average tax rate. The firm-level increase in taxable profit measures the decrease in the total cash flow due to tax reform. We then scale the increase in taxable profit with one-period lagged fixed asset. The corresponding average decrease in investment rate is around 0.18. Dividing this coefficient by the average increase in the taxable profit scaled by lagged fixed asset gives an estimate of 0.24, suggesting that for each pound of increase in the tax bill, the average decrease in investment for all firms that invest consistently is around 0.24 pound.

[50] The long-term sales growth rate is calculated as the average sales growth rate in the last three years, or the average sales growth rate over the last two years for younger firms with missing sales growth rate from three years ago.

6.3 Controlling for Pre-Incorporation Firm Size

Ultimately, we aim to identify the effect of incorporation on small business investment through gradually relaxing their financial constraints after becoming incorporated. This effect should be independent of the effect of the number of years the firm has been established before incorporation. This raises a concern that our measure of the period since incorporation may be correlated with the total age of the business, including any period of non-incorporation. One way to test for this would be to include the age of the business at incorporation, and also interact that with the lagged cash flow term. However, we do not observe firm age at incorporation. Instead, we attempt to control for, and estimate indirectly, the effect of years pre-incorporation on investment by including proxies for age at incorporation. We use measures of firm size at incorporation, S_i^I, measured by sales and fixed assets. Empirically, we estimate:

$$\begin{aligned} \frac{I_{it}}{K_{it-1}} &= \beta_0 + \beta_1 \Delta \ln Y_{it} - \beta_2 \Delta \ln CoC_{it} - \lambda(\ln K_{it-1} - \ln Y_{it-1} - \sigma \ln CoC_{it-1}) \quad (18) \\ &\quad + b_1 x_{it} + b_2 \tau_{it-1} + b_3 S_i^I \tau_{it-1} + b_4 x_{it} \tau_{it-1} + d_t + \eta_i + u_{it}, \end{aligned}$$

where S_i^I is subsumed in the firm fixed effect η_i. Note that because we are using a proxy for age at incorporation, the estimated coefficients $\widehat{b}_3$ and $\widehat{b}_4$ are not directly comparable in magnitude. The regression sample used to estimate equation (18) are firms that are newly incorporated since 2002, for which we observe the size of their initial turnover (Y^0) and fixed assets (K^0) at the point of incorporation.

Table 7 presents regressions of the form in equation (18). Column (1) reports the effects of the average tax rate without controlling for $S_i^I \tau_{it-1}$. The results confirm the basic findings of a diminishing tax sensitivity of investment over the period of incorporation in the newly incorporated sample, similar to findings using the main *investor* sample in Table 6. Having a corporate form seems to have a stronger effect in relaxing financial constraints for newly incorporated firm, as indicated by the strong and positive coefficient estimate $\widehat{b}_4$. The next column adds $x_{it}\tau_{it-1}$ as an additional control and shows that both the initial firm size and the number of years post-incorporation alleviate the negative cash flow effect of taxes on investment. The results are robust to using initial fixed asset (K^0) to measure S^I in column (3), where the size of coefficient $\widehat{b}_4$ was unaffected.

The relative size of the coefficients indicates that the effect of the number of years post-incorporation in easing financial constraints dominates the effect of years in business prior to incorporation. To see this, first note that based on the results in Table 7 column (3), the marginal effect of one more year post-incorporation on investment is $0.138\tau_{it-1}$, whereas

the marginal effect of one unit increase in Y^0 on investment is $0.116\tau_{it-1}$. Given that the average initial turnover for newly incorporated firms is £0.292 million, a 10% increase in the average Y^0 implies a marginal effect on investment of about $0.003\tau_{it-1}$. This is considerably smaller than the effect of one more year post incorporation in relaxing financial constraints. In an extreme case where the average initial sales of a new company doubles from £0.29 to £0.58 million, this translates to a marginal effect on investment of $0.03\tau_{it-1}$, which even then is four times smaller than the average effect of one more year post incorporation on investment.

6.4 Investment Responses by Minimizer Type

As discussed above, our empirical estimation identifies the effect of incorporation on investment by relaxing the extent of financing constraints faced by the average company in the sample. This is an average effect, and may not hold for tax-sophiscated companies if they only respond to the tax saving by changing their legal form without changing their real economic activities. For example, "tax minimizers" may cash out all their tax savings rather than use them to fund investment. To see whether this is the case, we test whether the investment response to tax rates by "minimizers" is systematically different from "non-minimizers". We do so in a difference-in-differences setting by augmenting equation (17) with additional terms $\tau^{avg}_{i,t-1} \cdot Minimizer_{it}$ and $\tau^{avg}_{i,t-1} \cdot x_{it} \cdot Minimizer_{it}$. In this setting, the coefficient on $\tau^{avg}_{i,t-1} \cdot Minimizer_{it}$ can be interpreted as the differential effect of a change in lagged taxes on investment by "minimizers". The coefficient on $\tau^{avg}_{i,t-1} \cdot x_{it} \cdot Minimizer_{it}$ shows whether there is any difference in the extent of reduction in the effect of taxes on investment between the "minimizers" and "non-minimizers". We perform this test in three samples of different investment frequency.

Table 8 summarizes the regression results. Column (1) is based on the *investor* sample and shows that the coefficient on $\tau^{avg}_{i,t-1} \cdot x_{it} \cdot Minimizer_{it}$ is insignificant, indicating that the rate of diminishing financial constraints over the lifetime of incorporation is quite similar between the two groups. Column (2) shows a similar result by controlling for the user cost of capital. Columns (3)-(6) in Table 8 present the regression results using the *frequent investors* (columns (3)-(4)) and *consistent investors* (columns (5)-(6)) sample. We continue to find a negative and diminishing cash flow effect of taxes on investment in both samples. The excess sensitivity of investment to taxes does not differ significantly between minimizers and non-minimizers, and the finding is robust to controlling for the user cost of capital in columns (4) and (6).

7 Conclusion

In this paper, we examine the effect of incorporation in stimulating small business investment, and also the related effect of taxation. We provide evidence that a higher corporation tax rate introduced in the UK in 2006 reduced the number of unincorporated firms choosing to switch to corporate form. We also provide evidence that small companies responded to the exogenous rise in their tax payment by reducing investment, indicating that their investment was constrained by available internal funds. And we show that this effect was most pronounced for newly incorporated firms, and diminished gradually over the period since incorporation.

The heterogeneous effect of tax on investment for companies with different durations since incorporation is consistent with a positive relationship between incorporation and investment. Incorporation lowers the cost of external finance for small businesses by improving their information and reputation, so that the availability of internal funds becomes less important for more established companies. The positive link between incorporation and easier accesses to external finance is also directly corroborated in our survey evidence. In consequence, our findings imply real welfare improvement associated with small business incorporation.

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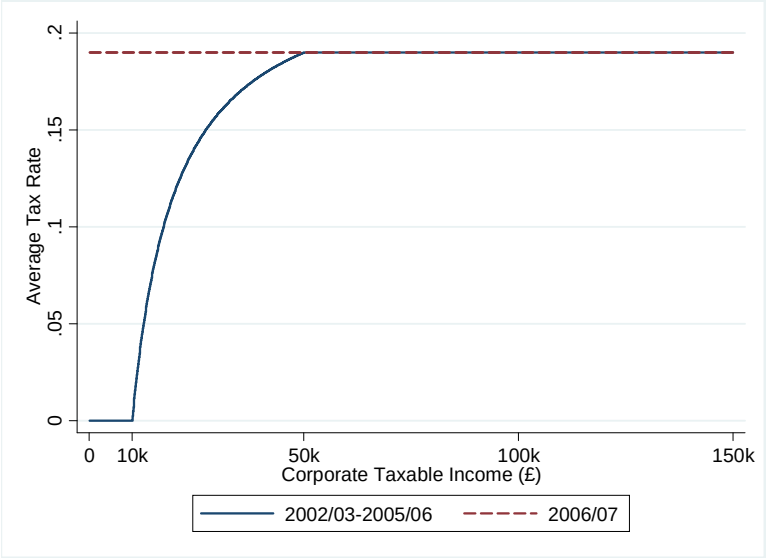
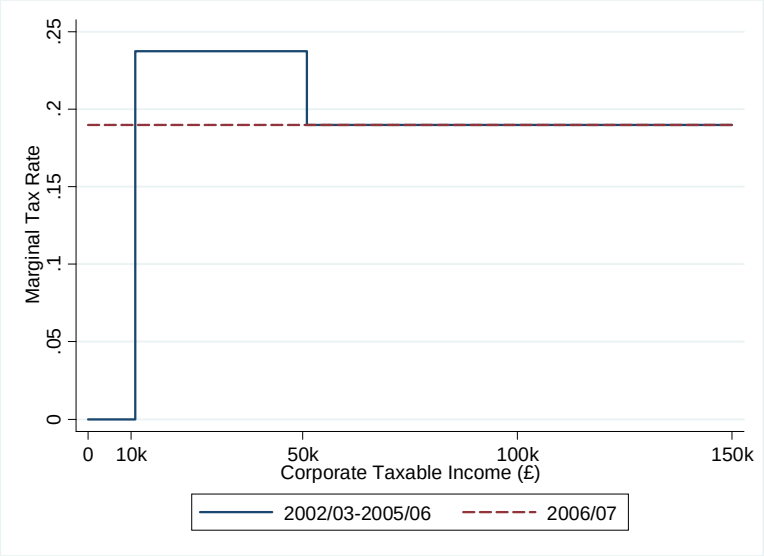
Figure 1. Tax Consequences of Abolishing the Zero Starting Rate

A: Changes in the Average Tax Rate



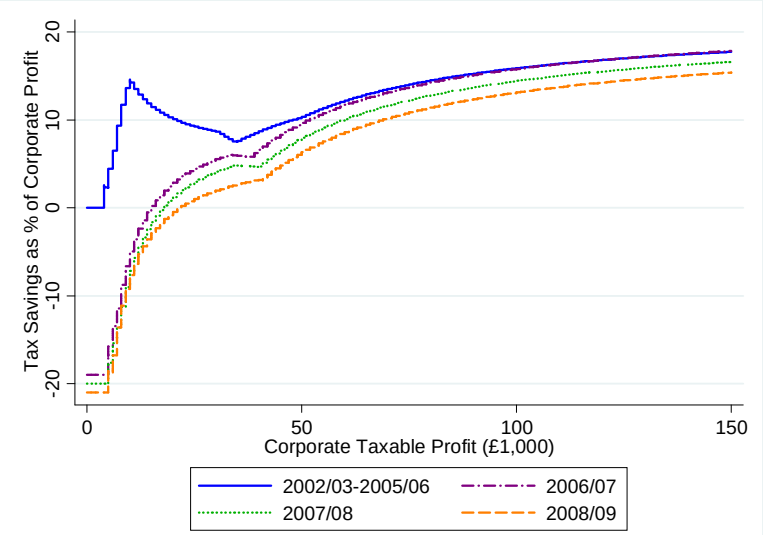
B: Changes in the Marginal Tax Rate



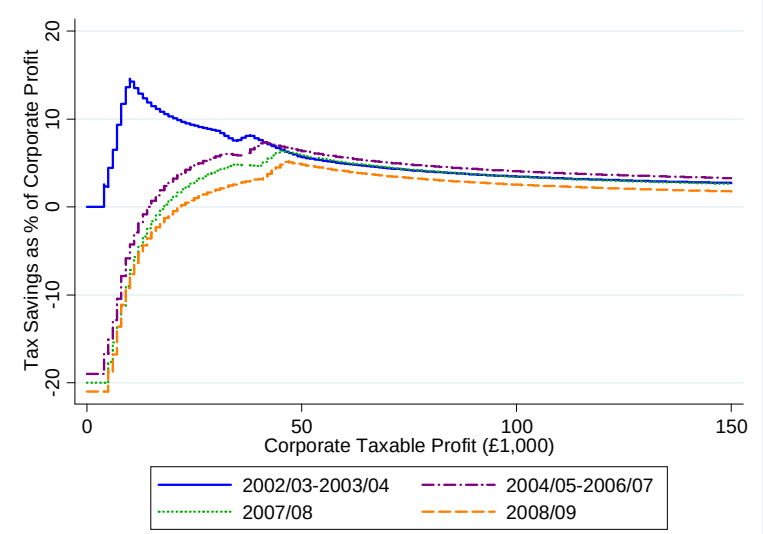
Notes: The panels A and B plot the average and marginal tax rate for companies with taxable profits up to £150,000, before and after the abolition of the zero starting rate in 2006/07, respectively. The zero starting rate, which was in place between 2002/03 and 2005/06, exempted the first £10,000 of corporate profits from tax.

Figure 2. The Tax Gain from Incorporation in the UK

A: Retained Earnings

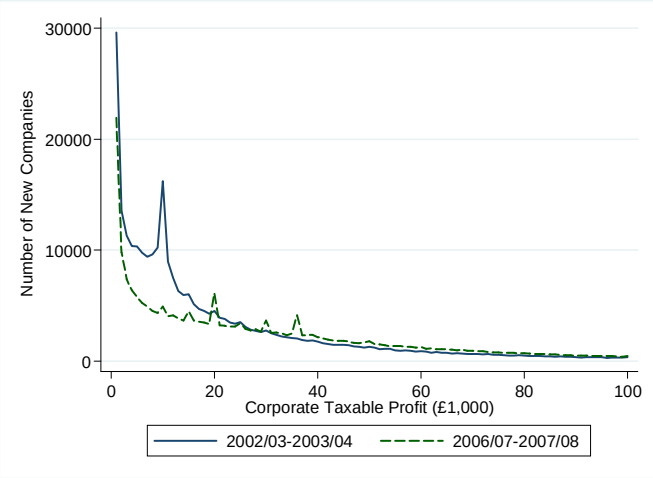


B: Distributed Dividends



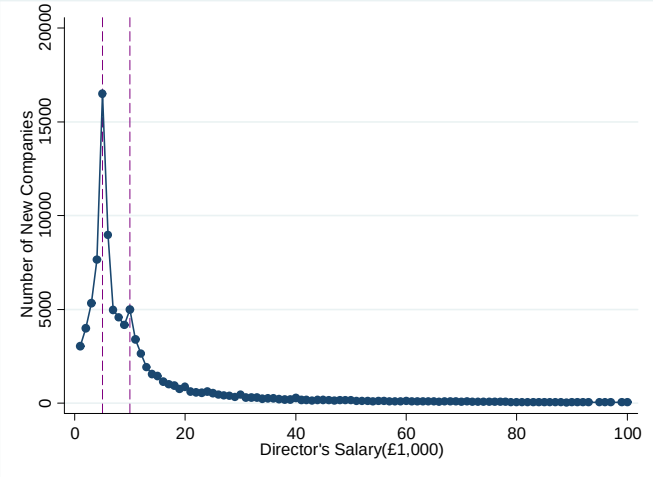
Notes: The panels A and B plot the tax gain from incorporation for small businesses as a percentage of their pre-tax income. The tax gain from incorporation is computed as the difference between the average tax rate for self-employment income and the average tax rate for corporate profit, i.e. $\tau_U^{avg} - \tau_C^{avg}$. Panel A assumes that all profits within the company are retained earnings, while Panel B assumes that all profits are paid out to the shareholders in dividends.

Figure 3. Distribution of Newly Incorporated Companies



The figure shows the observed distribution of the pre-tax profits for companies incorporated in 2002/03-2003/04 (solid line) and in 2006/07-2007/08 (smooth line).

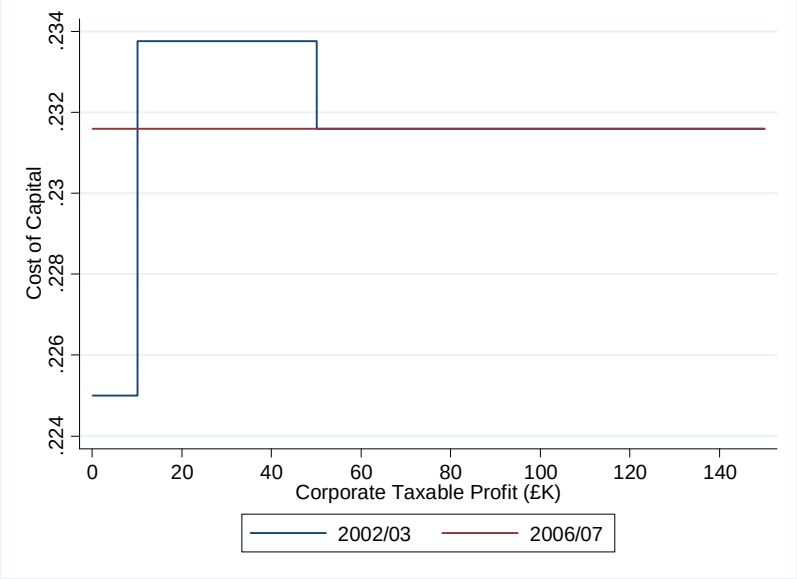
Figure 4. Tax Minimization by Bunching in Directors' Salary



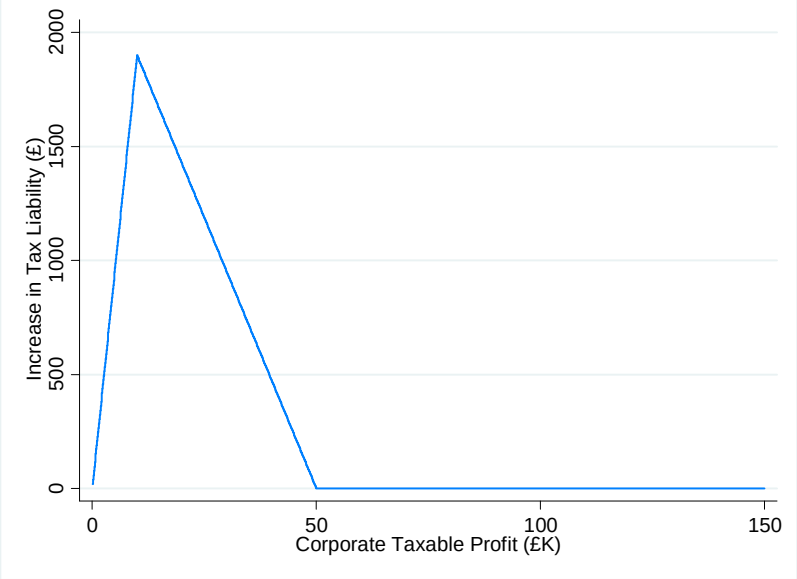
Notes: The figure shows in solid line the empirical distribution of salaries and wages paid to directors in companies that incorporated in 2002/03-2008/09. The total taxable income in these new companies range between £0 and £100,000, and is defined as the sum of pre-tax corporate profits and salaries and wages received by their directors. The first vertical dashed line denotes the amount of the basic personal allowance, which remained the same in nominal terms during the sample period. The second vertical dashed line denotes twice the amount of the basic personal allowance. Paying a salary in this amount can minimize the total tax liability of companies with joint directors (often as husband and wife).

Figure 5. Changing Tax Incentives for Corporate Investment

A: Changes in the Cost of Capital



B: Increases in Corporation Tax Liability



Notes: The panels A and B show changes in the tax incentives for corporate investment. Panel A compares the user cost of capital for companies with taxable profit up to £150,000 before and after the abolition of the zero starting rate in 2006/07. Panel B plots the post-2006 increase in the overall tax liability for companies with taxable profit up to £150,000.

Table 1. Likelihood of Failure in Obtaining External Finance: Marginal Effects

Dependent variable:	Overall Failure (1)	Denied (2)	Depressed (3)	Discouraged (4)
LLC	-0.117***	-0.049*	-0.032	-0.029*
	(0.040)	(0.028)	(0.026)	(0.018)
Firm age	-0.003**	-0.001	-0.003*	-0.002*
	(0.002)	(0.001)	(0.001)	(0.001)
LLC × Age	0.003*	0.001	0.003**	0.001*
	(0.002)	(0.001)	(0.001)	(0.001)
Total Asset (£mils)	-0.0005	-0.0003	-0.0002	-0.005***
	(0.0008)	(0.0008)	(0.0003)	(0.0013)
Year FE	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y
Pseudo R^2	0.046	0.025	0.026	0.135
N	1,056	1,056	1,056	1,056

Notes: The dependent variables are outcome indicators of whether the SME was successful in obtaining sufficient external finance. The indicator Denied takes value of 1 if the SME applied to a bank or financial institution for any overdraft or commercial lending and was turned down outright, and 0 otherwise. The dummy variable Depressed takes value of 1 if the SME was offered less than what was requested for external finance, and 0 otherwise. The indicator Discouraged equals 1 if the SME did not apply for any external finance in the fear of being turned down, and 0 otherwise. The indicator Overall Failure is the sum of the three indicators and takes value of 1 if any of them is nonzero. The estimation sample includes firms that have indicated need of external finance in the 2008 and 2009 surveys of UK SME finance. ***, **, * denotes significance at 1%, 5% and 10% level, respectively. Standard errors are clustered at firm level and reported in parenthesis.

Table 2. Summary Statistics for Investment Analysis

	Investors			Frequent Investors			Consistent Investors		
	Count	Mean	Std. Dev	Count	Mean	Std. Dev	Count	Mean	Std. Dev
Investment variables									
I_t	3,919,103	6.313	15.471	2,659,645	8.589	17.696	856,881	14.431	22.511
I_t/K_{t-1}	2,851,210	0.377	0.639	1,959,904	0.465	0.666	567,197	0.578	0.660
Tax variables									
$\tau_{avg,t-1}$	3,919,103	0.110	0.093	2,659,645	0.118	0.092	595,747	0.129	0.091
CoC_t	3,919,103	0.229	0.004	2,659,645	0.229	0.003	856,881	0.228	0.003
Firm-level characteristics									
Turnover (Y_t) (£k)	3,919,103	413.937	48,195.240	2,659,645	511.630	58325.36	856,881	689.781	58,424.910
Fixed Asset (K_t) (£k)	3,552,631	68.013	734.388	2,511,255	70.133	708.113	834,255	86.825	687.054
Age since Incorporation (x_t)	3,919,103	9.210	10.789	2,659,645	8.982	10.783	856,881	8.107	10.697
CF_t/K_{t-1}	2,851,210	9.824	19.475	1,959,904	8.595	15.579	567,197	0.509	6.717

Notes: This table presents summary statistics for the regression sample used in the investment analysis. I_t is the qualifying investment on plant and machinery. I_t/K_{t-1} is the qualifying investment on plant and machinery scaled by beginning-of-period fixed asset. $\tau_{avg,t-1}$ is one-period lagged average tax rate. CoC_t refers to the cost of capital for retained earnings and is calculated following equation (19). CF_t/K_{t-1} is current-period total trading profit and loss scaled by beginning-of-period fixed asset. Monetary variables are in nominal terms. Ratios are winsorized at the 0.05 percent level.

Table 3. Comparison of Econometric Models for Incorporation Analysis

Estimation Model	Log Linear (1)	Poisson GLM (2)	Negative Binomial (3)	Poisson Pseudo-MLE (4)
Panel A				
$Tax\ Gain^{re}$	0.038***	0.038***	0.045***	0.042***
	(0.001)	(0.004)	(0.001)	(0.002)
Panel B				
$Tax\ Gain^{div}$	0.032***	0.032***	0.038***	0.028***
	(0.001)	(0.004)	(0.001)	(0.002)
Income Bin Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
No. of Observations	7,000	6,993	7,000	7,000
No. of Income Bins	1,000	1,000	1,000	1,000

Notes: This table presents regression results from four econometric models that estimate the effect of the tax gain from incorporation on the number of newly incorporated firms based on equation (16), with different assumptions on the distribution of the error term. The dependent variable in column (1) is the natural logarithm of the number of newly incorporated firms by £100 income bin and year. The dependent variable in columns (2)-(4) is the number of newly incorporated firms. The main variable of interest in panel A and B is the tax gain from incorporation assuming all corporate profits are retained within the company and paid out to shareholders in dividends, respectively. All other variables are as previously defined. Heteroskedasticity-robust standard errors are listed in brackets in columns (1) and (4). ***, **, * denotes significance at 1%, 5% and 10% level, respectively.

Table 4. Choice of Corporate Form in Response to the Tax Gain from Incorporation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$Tax\ Gain_{re}$	0.042***	0.042***	0.042***	0.042***	0.043***	0.038***	0.043***	0.042***	0.045***
	(0.002)	(0.001)	(0.002)	(0.002)	(0.003)	(0.001)	(0.001)	(0.001)	(0.002)
Average Sales (£ bil)			-0.092***	-0.092***	-0.119				-0.003***
			(0.014)	(0.014)	(0.086)				(0.001)
Average Assets (£ bil)				-0.702***	-2.905				0.002
				(0.217)	(12.134)				(0.002)
Average Number of Workers					0.014				-0.00001
					(0.020)				(0.00001)
Income Bin Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Period Fixed Effects	No	Yes	No	No	No	No	No	No	No
Year Fixed Effects	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	No	No	No	No	No	Yes	Yes	Yes	Yes
Industry-Specific Time Trend	No	No	No	No	No	No	No	Yes	Yes
No. of Observations	7,000	4,000	7,000	7,000	4,227	6,754	44,160	44,160	6,760

Notes: This table presents regression results based on the Poisson Pseudo-MLE model. The dependent variable is the number of newly incorporated firms by income bins of £100 up to £150,000. Heteroskedasticity-robust standard errors are listed in brackets. ***, **, * denotes significance at 1%, 5% and 10% level, respectively.

Table 5. Heterogeneous Incorporation Responses to the Tax Saving

	All Firms (1)	All Firms (2)	Tax Minimizers (3)	Non-Minimizers (4)
Panel A:				
$Tax\ Gain^{re}$	0.027***		0.079***	0.021***
	(0.002)		(0.003)	(0.002)
$Tax\ Gain^{re} \times Minimizer$		0.035***		
		(0.004)		
$Tax\ Gain^{re} \times Non-Minimizer$		0.024***		
		(0.002)		
$Minimizer$	-1.025***	-1.143***		
	(0.013)	(0.053)		
Panel B:				
$Tax\ Gain^{div}$	0.022***		0.065***	0.019***
	(0.002)		(0.003)	(0.001)
$Tax\ Gain^{div} \times Minimizer$		0.045***		
		(0.003)		
$Tax\ Gain^{div} \times Non-Minimizer$		0.015***		
		(0.001)		
$Minimizer$	-0.995***	-1.218***		
	(0.013)	(0.032)		
Additional Variables Included:				
Income Bin Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
No. of Observations	10,195	10,195	4,580	5,589
No. of Income Bins	941	941	910	941

Notes: This table presents regression results based on the Poisson Pseudo-MLE model. The regression sample includes all firms with non-missing directors' salary, which allows us to distinguish between tax minimizers and non-minimizers. The dependent variable is the number of newly incorporated firms by type of tax minimizers in total taxable income bins of £100 up to £150,000. Heteroskedasticity-robust standard errors are listed in brackets. ***, **, * denotes significance at 1%, 5% and 10% level, respectively.

Table 6. Excess Sensitivity of Investment to the Average Tax Rate

Sample:	Investor					Frequent Investor	Consistent Investor
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\triangle \ln Y_t$	0.235***	0.209***	0.208***	0.218***	0.186***	0.263***	0.344***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)
$\Delta \ln CoC_t$				-6.802***			
				(0.034)			
$\ln(K/Y)_{t-1}$	-0.333***	-0.307***	-0.307***	-0.303***	-0.350***	-0.381***	-0.471***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)
$\ln CoC_{t-1}$				-4.847***			
				(0.069)			
$\tau_{avg,t-1}$	-0.125***	-0.126***	-0.258***	-0.403***	-0.180***	-0.292***	-0.317***
	(0.007)	(0.007)	(0.010)	(0.012)	(0.014)	(0.012)	(0.019)
$\tau_{avg,t-1} \times x_t$			0.011***	0.011***	0.009***	0.011***	0.011***
			(0.0004)	(0.0004)	(0.001)	(0.001)	(0.001)
$Profitability_{t-1}$					0.061***		
					(0.009)		
$Profitability_{t-1} \times x_t$					-0.005***		
					(0.000)		
$GrowthRate_{t-1}$					-0.055***		
					(0.003)		
$GrowthRate_{t-1} \times x_t$					-0.003***		
					(0.000)		
x_t		-0.037***	-0.038***	-0.033***	-0.039***	-0.039***	-0.036***
		(0.0003)	(0.0003)	(0.0003)	(0.000)	(0.000)	(0.001)
CF_t/K_{t-1}		0.005***	0.004***	0.005***	0.004***	0.006***	0.005***
		(0.0001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R^2	0.172	0.175	0.175	0.194	0.179	0.221	0.28
No. of Observations	2,653,640	2,653,640	2,653,640	2,653,640	1,419,683	1,891,328	525,988

Notes: This table presents regression results from the error-correction model of investment based on equation (17). The dependent variable is the qualifying investment on plant and machinery scaled by beginning-of-period fixed asset. All regressions include a set of firm and year fixed effects. The regression sample includes all firms with some positive qualifying investment during the sample period, i.e. the investor sample. Heteroskedasticity-robust standard errors clustered at firm level are listed in brackets. ***, **, * denotes significance at 1%, 5% and 10% level, respectively.

Table 7. Excess Sensitivity of Investment: Controlling for Initial Company Size

	(1)	(2)	(3)
$\triangle \ln Y_t$	0.278***	0.278***	0.279***
	(0.002)	(0.002)	(0.002)
$\ln(K/Y)_{t-1}$	-0.416***	-0.416***	-0.416***
	(0.002)	(0.002)	(0.002)
$\tau_{avg,t-1}$	-0.855***	-0.872***	-0.842***
	(0.035)	(0.035)	(0.036)
$\tau_{avg,t-1} \times x_t$	0.138***	0.138***	0.137***
	(0.007)	(0.007)	(0.007)
$\tau_{avg,t-1} \times Y_0$		0.116***	
		(0.026)	
$\tau_{avg,t-1} \times K_0$			0.206***
			(0.079)
CF_t/K_{t-1}	0.003***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)
Age_t	-0.079***	-0.079***	-0.079***
	(0.002)	(0.002)	(0.002)
R^2	0.223	0.223	0.222
No. of Observations	1,039,307	1,039,307	954,699

Notes: This table presents regression results from the error-correction model of investment based on equation (17). The dependent variable is the qualifying investment on plant and machinery scaled by beginning-of-period fixed asset. Y_0 is the amount of turnover (in £million) in the year of incorporation. K_0 is the amount of fixed assets (in £million) in the year of incorporation. The regression sample includes all firms that incorporated since 2002 and have some positive qualifying investment during the sample period. All regressions include a set of firm and year fixed effects. Heteroskedasticity-robust standard errors clustered at firm level are listed in brackets. ***, **, * denotes significance at 1%, 5% and 10% level, respectively.

Table 8. Excess Sensitivity of Investment: Tax Minimizers vs. Non-Minimizers

Sample:	Investors		Frequent Investors		Consistent Investors	
	(1)	(2)	(3)	(4)	(5)	(6)
$\triangle \ln Y_t$	0.240***	0.249***	0.289***	0.296***	0.335***	0.338***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.008)	(0.008)
$\Delta \ln CoC_t$		-6.684***		-6.680***		-3.023***
		(0.100)		(0.124)		(0.212)
$\ln(K/Y)_{t-1}$	-0.344***	-0.338***	-0.412***	-0.407***	-0.467***	-0.457***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.007)	(0.003)
$\ln CoC_{t-1}$		-5.136***		-5.028***		-2.114***
		(0.194)		(0.248)		(0.442)
$\tau_{avg,t-1}$	-0.252***	-0.389***	-0.261***	-0.422***	-0.188***	-0.298***
	(0.030)	(0.036)	(0.036)	(0.044)	(0.038)	(0.073)
$\tau_{avg,t-1}$	-0.066	-0.056	-0.08	-0.072	-0.104	-0.107
$\times Minimizer$	(0.050)	(0.049)	(0.064)	(0.063)	(0.108)	(0.108)
$\tau_{avg,t-1} \times x_t$	0.008***	0.008***	0.007***	0.007***	0.05***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
$\tau_{avg,t-1} \times x_t$	0.004	0.006	0.006	0.006	0.001	0.002
$\times Minimizer$	(0.004)	(0.004)	(0.005)	(0.005)	(0.008)	(0.009)
x_t	-0.043***	-0.040***	-0.043***	-0.041***	-0.038***	-0.041***
	(0.001)	(0.001)	(0.000)	(0.000)	(0.002)	(0.002)
CF_t/K_{t-1}	0.004***	0.006***	0.006***	0.007***	0.005***	0.006***
	(0.0001)	(0.0001)	(0.000)	(0.000)	(0.001)	(0.001)
R^2	0.18	0.18	0.227	0.243	0.274	0.277
No. of Observations	371,924	371,924	256,389	256,389	78,033	78,033

Notes: This table presents regression results from the error-correction model of investment based on equation (17). The dependent variable is the qualifying investment on plant and machinery scaled by beginning-of-period fixed asset. *minimizer* is a dummy indicator that takes value of 1 if the company uses an income allocation strategy to minimize its overall tax liability. The frequent investor sample includes firms with non-missing directors' salary and invested in more than half of the periods throughout their lifetime during the sample period. The consistent investor sample includes firms with non-missing directors' salary and invested in every period throughout their lifetime during the sample period. All regressions include a set of firm and year fixed effects. Heteroskedasticity-robust standard errors clustered at firm level are listed in brackets. ***, **, * denotes significance at 1%, 5% and 10% level, respectively.

For Online Publication

A Calculation of the User Cost of Capital

The Jorgenson and Hall (1967) cost of capital for new investment financed by retained earnings is computed as:

$$CoC_{it} = (r + \delta)\frac{(1 - A_{it}\tau_{it}^{mrg})}{(1 - \tau_{it}^{mrg})}, \tag{19}$$

where r is the real interest rate, δ the economic depreciation rate for plant and machinery, A_{it} the net present value of depreciation allowances, and τ_{it}^{mrg} is the statutory marginal corporation tax rate.

We assume common values of $r = 0.05$ and $\delta = 0.175$ with any variation across time or companies being controlled for using year dummies and firm fixed effects. The firm-specific tax component of the cost of capital, $(1 - A_{it}\tau_{it}^{mrg})/(1 - \tau_{it}^{mrg})$, captures variation in the marginal tax rate and depreciation allowance over the sample period. The key variation that we focus on is the post-2006 differential changes in τ_{it}^{mrg} across different profit bands as shown in Figure 1 panel B. We use additional variation in A_{it} due to variation in capital allowances.

B Supplementary Exhibits

Table B.1. SME Finance: Summary Statistics

	Overall			External Finance Needed			External Finance Not Needed			Test of Equal Means	
	Mean (1)	Std Dev (2)	N (3)	Mean (4)	Std Dev (5)	N (6)	Mean (7)	Std Dev (8)	N (9)	t (10)	p-value (11)
External Finance Failure Indicators											
Denied	0.04	0.20	3,647	0.09	0.28	1,697	0	0	1,950	-12.68	0.00
Depressed	0.04	0.20	3,647	0.09	0.28	1,697	0	0	1,950	-12.59	0.00
Discouraged	0.03	0.18	3,647	0.07	0.25	1,697	0	0	1,950	-11.21	0.00
Overall Failure	0.09	0.28	3,647	0.19	0.39	1,697	0	0	1,950	-19.85	0.00
Key Variables											
LLC	0.57	0.50	3,647	0.61	0.49	1,697	0.53	0.50	1,950	- 4.50	0.00
Firm Age	27.14	36.28	3,545	26.32	39.29	1,640	27.84	33.48	1,905	1.23	0.22
Average Interest Rate (%)	5.69	3.16	315	5.74	3.15	268	5.40	3.23	47	- 0.65	0.52
Other Variables											
Turnover (£1,000)	3,979	16,687	2,426	4,585	13,513	1,188	3,397	19,235	1,238	- 1.77	0.08
Total Asset (£1,000)	2,960	20,737	2,226	3,700	22,628	1,092	2,247	18,720	1,134	- 1.65	0.10
Number of Workers	47	1,160	3,647	34	67	1,697	58	1,585	1,950	0.67	0.50

Notes: This table summarizes the key characteristics of firms in the full sample in columns (1)-(3) and by whether they need external finance or not in columns (4)-(9). Columns (10)-(11) test whether firm characteristics in the two subsamples of "external financed needed" and "external finance not needed" have equal means and report the t statistic in (10) and the corresponding p-value in (11).

Table B.2. Individual Industry Regressions for Incorporation Analysis

	Agriculture, Forestry, and Fishing (1)	Utilities (2)	Mining and Oil (3)	Manufacturing (4)	Construction (5)	Wholesale and Retail Trade (6)
Panel A						
$Tax\ Gain^{re}$	0.031***	0.012***	0.010*	0.033***	0.023***	0.023***
	(0.005)	(0.005)	(0.005)	(0.003)	(0.003)	(0.003)
Panel B						
$Tax\ Gain^{div}$	0.037***	0.006	0.009	0.023***	0.020***	0.011***
	(0.004)	(0.004)	(0.006)	(0.003)	(0.002)	(0.004)
Income Bin Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of Observations	2,164	177	444	4,825	5,558	4,992

	Hotels and Restaurant (7)	Transportation and Communication (8)	Financial Intermediation (9)	Business Services (10)	Other Services (11)	Not Classified (12)
Panel A						
$Tax\ Gain^{re}$	0.026***	-0.006	0.018***	0.060***	0.030***	0.036***
	(0.004)	(0.004)	(0.003)	(0.001)	(0.003)	(0.002)
Panel B						
$Tax\ Gain^{div}$	0.015***	-0.007	0.025***	0.042***	0.028***	0.026***
	(0.004)	(0.005)	(0.003)	(0.001)	(0.003)	(0.003)
Income Bin Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of Observations	3,102	3,116	2,012	5,996	3,991	5,995

Notes: This table presents regression results based on the Poisson Pseudo-MLE model in each of the 12 industry sectors. The dependent variable is the number of newly incorporated firms by income bins of £100 up to £150,000. Heteroskedasticity-robust standard errors are listed in brackets. ***, **, * denotes significance at 1%, 5% and 10% level, respectively.

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