Incorporation for Investment*

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Abstract

We estimate the effect of corporation tax on small business incorporation and investment by exploring cross-sectional variation in the impact of a 2006/07 tax reform in a difference-in-differences design. Analyzing the population of UK corporation tax records from 2002/03 to 2008/09, we present three findings. First, a one percentage point increase in the tax gains to incorporation increases the number of newly incorporated companies by around 2 to 4.5%. Second, there is a strong cash flow effect of taxes on corporate investment. On average, a one percentage point increase in the average tax rate reduces investment rate by about 2.2 percentage points. Third, the cash flow effect of corporation taxes on investment is most pronounced for newly incorporated firms, and diminishes over time. This evidence is consistent with the hypothesis that incorporation lowers the cost of external finance for small businesses, and that the cost is further reduced the longer a business has been incorporated.

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1 Introduction

Why do small businesses incorporate? A popular argument is that firms choose to incorporate in order to benefit from the protection of limited liability. Because the newly incorporated firm becomes a separate legal entity from its owners, its creditors can satisfy their claim only against the assets of the company but not against the personal property of the company's owners. But the value of limited liability can be quite restricted for small companies, which are commonly asked to provide personal security as collateral when borrowing from banks. In fact, more than 70 percent of newly incorporated small and medium sized firms (SMEs) in the UK are required to provide personal security for their loans and mortgages.[1]

Besides limited liability, separation of ownership and control is another popular argument why firm incorporates, so that shareholders possess little or no direct control over management decisions in the business. While this is certainly an important issue for large and publicly-traded corporations, more than 90% of companies in the UK have less than 10 employees and 40% of UK companies are managed by the same owner. For most private companies, management and control are concentrated in just a few agents and they would benefit little from separation of the two (Fama and Jensen, 1983). In this paper, we explore an alternative explanation that the main benefit of incorporation for small businesses is that it requires a greater degree of formality and information provisions that lowers their information cost of external finance. Corporations are required to comply with formal accounting and reporting standards, which increases transparency to external investors and other stakeholders. The government becomes an implicit guarantor of the quality of the information in the financial and tax accounts. The advantage of implicit government guarantee is exclusive to the corporate form and reduces the information cost of external finance for small companies. The entrepreneur is thus able to raise more external capital for any given amount of own equity and therefore to undertake more investment.

We start by providing some firm-level evidence that incorporation facilitates access to external finance for SMEs. We show that there is an important negative association between the corporate form and the likelihood of failure in obtaining external finance. Incorporation reduces the probability of small firms being denied access to sufficient external finance by more than 12 percentage points. We then illustrate the role of corporation tax on small business incorporation and investment in a simple model in which firms continue to invest up to the point where the marginal rate of return equals the cost of capital. In the model, for a given firm the cost of capital for external finance is higher than that for internal

[1] We document this empirical evidence using a recent survey of finance of small and medium sized enterprises (SMEs) in the UK in the next section.

finance. Incorporation lowers the cost of capital for external finance by lowering the cost of borrowing. A reduction in the corporation tax rate implies a lower total tax liability and a lower marginal tax rate. In response, existing companies may increase their investment through two different channels: (1) an increase in internal cash flow available for investment as a result of lower tax payment, and (2) a lower cost of capital for external finance as a result of a lower cost of borrowing and a lower marginal tax rate. At the extensive margin, some firms that were previously unincorporated will choose to incorporate and invest more if tax savings from incorporation more than offset the cost of incorporating.

To investigate the role of corporation tax on small business incorporation and investment, we use the population of UK corporation tax records from 2002/3 to 2008/9 and exploit the tax rate changes following the abolition of zero starting rate of tax in 2006/7. In 2006/7, the zero starting rate, which taxed the first £10,000 corporate profit at zero percent and the next £40,000 at 23.75 percent was replaced with a flat rate of 19 percent for corporate profit up to £300,000. Depending on the level of pre-tax profit, this reform had a differential impact on small companies with taxable profit up to £50,000. First, it increased the average tax rate for companies with taxable profit up to £50,000, with the largest increase occurring around £10,000. With the personal income tax system remaining stable during this period, the increase in the average tax rate implies a decrease in the tax savings to incorporation for small businesses with pre-tax income up to £50,000. Second, the tax reform increased the marginal tax rate from zero to 19 percent for companies with taxable profit up to £10,000 and decreased the marginal tax rate from 23.75 to 19 percent for companies with taxable profit between £10,000 and £50,000. In contrast, small companies with taxable profit between £50,000 and £300,000 did not see any change in their average or marginal tax rates as a result of this tax reform.

To identify the causal effect of tax incentives on small business incorporation, we analyze changes in the distribution of the taxable profit of newly incorporated companies due to changes in the tax savings from incorporation. We use the post-2006 period where the tax rate was the same for all small firms to form a counterfactual of the distribution of profits of newly incorporated firms in the absence of differences in tax between firms. We compare this counterfactual to the distribution of profits of firms that choose to incorporate prior to 2006 when the average tax rate varied continuously between firms. We estimate the conditional expectation of new incorporation as a function of tax gains to incorporate and other observables in a fixed-effects model. We find a positive and significant semi-elasticity of small business incorporation with respect to the tax savings to incorporate, which remains robust to various alternative specifications including inclusion of additional control variables, exclusion of the bunching region where companies may manipulate their level of taxable

profits, and industry-level estimation controlling for industry fixed effects, industry-specific time trend, and industry-level covariates. Overall, a one percentage point increase in the tax gains to incorporate increases the number of new companies by around 4.2 to 4.5 percent, assuming that all profits are retained within the company. Should all profits be distributed to shareholders in the form of dividends, a one percentage point increase in the tax gains to incorporate would increase the number of new companies by around 1.9 to 2.2 percent. We further distinguish between tax-minimizing and non-minimizing companies and find that tax minimizers are more responsive to changes in the tax incentives to incorporate.

To link incorporation and investment, we hypothesize that financial constraints on investment are less severe for incorporated firms that are required to provide formal records of shareholders and directors and to file accounts with a government agency, Companies House. The advantages in external borrowing may come partly from the greater formality required in owning and managing a company, and also partly in the public provision of information. We further hypothesize that such financial constraints diminish further the longer the business has been incorporated, as the company creates a track record of formality and public information provision. Empirically, we investigate heterogeneous investment responses to financial constraints for newly incorporated companies compared to companies that have been incorporated for a longer period. To identify the causal effect of tax incentives on small business investment, we estimate a fixed-effects regression that relates changes in the firm-level investment rate to differential changes in the average tax rate which directly decreases the current-period available cash flow for internal finance. Identification relies on the cross-section variation across small companies with taxable profits below £50,000 that were primarily affected by the tax reform, which allows a within-year comparison of investment for companies in different profit bands. Regression results indicate a significant cash flow effect of taxes on investment, which is robust to controlling for additional proxies of investment opportunities and inclusion of the user cost of capital. On average, a one percentage point increase in the average tax rate reduces investment rate by about 3.9 percentage points, which implies an elasticity of investment rate with respect to the average tax rate of around 1.14. More importantly, the sensitivity of investment to average tax rate diminishes over time. The cash flow effect of taxes on investment is more pronounced for newly incorporated firms and decreases by about 1 percentage point for each year the company remains active.

Our paper relates to several strands of literature in economics and corporate finance. First, the paper relates to the literature on small business financing that finds that small firms have less access to external finance and are more constrained in their operation and growth.[2] We evaluate indirectly the role of incorporation on access to external finance for

[2]See, for example, Berger and Udell (1998), Beck and Demirguc-Kunt (2006), and Beck, Demirgüç-Kunt

small firms. More directly, the paper relates to a large empirical literature that has found significant effects of corporation taxes on business investment.[3] The paper also complements the literature on financial constraints and corporate investment.[4] Our findings confirms the presence of excess sensitivity of investment, however this effect diminishes over the period after incorporation. In the small literature on taxation and the choice of organizational form, our study reveals a strong effect of corporation tax on business incorporation.[5] To our best knowledge, this paper is the first to address the welfare effect of incorporation, by studying the linkage between incorporation and investment exploring windfall changes in the internal cash flow as a result of exogenous tax reform.

The remainder of the paper is organized as follows. Section 2 documents an empirical connection between incorporation and access to external finance. Section 3 outlines a conceptual framework on the role of information cost on firm incorporation and investment. Section 4 discusses the policy experiment that introduces exogenous variation in the tax gains to incorporate, the user cost of capital and the available internal cash flow of corporations. Section 5 presents the data that we use in the empirical analysis. Section 6 presents our empirical findings on the effect of tax incentives on incorporation. Section 7 discusses our findings on the link between incorporation and investment. Section 8 concludes.

2 Incorporation Facilitates Access of External Finance

We start by providing some firm-level evidence that incorporation facilitates access to external finance for small and medium sized firms (SMEs). We show that there is an important negative association between the corporate form and the likelihood of failure in obtaining sufficient external finance. The dataset we use is constructed from two waves of surveys

and Maksimovic (2008).

[3]The modern literature on the impacts of corporate taxation on aggregate investment and long-run capital formation begins with Jorgenson and Hall (1967). More recent empirical studies include Cummins et al. (1994), Caballero, Engel and Haltiwanger (1995), Chirinko, Fazzari and Meyer (1999), Edgerton (2010), Yagan (2013), Bond and Xing (2013), and Zwick and Mahon (2014). See Hassett and Hubbard (2002) for a survey on this topic.

[4]The early empirical work on corporate investment stressed the availability of finance (Meer and Kuh (1957). Influential empirical work by Fazzari, Hubbard and Petersen (1988) suggest that heterogeneity in the sensitivity of investment to cash flow for firms with financial constraint can be 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, and Zwick and Mahon(2014)). We apply this insight to the case of an increase in the statutory corporation tax rate, which creates a windfall change to the amount of cash firms need to perform their desired investment.

[5]The tax difference between corporate and non-corporate earnings can play an important role in firms' choice of organizational forms. See, Gordon and MacKie-Mason (1994), Mackie-Mason and Gordon (1997), Gordon and Slemrod (2000), Goolsbee (1998, 2004), and Liu (2014) for evidence in the U.S. and de Mooij and Nicodeme (2008) and Egger, Keuschnigg and Winner (2009) for experience in Europe.

of SMEs' finances in the UK in 2008 and 2009, conducted by Warwick Business School.[6] The full dataset contains 2,452 SMEs and provides detailed information on the availability of credit, the types of finance used and basic firm and balance sheet characteristics. A key question in the survey asks whether the SME has ever applied or considered applying for any external finance over the past three years[7], irrespective of whether or not the SME was granted the facilities. We use this information to identify that around 46.53% of firms in the full sample need external finance, given that they applied or considered applying new external finance or extending existing credit.[8]

Table B.1 summarizes the key characteristics of firms in the full sample and by whether they need external finance or not. 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 institution for any overdraft or commercial lending and was turned down outright, and 0 otherwise. In other words, the SME completely failed to obtain any external capital with *Denied* taking value of 1. 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. The last two indicators suggest that the SME has somewhat failed in obtaining sufficient external finance though not as extreme as indicated by the first indicator. 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. As suggested in column (1) and (4) in table B.1, about 9 percent of firms in the full sample and 19 percent of firms that indicated need of external finance have failed to obtain sufficient external finance as requested.[9]

We first show that in the data, a substantial proportion of small company owners in the UK are required to pledge personal commitments to obtain business loans.[10] This is

[6]The 2008 survey samples about 2,500 SMEs to represent small firms with fewer than 250 employees in the UK private sector. The 2009 survey is a follow up of the 2008 survey and covers 1,250 SMEs that were included in the 2008 survey. For more information on the surveys, please see http://www.esds.ac.uk/doc/6314/read6314.htm.

[7]The 2009 survey asks whether the SME has applied or considered applying for external finance in the past 12 months.

[8]The form of external finace includes overdraft, commercial loans and mortgage, leases or hire purchase arrangement, and asset based finance.

[9]We test whether firm characteristics of the two subsamples have equal means and report the t statistic and p-valuein in columns (10) and (11). It is interesting to note that firms in need of external finance are more likely to be a limited liability company (LLC) and have larger turnover and total asset, but they are not statistically different in terms of age or employment. A small number of firms reported the total interest rate charged on their loans, and the average interest rate does not seem to statistically differ in the two groups of different external finance need.

[10]Under corporate organizational forms, the pledging of personal commitments generates explicit claims on personal assets and/or wealth. Personal assets are no longer separated from business assets and lenders'

consistent with the widely accepted conjecture that there is a lack of separation between business and personal risks among small companies. Combining information on (1) whether any type of security was required for the SME to get the current loan and (2) the type of security required to get the loan, we compute and show in figure 1 the share of companies that are required to provide personal security for external finance across different age band.[11] This ratio is strikingly high for newly incorporated firms established in the last five years– around 70 percent of them have to provide personal security to back commercial loans. The ratio drops considerably to less than 40 percent for companies established within the last five to ten years, and remains stable or slightly lower for more matured companies up to 40 years old. The evidence suggests that as young LLCs are often required to provide personal security for external finance, the protection of limited liability is circumvented for small companies.[12]

Next we show that for small firms, being a corporate form is associated with a lower probability of failure in obtaining external finance. Formally, we estimate the likelihood of failure in accessing external finance in a probit model of the following form:

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

where y_{it} is one of the outcome indicators in obtaining external finance. The key variable of interest is LLC_i, which is a dummy variable and takes value of 1 for limited liability companies and 0 for SMEs of other, non-corporate ownership type.[13] 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.

claims fall explicitly on the owners, thus the pledging of personal collateral reduces the effectiveness of limited liability protection under corporate organizational forms.

[11] Types of personal security include personal property, mixed property, other personal assets, and directors' or personal guarantee. We include all these types of personal security as personal commitments because they have similar implications for the nature of bank claims. In particular, personal collateral provides an explicit claim on a personal asset, while a personal guarantee provides an explicit claim on the personal wealth of the owner. A lender's ability to seek repayment from an owner is not limited to personal assets, but also includes the current wealth and future income of the owner.

[12] Two other empirical studies provide evidence from other countries that personal commitments are an important component of SME lending. Ang, Lin and Tyler (1995) show that in the U.S., small business owners have a significant incidence of personal assets and wealth pledged for business loans, even for organizational forms such as S-corporations and C-corporations with limited legal liability. Specifically, S-corporations have the highest incidence of personal commitments pledged at 72.9 percent, while 58.9 percent of C-corporations pledge some form of personal commitment.

Voordeckers and Steijvers (2006) show that in a dataset of 234 incorporated, medium-sized companies that have credit files of an important Belgian bank, about 30.34 of them are required to provide personal commitments as collateral protection. These results, together with ours, confirm that there is a lack of separation between business and personal risks for small and medium sized companies.

[13] including sole proprietorship, partnership, limited liability partnership and other forms.

The latter is included to control for the fact that different industries are associated with different degree of asset tangibility which may increase borrowing capacity independent of a firm's legal status by allowing creditors to more easily repossess its assets (Campello and Giambona, 2012). 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 firms in 2008 and 2009 that have ever indicated need of external finance and report the average marginal effects. We cluster the standard error at the firm level to control for potential serial correlation of errors as a subset of firms are surveyed in both years.

Table 1 presents the estimated marginal effects from the probit model based on equation (1).[14] The dependent variable in column (1) is the overall likelihood of failure in obtaining sufficient external finance. Estimated at the mean, incorporation, or being a LLC, decreases the probability of failing in raising sufficient external finance by 0.12. Firm age is negatively associated with the probability of failing to obtain sufficient external finance, but has a much weaker effect than incorporation. Staying in the business for one more year decreases the probability of being denied for external finance by 0.003. The estimated marginal effect of the interaction term between LLC and firm age is of similar magnitude with that of firm age but takes the opposite sign. This suggests that the benefit of being older is stronger for unincorporated businesses but disappears when a firm incorporates and is more likely to start a new relationship with its lenders.

The next three columns report the effect of incorporation on individual indicators of failure including *Denied*, *Depressed*, and *Discouraged*, respectively. Evaluated at the mean, results in column (2) suggest that incorporation decreases the probability of being turned down for application of external finance by five percentage points. In column (3), the estimated marginal effect of LLC on the probability of obtaining less external finance than requested is negative but imprecisely estimated. Finally, column (4) reports that being a corporate form has a strong and negative effect on the probability of being discouraged from applying in the first place. In summary, the regression results document a strong and negative correlation between incorporation and the likelihood of failure in obtaining external finance.

The above findings provide suggestive evidence that being a corporate form enhances access of external finance by SMEs in the UK. We argue that this is not UK specific as this important relationship is also corroborated by additional cross-country evidence presented in Demirguc-Kunt, Love and Maksimovic (2006). Using firm-level data from 52 countries from the World Business Environment Survey conducted by the World Bank, Demirguc-Kunt,

[14]The table reports the average marginal effects. The coefficient estimates are reported in Table B.2 in the appendix.

Love and Maksimovic (2006) show that corporations report fewer financing and growth obstacles than unincorporated firms, and that this advantage is greater in countries with more developed institutions and favorable business environments.

3 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 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}, so that $r_x < 0$ 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 with respect to the level of debt is moderated by having greater information. We assume that 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. Further, we assume that the longer the period of such compliance the more credible information is available, and ceteris paribus, the lower the interest rate.

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 in this model.

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 $B_t = 0$. Then 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 no dividends 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, and so the cost of capital is not affected by tax. However, despite the tax advantage to the use of debt finance, we assume throughout that, due to informational constraints, $r\left(x_{t-1}\right) \geqslant \rho/(1-\tau)$ and so retained earnings is a cheaper source of finance than external debt.

3.1 Choice of Organizational Form

So far we have considered only one tax rate, τ. However, now suppose that the tax rate for companies (τ^C) is lower than that for unincorporated businesses (τ^U) - as is typically the case in the UK for the period we consider, i.e. $\tau^U > \tau^C$. A firm in Regime 1 would therefore face a lower cost of capital if incorporated compared to being unincorporated, since $\rho/(1-\tau^C) < \rho/(1-\tau^U)$.

We also need to consider the cost of external borrowing, and even in the first period in which an unincorporated business becomes a company we assume that this increases the information set for the bank, $x_t^C > x_t^U$, implying that $r_t^C < r_t^U$. Ceteris paribus, this reduces the interest rate charged by the bank, and hence also reduces the cost of capital in Regime 2.

In addition, a second consequence of changing organizational form to corporate status is that lower tax would be paid. Specifically, the change in tax in period t would be $dT_t = \left(\tau^C - \tau^U\right)\left\{F(K_{t-1}) - \delta K_{t-1} - r\left(x_{t-1}, B_{t-1}\right) B_{t-1}\right\} < 0$. This reduction in tax would make it more likely that the firm would be in Regime 1, able to finance its investment without hitting the dividend constraint. Further, in Regime 2 this additional cash flow would enable the company to borrow less and hence face a lower interest rate and lower cost of capital for this reason as well. Hence the cost of capital is lower in Regime 2 for incorporated businesses, for two reasons.

We do not explicitly model the choice of organizational form. However, assume that there are fixed costs, F, of incorporation 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 to be the case for firms that have more investment opportunities, and hence a faster

potential growth rate. It is also more likely for firms where the tax gain to incorporation is greater. In our empirical work, we investigate whether the number of new incorporations is related to the potential tax gains, which we measure by the size of taxable profit.

3.2 Empirical Strategy for Investment

We model the effects of incorporation on investment through the availability of information. It seems plausible to assume that x_t is higher for a company than an unincorporated business, and also that x_t increases with the period of time for which a company has been incorporated and therefore subject to regulatory demands for filing accounts and other information. In the empirical analysis below, we do not observe firms switching organizational form, since we have data only on incorporated firms. However, we do have information on the period since the firm first incorporated. We use the age of the corporation as a proxy for the amount of information available to creditors.

We can indirectly investigate the impact of information on firm investment as follows. First, in Regime 2, conditional on the level of borrowing, any rise in x_t - which may arise from incorporation - would have a direct impact on the cost of borrowing and hence raise investment. From (12)

$$\frac{dI_t}{dx_t} = \frac{r_x}{F_{KK}} > 0. \tag{13}$$

But there is also an indirect effect of information. through the cost of borrowing in Regime 2. With only one period borrowing, a firm in Regime 2 would have $B_t = I_t - R_t$, where R_t is post-tax retained earnings when the firm pays its minimum dividend. Since taxes are paid 9 months after the accounting year end, 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 a change in retained earnings in period t: $dR_t = -dT_{t-1}$. Using $dB_t = dI_t + dT_{t-1}$ and $dK_t = dI_t$, totally differentiating (12), (and recalling that $r_{BB} = 0$) yields

$$F_{KK} dI_t = 2r_B \left(dI_t + dT_{t-1}\right) \tag{14}$$

and so

$$\frac{dI_t}{dT_{t-1}} = \frac{2r_B}{F_{KK} - 2r_B} < 0 \tag{15}$$

This expression shows the effects on investment in Regime 2 of a reduction in the tax liability of the previous period. As would be expected, a higher tax charge reduces investment. Since incorporation generally reduces the tax charge, this will have a positive impact on investment.

We now want to consider how dI_t/dT_{t-1} depends on the information available to the bank, x_t. From (15), the extent of the reduction in investment depends on the extent to which the cost of debt responds to the level of debt, which in turn depends on x_t. Specifically, we have

$$\frac{\partial\left(dI_t/dT_{t-1}\right)}{\partial x_t} = \frac{2r_{Bx}F_{KK}}{\left(F_{KK}-2r_B\right)^2} > 0 \tag{16}$$

This shows that the greater the available information, the smaller the effect of a higher tax charge on investment. Put another way, suppose that a firm incorporates and therefore faces a reduction in its tax burden. This represents an increase in the cash available to the firm, which in turn allows it to borrow less, reducing its marginal interest rate, and increasing investment. Over time, as more information is acquired by the bank, the marginal interest rate continues to fall, though presumably it approaches some lower bound.

Our empirical strategy is as follows. Our data do not allow us to compare investment of unincorporated businesses and corporations. We therefore cannot directly test whether the lower tax charge on corporations is reflected in higher investment. However, we can examine the impact on corporations of different ages. Specifically, for a given taxable profit in period $t-1$, we compute the average tax rate in period $t-1$ and the resulting tax payment due in period t for each company and year, and we test whether this has a negative impact on investment. We also test whether this negative impact falls over time as more information becomes available to banks.

4 Institutional Background and the Policy Experiment

As in many other countries, tax treatment of small business income in the UK depends on legal form.[15] Profits generated by non-corporate businesses, including sole proprietorships and partnerships, are passed through to the owners as personal income and are liable for income taxes and charges for national insurance contributions (NICs). Profits generated by corporate businesses, on the other hand, 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 credit for corporation tax paid. A key feature of small companies in the UK is that there is often no distinction between the owner and the manager, for which the distinction between business and personal income is less clear since income can also be paid out to the owner-manager as a salary and therefore be liable for income taxes and National Insurance Contributions (NICs).[16]

[15] 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.

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

Table 2 provides a comprehensive overview of the aspects of tax systems that are relevant for our analysis between 2002/03 and 2008/09. A few points are worth noting. First, total NICs for wage and salary, including both employee and employer's contribution, are considerably higher than NICs for self-employment income. Second, accounting for the credit for corporate tax paid at the firm level, dividends are taxed at an effective rate of zero for taxpayers in the basic rate band and 25 percent for taxpayers in the higher rate band. More importantly, despite the annual increase in the personal allowance threshold to adjust for inflation, the rate of income taxes remained quite stable during the period. By contrast, there were frequent and substantial changes in the corporate tax schedule, including the introduction, modification, and subsequent abolition of a zero starting rate which primarily affected taxation of small companies with taxable profit below £50,000. A 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" (Budget 2002).[17,18] The zero tax rate was subsequently restricted to retained earnings during 2004/05-2005/06 and was eventually abolished in 2006/07.

4.1 Abolition of the Zero Starting Rate in 2006/07

In 2006/07, the zero starting rate, which taxed the first £10,000 corporate profit at 0% and the next £40,000 at 23.75%, was replaced with a flat rate of 19% for corporate profit up to £300,000. Depending on the level of pre-tax profit, this reform had differential impact on the average tax rates faced by small companies as illustrated in Panel A of Figure 2. The average tax rate increased after the tax reform, but only for companies with taxable profits up to £50,000. For companies with taxable profits below £50,000, the increase in the post-2006 average tax rate is continuously decreasing in their pre-tax profit, with the largest increase occurring for companies with taxable profits below £10,000.

The abolition of the zero starting rate also introduced differential changes in the marginal tax rate faced by small companies. Similar to changes in the average tax rate, only companies with taxable profit below £50,000 saw a marginal rate change of different directions depending on their profit. As shown in Panel B of Figure 2, the marginal tax rate increased from 0 to 19% for companies with taxable profit up to £10,000, while it decreased from 23.75% to 19% for companies with taxable profit between £10,000 and £50,000. Unlike the continuous change in the average tax rate, changes in the marginal tax rate were discrete

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

[18] See HM Treasury and HMRC, Budget 2002. (www.hmrc.gov.uk/budget2002).

and piecewise uniform for all companies in the relevant income range.

5 Data

The empirical analysis is based on administrative corporation tax returns covering the population of companies in the UK between 2002/03 and 2008/09.[19] The full tax dataset has around 10.7 million observations for 2.5 million individual companies and contains detailed and precise information on taxable profits and how they are determined. To obtain more information on company characteristics including the financial statement, we link the tax return dataset with company accounts in the Financial Analysis Made Easy (FAME) database, a commercial database provided by Bureau van Dijk. FAME covers all the registered firms in the UK that are legally required to file accounts with the Company House. We are able to match the tax return and company account for each company-year for approximately 90% of corporate taxpayers. 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.

5.1 Dataset for Incorporation Analysis

We construct the dataset for incorporation analysis by first identifying companies that were newly incorporated between 2002/03 and 2008/09, with their exact date of incorporation obtained from FAME. We focus on incorporation decisions of standalone domestic businesses by eliminating newly incorporated companies that are part of a larger company group or have foreign-source income. Since we do not have any information on unincorporated businesses, we focus on identifying changes in the post-2006 distribution of newly incorporated companies that would be consistent with changes in the tax incentives to incorporate. Specifically, we count the number of newly incorporated companies in income bins of £100 and £1,000 for each year during the sample period. For each bin, we compute the average characteristics of newly incorporated companies including average turnover, fixed assets, and number of workers in order to control for non-tax reasons to incorporate.

We use additional information on director's salary in FAME and construct a measure of total taxable income as the sum of corporate taxable profit and directors' salary. Since small and medium-sized companies are not require to disclose directors' salary in their accounts, this information is only available for around 12 percent of companies in the linked dataset.

[19] 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.

Focusing on the sub sample of companies reporting director salary allows us to observe how companies split their total profit between business and personal income. In particular, given that the marginal tax rate for salary is constantly 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 rest as corporate profit. Depending on whether they are following this tax-minimization strategy we distinguish between tax minimizers and non tax-minimizers and examine potential heterogenous tax effects between them.

5.2 Dataset for Investment Analysis

We analyze the link between incorporation and investment using an unbalanced firm-level panel which include standalone companies with taxable profit consistently below £300,000 that undertook some positive investment between 2002/03 and 2008/09.[20] The main variables we use are flows of investment, sales, and net trading profit reported in the tax records. We use total qualifying expenditure for machinery and plant reported in the tax form to measure investment I_{it}, which is the sum of qualifying expenditure on machinery and plant for claiming first year allowance and regular writing-down allowance. The investors sample includes around 67 percent of observations in the linked tax-accounting dataset. To investigate potential heterogenous effects of information constraints on investment, we construct two alternative samples of frequent investors (including companies that invested in more than half of the periods throughout the sample period or their lifetime, whichever is shorter) and consistent investors (including companies that invested consistently throughout the sample period or their lifetime, whichever is shorter). We scale I_{it} by beginning-of-period book value of fixed asset K_{it-1} to obtain a measure of investment rate (I_{it}/K_{it-1}).

We calculate the key variable of interest, 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 the taxable profit $\pi_{i,t-1}$, i.e. $\tau^{avg}_{i,t-1} = Tax_{i,t-1}/\pi_{i,t-1}$. The average tax rate is calculated based on tax liability of the previous year to account for the nine month lag after the accounting year end until the required date for filing and payment of tax. Given this lag in tax payment, an increase in the current-year average tax rate would reduce tax payment and the available cash flow for internal finance in the following year.

We summarize the effects of the 2006 tax reform on investment demand in the user cost of capital, a concept first introduced by Jorgenson (1963) and Jorgenson and Hall (1967). Building on a neoclassical optimal capital accumulation model in which firms maximize their

[20] 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% of the linked tax-accounting dataset.

profit subject to a form of neoclassical production function by choosing input levels of labor and capital, firms set their demand for capital input at the level where the marginal product of capital is equal to the user cost of capital. Following Devereux and Griffith (2003), we express the cost of capital for new investment financed by retained earnings as:

$$CoC_{it}^{re} = (r + \delta)\frac{(1 - A_{it}\tau_{it}^{mrg})}{(1 - \tau_{it}^{mrg})}, \tag{17}$$

where r is the real interest rate, δ is the economic depreciation rate for machinery and plant, and A_{it} is the net present value of depreciation allowances, of which a proportion in the amount of the statutory marginal rate (τ_{it}^{mrg}) can be offset against taxable profit. For new investment financed with debt, interest payments are deductible and the cost of capital with debt financing can be expressed as:

$$CoC_{it}^{debt} = CoC_{it}^{re}\left[1 - \frac{(r - (1 - \tau_{it}^{mrg})int_{it})}{(r + \delta)(1 - A_{it}\tau_{it})}\right],$$

where int_{it} is the interest rate paid on the firm's outstanding external debt, which is firm specific and may be decreasing with the duration since the firm incorporated. Given that we do not observe firm-specific borrowing rate int_{it}, we express this extra term of debt financing as a multiplicative term of CoC_{it}^{re} so that when taking logs, the impact of firm-specific tax advantage for debt financing can be approximately controlled for with year dummies and firm fixed effects in econometric specifications.

In some of the econometric specifications we include a measure of CoC_{it}^{re} computed following equation (17), assuming that $r = 0.05$ and $\delta = 0.175$ such that they are common for all companies, or at least not to vary across time for each company so that variation in real interest rate can be 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 rate of statutory tax 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 panel B of figure 2. We use additional variation in A_{it} due to variation in capital allowances. Table 3 presents some basic features of the key variables.[21]

[21] 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.

6 The Causal Effect of Tax Incentives on Incorporation

6.1 Changing Tax Incentives for Incorporation

To illustrate changes in the tax incentives to incorporate following the abolition of the zero starting rate, we compare the average tax on every pound of corporate profit with the average tax charged had the same income been earned in an unincorporated business. We express the tax gains to incorporation as the difference between the average tax rate applying to unincorporated businesses and for corporate profit, i.e. $\tau_U^{avg} - \tau_C^{avg}$. At a given level of pre-tax income, a positive difference between the two rates represents tax savings to incorporate since a small business owner can choose to incorporate and end up with a higher after-tax income. In the UK, dividends paid to shareholders paying the higher income tax rate are subject to personal taxation. Accounting for the differential tax treatment of retained earnings versus dividend income, Figure 3 presents two series of tax gains to incorporate, assuming that (i) all corporate profits are retained earnings in Panel A, or (ii) all corporate profits are paid out as dividends to higher rate shareholders in Panel B. In circumstances when small companies pay out part of their profits as dividends, the tax gains to incorporation would lie between the two series. That is, the tax gains to incorporation calculated under assumption (i) and (ii) represent the maximum and minimum tax savings from incorporation, respectively.

Panel A in Figure 3 plots the tax gains to incorporate assuming that a small company retains all the profits. 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. Comparing the tax gains immediately before and after the tax reform, i.e. 2002/3-2005/6 compared to 2006/7, it is also evident that the abolition of the zero starting rate introduced differential changes to the tax gains to incorporate. Small firms with taxable profits up to £50,000 and particularly those with taxable profit below £20,000 saw the largest decrease in the tax gains to incorporate. In contrast, there is essentially no change in the tax gains to incorporation for taxable incomes above £50,000. It is this differential change in the tax gains to incorporation at different income levels that we exploit to identify the causal effect of tax incentives on incorporation.[22]

To examine how far dividend taxes reduce the tax gains to incorporate, Panel B plots the tax gains under the alternative assumption that all corporate profits are distributed as dividends. Overall, the level of tax gains decreases slightly for income levels above the basic taxpayer bracket, reflecting that there are additional dividend taxes of 25% above the basic taxpayer bracket. It remains the case that there are positive tax gains to incorporate except

[22]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.

at the very low income level. Once again, the abolition of the zero starting rate in 2006/07 changed the tax gains differentially. In particular, small firms with taxable income up to £50,000 saw a significant decrease in the their tax gains to incorporate, while the tax gain to incorporate for those with income above £50,000 were almost unaffected by this policy reform.

6.2 Graphical Evidence

To examine whether changes in small business incorporation are driven by changes in the tax gains to do so, Figure 4 compares the distribution of newly incorporated firms by profit bins of £1,000 before and after the abolition of the zero starting rate. Changes in the number of newly incorporated companies are strikingly consistently with changes in the tax gains to incorporate following the tax reform. There is a noticeable decrease in the number of newly incorporation from 2002/03-2003/04 to 2006/07-2007/08 mainly for companies with taxable profit up to £50,000. The largest decrease in the number of new incorporations is concentrated between £0-£20,000, an income region with the most significant decrease in the tax gains to incorporate. 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 to incorporate had some negative impact on the number of newly incorporated companies after the 2006/07 policy reform. As shown in Devereux, Liu and Loretz (2014), the kink at £10k in the statutory tax schedule generated large and sharp bunching of companies around the kink point. This can clearly be seen in Figure 4, and so also applies to newly incorporated companies. This is consistent with behavioral responses to variation in the marginal tax rate. We test the robustness of our results below by excluding the bunching region from the analysis.

6.3 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 in the tax gains of 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 prior to 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 minimum change in the tax savings to incorporation for companies in the control group, and therefore the 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. Quantitatively, we estimate the conditional expectation of new incorporations as a function of tax gains and other observables in the following form:

$$E(c_{it}|Tax\ Gain_{it}, X_{it}) = \exp(\gamma_i + \lambda_t + \beta_{tax} Tax\ Gain_{it} + \beta_x X_{it}), \tag{18}$$

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 incorporation, 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 tax savings from incorporation as a percentage of pre-tax income i at time t. An additional error term, which represents temporary fluctuations in the unobserved determinants of incorporation, enters equation (18) additively or multiplicatively depending on the model specification.

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):

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

The log transformation preserves the number of total observations since all counts are positive in the £0-£100,000 profit region. We estimate β_{tax} using the standard fixed effect estimator, allowing for arbitrary correlation of the error terms in the covariance matrix.[23]

The next three regression models estimate c_{it} in levels using Maximum Likelihood Estimation (MLE):

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

where η_{it} is the error term with $E(\eta_{it}|Tax\_Gain_{it}, X_{it}) = 1$ and hence:

$$E(c_{it}|Tax\ Gain_{it}, X_{it}) = \mu_i = \exp(\gamma_i + \lambda_t + \beta_{tax} Tax\ Gain_{it} + \beta_x X_{it}). \tag{19}$$

An advantage of the MLE approach is that as long as the conditional mean function is correctly specified, consistency of $\widehat{\beta}_{tax}$ holds for the MLE of any specified exponential density

[23] Note that consistency of $\widehat{\beta}_{tax}$ hinges on the assumption that $E(\varepsilon_{it}|Tax\ Gain_{it}, X_{it}) = 0$.

(Cameron and Trivedi, 2013, p. 59-63). That is, consistent estimation of the tax effect β_{tax} is robust to distributional assumptions of the error term and does not require c_{it} to be Poisson or Negative Binomial distributed.

We use three models - the Poisson Generalized Linear Model (GLM), the Negative Binomial model (NB2), and the Poisson Pseudo Maximum Likelihood (PMLE) - to estimate the same conditional mean in equation (19) with different assumptions of the variance structure for c_{it}.[24] Importantly, the estimated tax coefficient in all four specifications can be directly interpreted as a semi-elasticity of the number of newly incorporated companies with respect to the tax gain to incorporation. Specifically, it equals the proportionate change in the conditional mean of the number of newly incorporated firms for a one percentage point increase in the tax savings to incorporation.

6.4 Empirical Findings

Table 4 summarizes the baseline regression results from the alternative econometric models. Following the methodology described in section 5.3, 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 ($Tax\ Gain^{re}_{it}$) and from dividend income ($Tax\ Gain^{\text{div}}_{it}$), 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 5 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 $Tax\ Gain^{re}_{it}$ calculated under the assumption that all profits are taxed as retained earnings.[25] Heteroscedasticity-robust standard errors are clustered at the income bin level. For comparison, column (1) presents the baseline results shown in table 4 column (4) and does not

[24] 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 and the variance matrix is estimated using a robust estimator. This is the Poisson Pseudo Maximum Likelihood estimator proposed in Silva and Tenreyro (2006) and Cameron and Trivedi (2013).

[25] Regressions using $Tax\ Gain_{\text{div},it}$ show very similar results and are presented in the Appendix.

include any other explanatory variables. To assess the robustness of the strong effect of tax 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.[26] The basic result is essentially unchanged.

To assess the robustness of the findings to controlling for other non-tax reasons to incorporate, columns (3)-(5) include additional control variables including 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 qualitative results essentially unchanged.

As noted above, there is large and sharp bunching of newly incorporated companies around £10,000 where the marginal corporate tax rate jumps from zero to 19 percent. To ensure that our finding of the strong tax effect is not entirely driven by self selection of bunchers into incorporation, we exclude using counts of newly incorporated companies around the tax kink, i.e. those with taxable profits between £8,000 and £12,000. The results are presented in column (6) and confirm the previous findings: the estimated coefficient on $Tax\ Gain_{it}^{re}$ 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, regressions in 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. Regressions in column (7) include a full set of industry fixed effects and additional industry-specific time trends and other non-tax control variables in column (8) and (9), respectively. The basic result again remains quantitatively unchanged.

To summarize, the coefficient estimate for $Tax\ Gain_{it}^{re}$ exhibits a positive sign and is statistically significant at 1% level across all specifications. 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, column (7) suggests that a one percentage point increase in the tax gains to incorporate increases the number of new companies by 4.3 percent, under the

[26] 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.

assumption that all profits are retained within the company. Should all profits be distributed to higher rate shareholders and are liable for dividend taxes, a one percentage point increase in the tax gains to incorporate raises the number of new companies by around 2.2 percent. Given that the average tax gains to incorporate is around 8.45 percent for retained profits (and 3.36 for dividend income), our findings suggest that the elasticity of the number of newly incorporated companies with respect to the tax gain is around 0.37 for retained profits and 0.09 for dividend income.

In table 6, we present the estimated tax coefficient ($\widehat{\beta}_{tax}$) from 12 individual industry-sector regressions, with 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. Although the point estimate of the tax effect varies across industries, they generally support the view that tax savings exert a positive influence on the incorporation decision of small businesses. Focusing on estimation results in the top panel, 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.

6.5 Heterogeneous Response to Tax Incentives

In this section, we first address potential measurement in the taxable income of newly incorporated companies when they have the option to declare business income as salary. In a small owner-managed company, the business income can be paid in the form of salary to the director/manager or in the form of corporate profit to the shareholder/owner. When the owner-manager also receives some salary, corporate profit alone would understate the amount of total taxable income earned in the small company. In this case, the true tax gains to incorporate would be measured with error by the tax gains based on corporate profit alone. To check the robustness of our findings to potential measurement error in the tax gains variable, we focus on companies which also report director's salary in their company accounts, which represents around 12 percent of the total observations in the linked tax-accounting dataset. We compute the total taxable income for these companies as the sum of corporate profit and director's salary.[27] We compute two series of average tax rates levied on the total taxable income given the observed split of salary and corporate profit and on the same total had it been earned as income from an unincorporated business. The tax gains to incorporate 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 taxable income. Accounting for double taxation of dividend income at the shareholder level, we calculate two series of

[27] Note that this is an extreme assumption, effectively that the business is owned by a single owner-manager.

tax gains for retained earnings and dividend income, respectively.

Another advantage of using information on reported salary and total income is that it allows us to uncover heterogeneity in companies regarding the extent to which they minimize their total tax liability. Given the marginal tax rate structure described in Table 2, tax minimization of a small owner-managed company implies paying a salary equal to the personal allowance and the rest as corporate profit. This is because this salary implies zero liability for personal income tax and NICs.[28] Once above the personal allowance threshold, corporate profit is always taxed at a lower marginal rate than salary.

Consistent with the tax minimization strategy, we observe that a substantial number of companies do pay out the directors' salaries just at the personal allowance threshold in figure 5. Over time, bunching of salary also closely tracks changes in the personal allowance as the latter is increased annually to adjust for inflation in the UK. Given that bunching of salary is concentrated within £1,000 below the personal allowance kink, we define a company as a tax minimizer if (i) it pays a director's salary within £1,000 from the personal allowance threshold, and (ii) its total taxable income is above the personal allowance threshold. Following this definition, we identify around 45 percent of companies with total taxable income between the personal allowance threshold and £100,000 as tax minimizers.

Table 7 summarizes the regression results using the Poisson PMLE model, with the tax variable in the upper/lower panel capturing the gain to incorporate based on retained earnings/dividend income. The dummy variable $Minimizer_{it}$ takes value of 1 if the company engages in tax minimization and 0 otherwise. Column (1) follows the same specification in equation (18) and adds the dummy variable $Minimizer_{it}$ as an additional regressor. Column (2) interacts tax gain with a tax minimizer dummy and a non tax-minimizer dummy (and omitting the constant term) to capture any differential behavioral responses between the two groups. Allowing the tax minimizers and non minimizers to be differentially affected by shocks across different income bin or year, column (3) and (4) report regression results based on minimizers and non minimizers, respectively. All regressions include a set of income bin and year fixed effects.

Regression results in table 7 reveal important heterogeneous effects of taxes on incorporation. Focusing on the upper panel, column (1) suggests that there is a positive and statistically significant effect of tax gains on incorporation for companies with their tax incentives precisely measured. Column (2) shows a stronger tax effect for tax minimizers than for non-minimizers as companies that aim to minimize their overall tax liability are more responsive to the tax gains to incorporate. Allowing for differential effects of unobserved income bin and time heterogeneity, the tax coefficient for minimizers in column (3) is three

[28] Although still with an entitlement to benefits relating to NIC payments.

times larger than for non tax-minimizers in column (4), and the difference is highly significant. By distinguishing between tax minimizers and non-tax minimizers, we confirm that tax incentives encourage small business incorporation. More importantly, we uncover important heterogenous responses of newly incorporated firms to tax incentives.[29]

7 Incorporation for Investment: the Role of Corporation Tax

In this section we test the hypothesis that incorporation alleviates the cost of external finance due to asymmetric information between small businesses and their creditors. The empirical strategy developed in section 3.2 is employed throughout. For identification we exploit differential changes in the average tax rate and the resulting tax payment faced by small companies as a result of the 2006/07 tax reform. We begin by showing that small company investment responds negatively to the lagged average tax rate, and that this result is robust to a variety of specifications including those in which the user cost of capital is a control variable. We then show that the sensitivity of investment to average tax rates diminishes the longer that the firm has been incorporated, and that the diminishing tax-sensitivity of investment is robust to controlling for indicators of underlying investment opportunities including profitability and sales growth. We interpret these findings as evidence that financial constraints diminish over time as newly incorporated businesses start to establish a track record of formality and providing publicly available information that is more credible.

7.1 Changing Tax Incentives for Investment

A changes in the cost of capital is the first, and more conventional channel through which the 2006/07 tax reform may affect small company investment. Corresponding to differential changes in the marginal tax rate, there are differential changes in the cost of capital as shown in Figure 6 panel A by comparing the pre- and post-reform user cost of capital for companies with taxable profits up to £150,000. While there is an increase in the cost of capital for companies with taxable profits below £10,000, it slightly decreased for companies with taxable profits between £10,000 and £50,000.[30] The user cost of capital for profits above £50,000 was unaffected by the tax reform and remained the same afterwards.

Changes in the average tax rate and the associated tax payment is the second channel through which the 2006/07 tax reform may affect investment given that an increase in the

[29] Conclusions based on regression results in table 7 panel B are qualitatively the same.

[30] Note, though, that these effects on the cost of capital are rather small.

tax liability reduces the amount of available internal funds for investment . Panel B of figure 6 plots the change in the overall tax liability due to the 2006/07 tax reform and it is clear that there is some increase in the tax bill for all companies with taxable profits up to £50,000. Unlike the discrete increase in the cost of capital, the increase in the tax liability is piecewise continuous with the largest increase occurring around £10,000. The differential changes in the tax incentives suggest that companies with profits up to £50,000 consist a natural treatment group whose investment should be primarily affected by the 2006/07 tax reform, relative to a control group of small companies with taxable profits just above £50,000.

7.2 Empirical Specification: An Error-Correction Model

We model investment in a flexible error correction model. Consistent with the first-order conditions (10) and (12) in section 3, in the absence of adjustment costs, the desired capital stock of firm i in year t (K_{it}) can be written as a log linear function of output (Y_{it}) and the cost of capital (CoC_{it}) as

$$\ln K_{it} = \ln Y_{it} - \sigma \ln CoC_{it}, \tag{20}$$

where σ can take value of zero under a fixed capital-output ratio and of one under a Cobb-Douglas production function. To account for slow adjustment of the actual capital stock to the desired capital stock level, we nest equation (20) within a general autoregressive-distributed lag specification up to first order (an ADL (1,1) model) of the form:

$$\ln K_{it} = \beta_0 + \alpha \ln K_{it-1} + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{it-1} - \beta_3 \ln CoC_{it} - \beta_4 \ln CoC_{it-1} + u_{it}, \tag{21}$$

where u_{it} is a stationary error term.[31] Denoting λ the common value of $(\beta_0 + \beta_1)$ and $(1-\alpha)$, we reparameterize equation (21) as

$$\Delta \ln K_{it} = \beta_0 + \beta_1 \Delta \ln Y_{it} - \beta_2 \Delta \ln CoC_{it} - \lambda(\ln K_{it-1} - \ln Y_{it-1} - \sigma \ln CoC_{it-1}) + u_{it}.$$

The parameter λ reflects the speed of adjustment of the capital stock towards its long-run level, resting on the assumption 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, so that firms with a capital stock level below their target will adjust upwards and vice versa. Using the approximation that $\Delta \ln K_{it} \simeq I_{it}/K_{it-1}$, where I_{it} denotes firm-level gross investment and δ_i the rate of depreciation, we obtain a specification

[31] The dynamic equation (21) would be consistent with the long-run equilibrium relationship (20) if $(\beta_1 + \beta_2)/(1-\alpha) = 1$ and $(\beta_3 + \beta_4)/(1-\alpha) = \sigma$.

for investment rate of the following form:

$$\begin{aligned}\frac{I_{it}}{K_{it-1}} &= \beta_0 + \beta_1 \Delta \ln Y_{it} - \beta_2 \Delta \ln CoC_{it} - \lambda(\ln K_{it-1} - \ln Y_{it-1} - \sigma \ln CoC_{it-1}) \quad (22)\\ &\quad + d_t + \eta_i + u_{it},\end{aligned}$$

where 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 and collateral ability, as well as the corresponding industrial structure that may be relevant for bank lending decisions.

To assess the importance of informationally driven financial constraints, we include one-period-lagged average tax rate (τ_{t-1}^{avg}) and its interaction with firm age in the baseline investment equation (22). The error-correction model we estimate therefore has the form:

$$\begin{aligned}\frac{I_{it}}{K_{it-1}} &= \beta_0 + \beta_1 \Delta \ln Y_{it} - \beta_2 \Delta \ln CoC_{it} - \lambda(\ln K_{it-1} - \ln Y_{it-1} - \sigma \ln CoC_{it-1}) \quad (23)\\ &\quad + \gamma_1 \tau_{i,t-1}^{avg} + \gamma_2 \tau_{i,t-1}^{avg} \cdot age_{it} + d_t + \eta_i + u_{it}.\end{aligned}$$

Identification relies on the cross-sectional variation in the CoC_{it} and $\tau_{i,t-1}^{avg}$ given that only small companies with taxable profits below £50,000 were primarily affected by the tax reform and allows a within-year comparison of the investment rate for companies in different profit bands. By including the average tax rate in levels, we take the view that internal funds should enter the model only to account for short-term finance constraints and thus should only affect the timing of investment along the transition path between steady states

We include the lagged average tax rate as a measure of the exogenous shock to internal funds for investment due to the tax reform. By including the average tax rate variables in equation (23), we use an approach similar to Fazzari, Hubbard and Petersen (1988) and many other studies in the investment literature to test whether firms' investment tends to be more sensitive to its tax cash flow when they are more likely to face informationally driven financial constraints. Our approach differs from previous studies in that we allow the degree of tax sensitivity to vary continuously with the duration of incorporation by including the interaction term $\tau_{i,t-1}^{avg} \cdot age_{it}$.[32] The key advantage of using $\tau_{i,t-1}^{avg}$ is that it represents exogenous variation in total tax payment which leads to a windfall change in internal cash flow and should be uncorrelated with a firm's investment opportunities. Using the average tax rate to capture exogenous shocks to available internal funds, a significant and negative tax coefficient (γ_1) can be taken to indicate that on average, small company investment is

[32] This is similar to the approach used in Blanchard, de Silanes and Shleifer (1994), Lamont (1997), and Rauh (2006) which show that plausibly exogenous shocks to a firm's cash flow affect its investment in general.

financially constrained. At the same time, a positive coefficient on the interaction term (γ_2) between the average tax rate and firm age would be consistent with a decreasing effect of the constraint on the marginal interest rate over time after incorporation.

7.3 Basic Findings

Table 8 presents regression results from various specifications based on equation (23), with all regressions including a full set of firm and year fixed effects. The dependent variable in all regressions presented in Table 8 is the qualifying expenditure on machinery and plant scaled by lagged fixed assets (I_t/K_{t-1}). We impose the constant return to scale restriction in all regressions by including $\ln(K/Y)_{t-1}$ as a control variable to avoid potential collinearity between taxes and the contemporaneous output. Heteroscedasticity-robust standard errors are clustered at the firm level.

Column (1) presents results from the baseline specification of the investment equation which includes the average tax rate as an additional regressor. Variation in the user cost of capital is controlled for by including both time-specific and firm-specific effects. Consistent with the basic neoclassical investment model, the effects of conventional determinants of investment are estimated to be significant and have the expected sign. In particular, there is a significant and moderate adjustment of investment to reach the long-run target level of capital stock as indicated by a strong and negative estimated coefficient on the term $\ln(K/Y)_{t-1}$. Focusing on the cash flow effect of taxes, the estimated coefficient on the lagged average tax rate is negative and highly significant, suggesting that an increase in the corporate tax payment has an immediate effect on firm-level investment by decreasing the current-period after-tax cash flow. The negative relationship between the average tax rate and investment rate remains robust when controlling for firm age and a measure of total cash flow in column (2), with the absolute value of the coefficient on $\tau^{avg}_{i,t-1}$ increased slightly from 0.030 to 0.039 and remaining significant at the 1% level.

Having established the negative cash flow effect of taxes on investment, the regression in column (3) tests whether the strength of this relationship diminishes over time by including an interaction term between the average tax rate and firm age. The estimated coefficient on the interaction $\tau^{avg}_{i,t-1} \cdot age_{it}$ is positive and highly significant, while the coefficient on the average tax rate remains negative and statistically significant. These findings support the hypothesis that the negative effect of financial constraints on investment diminishes over time as the newly incorporated firm establishes a track record of providing credible information.[33]

[33] An alternative interpretation of the negative coefficient would be that as companies grow they start to have access to alternative channels of external finance including by issuing corporate bonds. As a result, they become less dependent on banks. While this argument may be relevant for the U.S. capital market, we

Column (4) assesses the robustness of the diminishing cash flow effect of taxes by including the user cost of capital as an additional control variable. While both the short-run and long-run effects of the cost of capital are estimated to be highly significant with the expected signs, controlling for the cost of capital leaves the basic finding of a diminishing investment sensitivity to corporation tax payments unchanged.

Allowing for possible nonlinearity in the relationship between investment and the financial constraints, column (5) includes a quadratic age term and its interaction term with the average tax rate. The basic findings are robust to the alternative specification of nonlinearity. The estimated coefficient on $\tau_{t-1}^{avg} \times age^2$ is positive and quite small, suggesting that liquidity matters more for firms during their first few years of incorporation but diminishes thereafter.

7.4 Ruling Out Alternatives

Having established a negative and diminishing cash flow effect of taxes on investment, we aim to rule out the possibility that the average tax rate serves 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 of the interaction term $\tau_{i,t-1}^{avg} \cdot age_{it}$ may reflect that over time as a company becomes more profitable it has a larger cash balance. To rule out this alternative explanation, the regression in Table (9) column (1) includes one-period lagged profitability and its interaction with firm age as additional regressors in the basic investment equation. The positive estimated coefficient on profitability confirms the positive relationship between investment and profitability, while the negative coefficient on the interaction term $Profitablitiy_{t-1} \times age_t$ suggests that the strength of this positive relationship diminishes over time. The regression in column (2) examines the effect of taxes on investment while controlling for profitability, and the results continue to support our basic findings since the signs of the key tax coefficients remained unchanged. Following a similar approach, column (3)-(4) examine the robustness of the tax effects conditioning on sales growth and the basic findings remain quantitatively unchanged. Finally, column (5) examines the cash flow effect of taxes on investment while controlling for both profitability and sales growth, and the basic findings again stay the same.

To summarize, the estimated coefficient on $\tau_{i,t-1}^{avg}$ exhibits a negative sign and is statistically significant at 1% level across all specifications. Quantitatively, column (2) in Table (8) suggests that a one percentage point increase in the average tax rate reduces the investment rate by about 3.9 percentage points, on average. Given that the mean average tax rate is

conjecture that it is less likely the case in the UK where the majority of companies, and certainly most if not all the companies in our dataset, depend on bank lending for external finance. For example, the minimum issue size for corporate bonds in the UK is around £100-200 million.

around 11 percent, this translates to an elasticity of investment rate of 1.14 with respect to the average tax rate. Column (3) suggests that the cash flow effect of taxes on investment is more pronounced for newly incorporated firms given that a one percentage point increase in the average tax rate would decrease their investment rate by around 17.6 percentage points. The negative cash flow effect of taxes on investment decreases by about 1.2 percentage point for each year the company remains active. For firms that have been incorporated for 15 years or more additional tax liability no longer significantly affect investment through the cash flow channel, suggesting that the information cost is no longer a binding constraint for established companies to access external finance.

In Table 10, we present the regression results using two different samples of frequent investors in columns (1) to (3) and consistent investors in columns (4) to (6). In each sample, we find a negative and diminishing cash flow effect of taxes on investment as indicated by the negative tax coefficient and the positive coefficient on the interaction term between average tax rate with age. The findings are robust to controlling for the user cost of capital.

8 Conclusion

The paper has provided evidence that corporation taxation affects firms' incorporation and investment decisions. The empirical findings suggest a strong cash flow effect of taxes on investment. The sensitivity of investment to taxes is most pronounced for newly incorporated firms, and diminishes gradually as companies started to establish a track record of providing credible information to banks. The empirical evidence is consistent with the hypothesis that incorporation lowers the cost of external finance for small businesses by reducing the information cost of borrowing. In other words, incorporation allows small businesses to undertake more investment and as a result, there are real welfare gains associated with small business incorporation.

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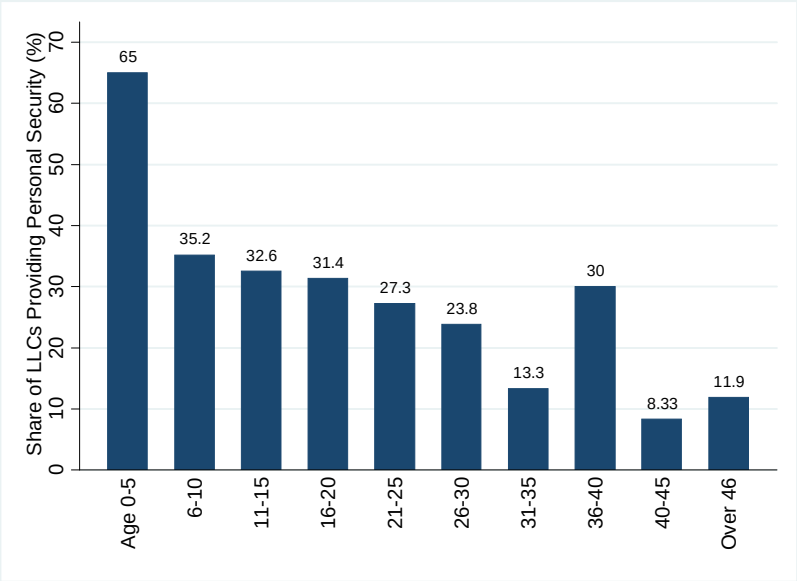
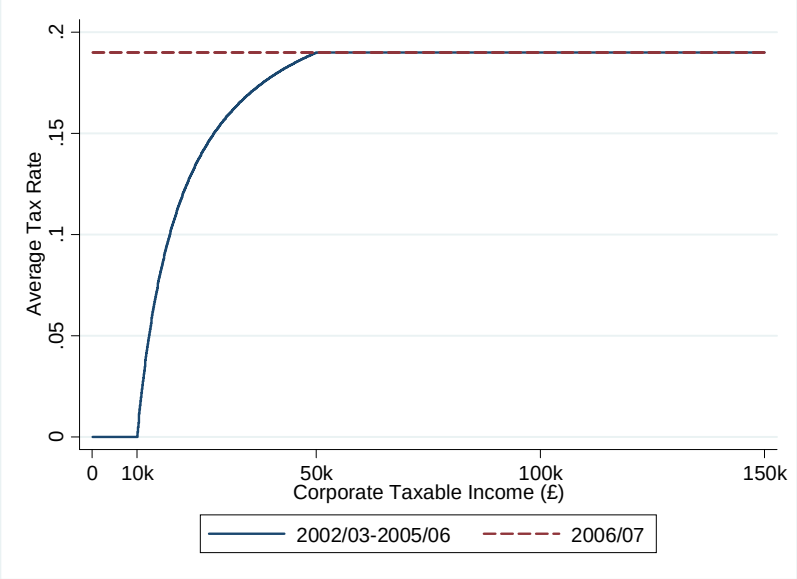
Figure 1. Share of Firms Providing Personal Security for External Finance



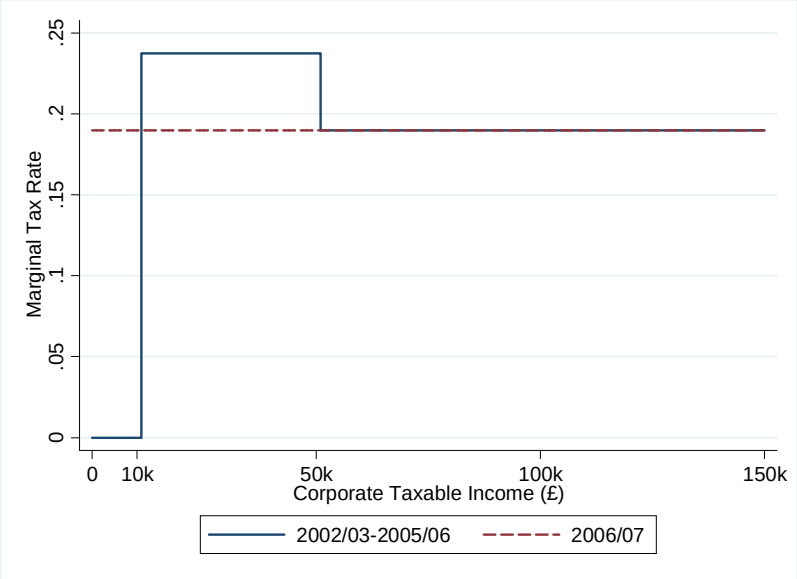
Notes: The figure is based on data from the 2008 and 2009 UK surveys of SME finances (as described in section 2). The figure shows the share (in percent) of firms choosing that are required to provide personal security in each of the different age bands, among all small incorporated SMEs that are required to provide security when borrowing from banks or financial institutions.

Figure 2. Tax Consequences of Abolishing the Zero Starting Rate

A: Changes in the Average Tax Rate



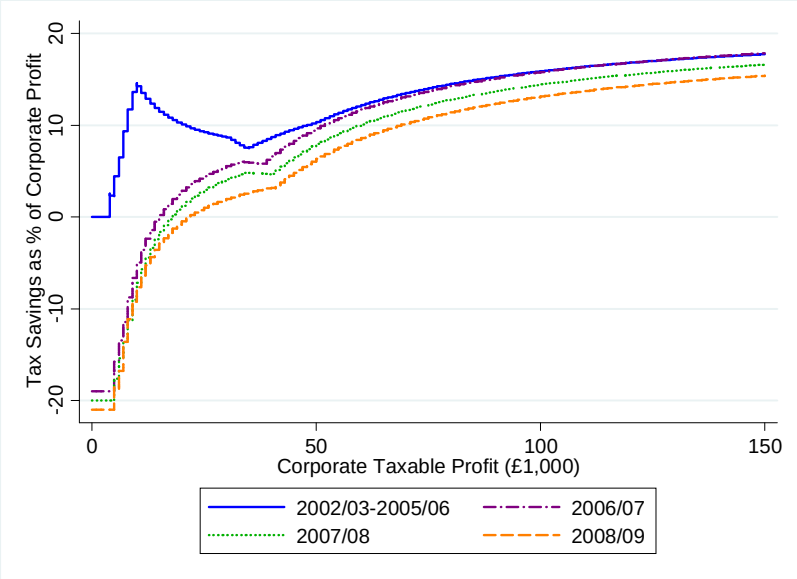
B: Changes in the Marginal Tax Rate



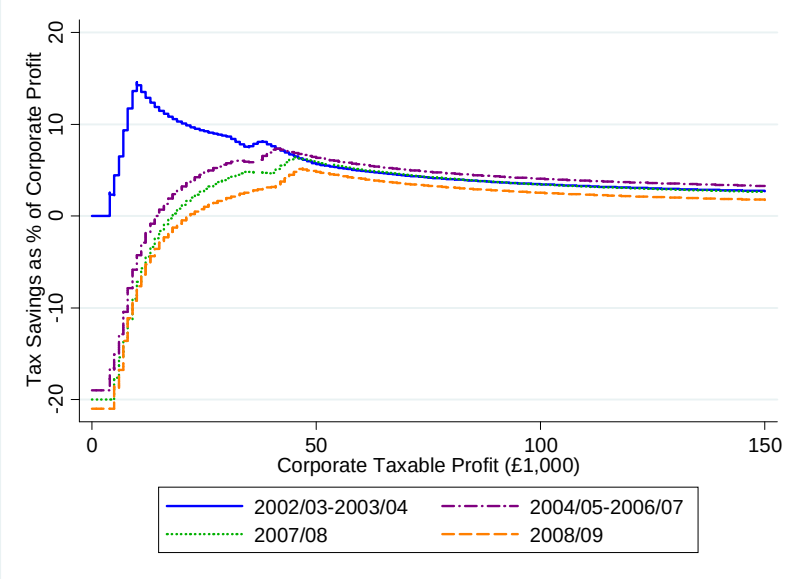
Notes: The panels A and B plot the average and marginal tax rate for companies with taxable profits up to £150,000 before and after the abolition of the zero starting rate in 2006/07, respectively.

Figure 3. Tax Gains to Incorporate

A: Retained Earnings

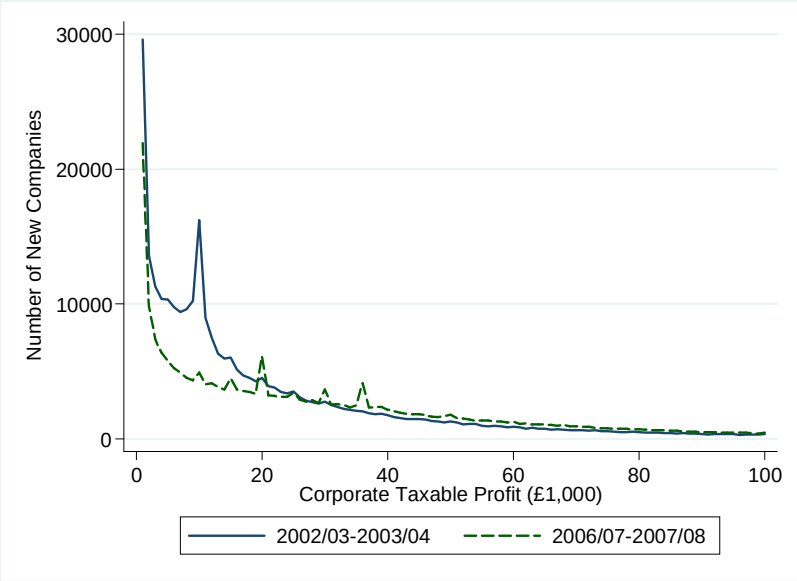


B: Distributed Dividends



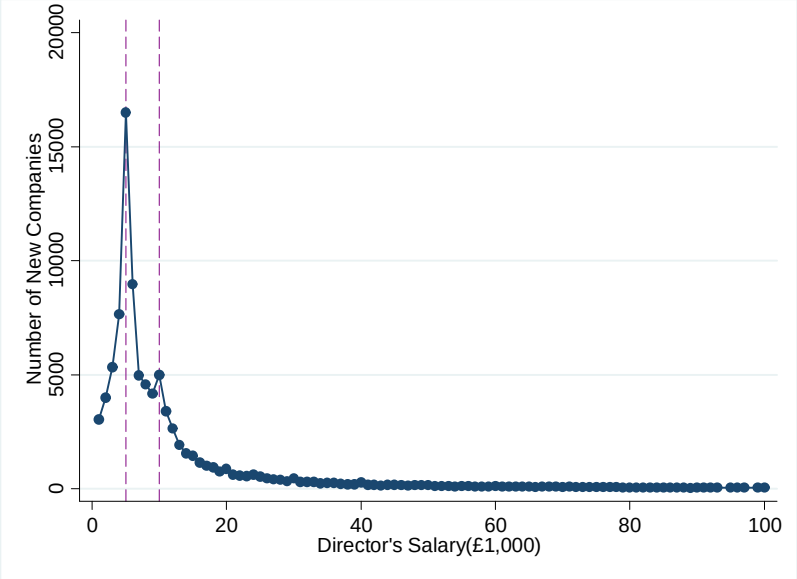
Notes: The panels A and B plot the tax gains to incorporate as a percentage of pre-tax income, assuming all corporate profits are retained profits and distributed dividends, respectively. Each panel computes the tax gains to incorporate as the difference between the average tax rate for self-employment income and the average tax rate for corporate profit, i.e. $\tau_U^{avg} - \tau_C^{avg}$.

Figure 4. Distribution of Newly Incorporated Companies



Notes: The figure shows the observed distribution of taxable profit for companies that are newly incorporated in 2002/03-2003/04 (solid line) and in 2006/07-2007/08 (smooth line).

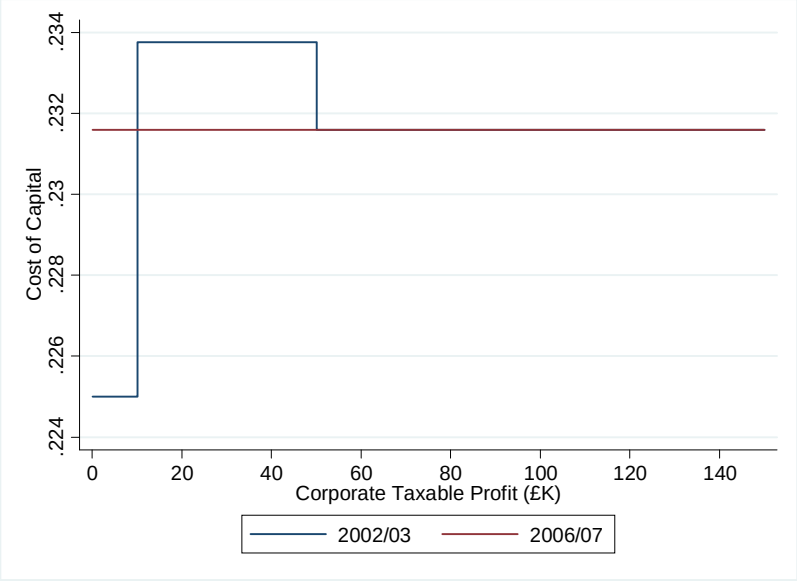
Figure 5. Bunching of Director's Salary



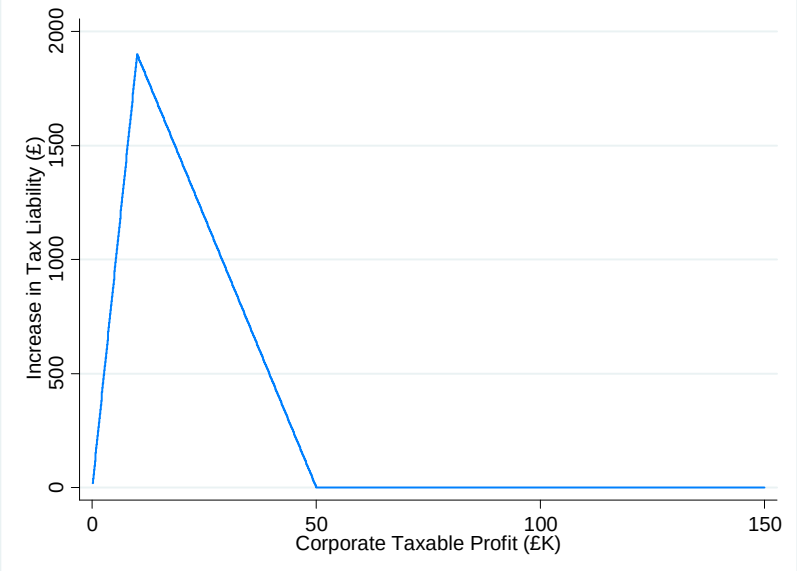
Notes: The figure shows the observed distribution of salaries and wages paid to directors in the companies that are newly incorporated in 2002/03-2007/08 and with total taxable income between £0 and £100,000 (solid line). Total taxable income is computed as the sum of total corporate taxable profit and salaries and wages paid to directors. The first vertical dashed line denotes the amount of the basic personal allowance during the sample period. The second vertical dashed line denotes twice the amount of the basic personal allowance.

Figure 6. Changing Tax Incentives for Corporate Investment

A: Changes in the User Cost of Capital



B: Increases in 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	Denied	Depressed	Discouraged
	(1)	(2)	(3)	(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: This table reports estimates of the marginal effects based on equation (1) and correspond to the estimated coefficients reported in the appendix tables B.1. The dependent variables are outcome indicators in obtaining 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. Depressed equals 1 if the SME was offered less than what was requested for external finance, and 0 otherwise. 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 of overall failure takes value of 1 if any of the three indicators equals to 1. The coefficients are estimated on the sample of firms that 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 clustered at firm level and reported in parenthesis.

Table 2. Income Tax Schedules in the U.K.

	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09
Corporate tax							
Income upper limit (UL)							
10,000	0	0	0	0	0.19	0.2	0.21
50,000	0.2375	0.2375	0.2375	0.2375	0.19	0.2	0.21
300,000	0.19	0.19	0.19	0.19	0.19	0.2	0.21
1,500,000	0.3275	0.3275	0.3275	0.3275	0.3275	0.325	0.2975
over 1,500,000	0.3	0.3	0.3	0.3	0.3	0.3	0.28
NCDR	0	0	0.19	0.19	0	0	0
Dividend tax							
tax credit rate	0.1	0.1	0.1	0.1	0.1	0.1	0.1
basic rate	0.1	0.1	0.1	0.1	0.1	0.1	0.1
higher rate	0.325	0.325	0.325	0.325	0.325	0.325	0.325
Personal tax							
personal allowance	4,615	4,615	4,745	4,895	5,035	5,225	6,035
starting rate UL	6,535	6,575	6,765	6,985	7,185	7,455	-
starting rate	0.1	0.1	0.1	0.1	0.1	0.1	-
basic rate UL	29,900	30,500	31,400	32,400	33,300	34,600	34,800
basic rate	0.22	0.22	0.22	0.22	0.22	0.22	0.2
higher rate	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Employment Income NICs							
Lower Earnings Limit	3,900	4,004	4,108	4,264	4,368	4,524	4,680
Upper Earnings Limit	30,420	30,940	31,720	32,760	33,540	34,840	40,040
employee's contribution							
primary threshold	4,628	4,628	4,732	4,888	5,044	5,200	5,435
basic rate contracted-in	0.1	0.11	0.11	0.11	0.11	0.11	0.11
basic rate contracted-out	0.084	0.094	0.094	0.094	0.094	0.094	0.094
higher rate	0	0.01	0.01	0.01	0.01	0.01	0.01
employer's contribution							
secondary threshold	4,628	4,628	4,732	4,888	5,044	5,225	5,435
basic rate contracted-in	0.118	0.128	0.128	0.128	0.128	0.128	0.128
basic rate contracted-out	0.083	0.093	0.093	0.093	0.093	0.091	0.091
higher rate	0.118	0.128	0.128	0.128	0.128	0.128	0.128
Self-employed Income NICs							
Class 2 band	4,025	4,095	4,215	4,345	4,465	4,635	4,825
Class 2 contribution	104	104	106.6	109.2	109.2	114.4	119.6
Class 4 Lower Profit Limit	4,615	4,615	4,745	4,895	5,035	5,225	5,435
Class 4 lower rate	0.07	0.08	0.08	0.08	0.08	0.08	0.08
Class 4 Upper Profit Limit	30,420	30,940	31,720	32,760	33,540	34,840	40,040
Class 4 higher rate	0	0.01	0.01	0.01	0.01	0.01	0.01

Notes: This table summarizes the basic features of the income tax system in the UK in 2002/03-2008/09. All rates and allowances are in nominal terms. NCDR refers to the non-corporate distribution rate. The lower basic NICs rates apply when the employee contracted out of the State Second Pensions (S2P) and are associated with the reduced benefits. Self-employed individuals pay a flat Class 2 contributions and a Class 4 earnings-related contribution. The payment of Class 2 and 4 NICs does not entitle the individual to S2P benefits.

Table 3. 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	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 dataset used in the investment analysis. I_t is qualifying investment on machinery and plant. I_t/K_{t-1} is qualifying investment scaled by beginning-of-period fixed asset. $\tau_{avg,t-1}$ is one-period lagged average tax rate. CoC_t refers to cost of capital for retained earnings and is calculated following equation (15). CF_t/K_{t-1} is current-period total trading profit and loss. Monetary variables are in nominal terms. Ratios are winsorized at the 0.05 percent level.

Table 4. Incorporation Econometric Model Comparison

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 alternative econometric models that estimate the effect of tax gains on incorporation based on equation (18) and assume different distribution of the error term. The dependent variable in specification (1) is the natural logarithm of the number of newly incorporated firms by income bin and year. The dependent variable in specifications (2)-(4) is the number of newly incorporated firms in levels. The dataset used is described in section 5.1. Panels A and B include the tax gains from retained earnings and from dividend income, respectively. Heteroskedasticity-robust standard errors are listed in brackets in columns (1) and (4). ***, **, * denotes significance at 1%, 5% and 10% level, respectively.

Table 5. Incorporation Responses to Tax Savings

	(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 6. 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	2164	177	444	4825	5558	4992

	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	3102	3116	2012	5996	3991	5995

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.

Table 7. Heterogeneous Incorporation Responses to Tax Savings

	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)		
$Tax\ Gain^{re} \times \text{Non}-Minimizer$		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)		
$Tax\ Gain^{div} \times \text{Non}-Minimizer$		0.015***		
		(0.001)		
$Minimizer$	-0.995***	-1.218***		
	(0.013)	(0.032)		
Additional Variables Inccluded:				
Income Bin Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
No. of Observations	10195	10195	4580	5589
No. of Income Bins	941	941	910	941

Notes: This table presents regression results based on the Poisson Pseudo-MLE model. The dataset used separately counts the number of newly incorporated firms that follow a tax minimizing strategy, and the number of newly incorporated, non-tax minimizing firms. The dependent variable is the number of newly incorporated firms by 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 8. Excess Sensitivity of Investment to Average Tax Rates

	(1)	(2)	(3)	(4)	(5)
$\triangle \ln Y_t$	0.193***	0.164***	0.163***	0.173***	0.162***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
$\Delta \ln CoC_t$				-6.646***	
				(0.034)	
$\ln(K/Y)_{t-1}$	-0.260***	-0.230***	-0.231***	-0.227***	-0.231***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
$\ln CoC_{t-1}$				-4.407***	
				(0.069)	
$\tau_{avg,t-1}$	-0.030***	-0.039***	-0.176***	-0.367***	-0.146***
	(0.007)	(0.007)	(0.010)	(0.012)	(0.013)
$\tau_{avg,t-1} \times age_t$			0.012***	0.011***	0.015***
			(0.0004)	(0.0004)	(0.001)
$\tau_{avg,t-1} \times age_t^2$					-0.0002***
					(0.00001)
Age_t		-0.039***	-0.040***	-0.035***	-0.054***
		(0.0003)	(0.0003)	(0.0003)	(0.0004)
Age_t^2					0.001***
					(0.0001)
CF_t/K_{t-1}		0.004***	0.004***	0.006***	0.004***
		(0.0001)	(0.0001)	(0.0001)	(0.0001)
R^2	0.145	0.15	0.15	0.169	0.152
N	2,761,231	2,761,231	2,761,231	2,761,231	2,761,231

Notes: This table presents regression results from error-correction model of investment based on equation (23). A set of firm fixed effects and year dummies are always included in the regressions. Heteroskedasticity-robust standard errors clustered at firm level are listed in brackets. ***, **, * denotes significance at 1%, 5% and 10% level, respectively.

Table 9. Excess Sensitivity of Investment: Ruling Out Alternatives

	(1)	(2)	(3)	(4)	(5)
$\triangle \ln Y_t$	0.150***	0.149***	0.139***	0.139***	0.140***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
$\ln(K/Y)_{t-1}$	-0.233***	-0.233***	-0.248***	-0.248***	-0.248***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
$\tau_{avg,t-1}$		-0.146***		-0.072***	-0.106***
		(0.011)		(0.014)	(0.014)
$\tau_{avg,t-1} \times age_t$		0.010***		0.007***	0.009***
		(0.001)		(0.001)	(0.001)
$Profitability_{t-1}$	0.053***	0.071***			0.094***
	(0.006)	(0.006)			(0.008)
$Profitability_{t-1} \times age_t$	-0.004***	-0.005***			-0.005***
	(0.0003)	(0.0003)			(0.0004)
$Sales\ Growth\ Rate_{t-1}$			-0.032***	-0.031***	-0.033***
			(0.002)	(0.002)	(0.002)
$Sales\ Growth\ Rate_{t-1} \times age_t$			-0.002***	-0.002***	-0.002***
			(0.0001)	(0.0001)	(0.0001)
Age_t	-0.035***	-0.036***	-0.039***	-0.040***	-0.039***
	(0.0003)	(0.0003)	(0.0004)	(0.0004)	(0.0004)
CF_t/K_{t-1}	0.004***	0.004***	0.004***	0.004***	0.004***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
R^2	0.145	0.145	0.149	0.149	0.149
N	2,106,985	2,106,985	1,486,097	1,486,097	1,486,097

Notes: This table presents regression results from error-correction model of investment based on equation (23). A set of firm fixed effects and year dummies are always included in the regressions. Heteroskedasticity-robust standard errors clustered at firm level are listed in brackets. ***, **, * denotes significance at 1%, 5% and 10% level, respectively.

Table 10. Excess Sensitivity of Investment: Alternative Samples

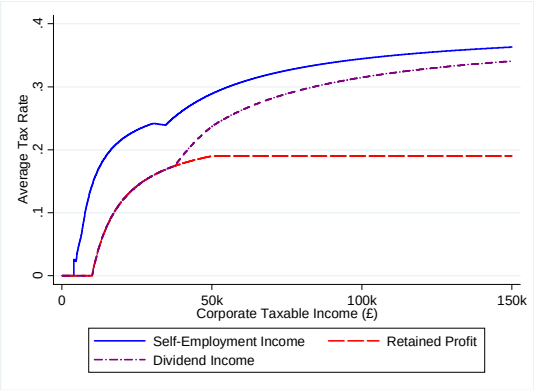
	Frequent Investors			Consistent Investors		
	(1)	(2)	(3)	(4)	(5)	(6)
$\triangle \ln Y_t$	0.231***	0.230***	0.239***	0.320***	0.319***	0.322***
	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)	(0.003)
$\Delta \ln CoC_t$			-6.970***			-2.684***
			(0.043)			(0.077)
$\ln(K/Y)_{t-1}$	-0.337***	-0.338***	-0.334***	-0.456***	-0.456***	-0.457***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
$\ln CoC_{t-1}$			-4.756***			-2.140***
			(0.091)			(0.169)
$\tau_{avg,t-1}$	-0.124***	-0.277***	-0.483***	-0.192***	-0.369***	-0.422***
	(0.009)	(0.012)	(0.015)	(0.015)	(0.021)	(0.027)
$\tau_{avg,t-1} \times age_t$		0.013***	0.012***		0.015***	0.015***
		(0.001)	(0.001)		(0.001)	(0.001)
Age_t	-0.041***	-0.043***	-0.041***	-0.038***	-0.040***	-0.043***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
CF_t/K_{t-1}	0.005***	0.005***	0.006***	0.004***	0.004***	0.005***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R^2	0.21	0.21	0.23	0.28	0.28	0.28
N	1,792,532	1,792,532	1,792,532	525,988	525,988	525,988

Notes: This table presents regression results from error-correction model of investment based on equation (23). A set of firm fixed effects and year dummies are always included in the regressions. Heteroskedasticity-robust standard errors clustered at firm level are listed in brackets. ***, **, * denotes significance at 1%, 5% and 10% level, respectively.

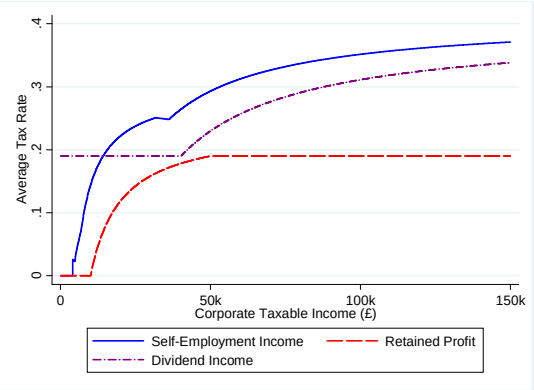
A Appendix Figures

Figure A.1. Average Tax Rates by Income Type

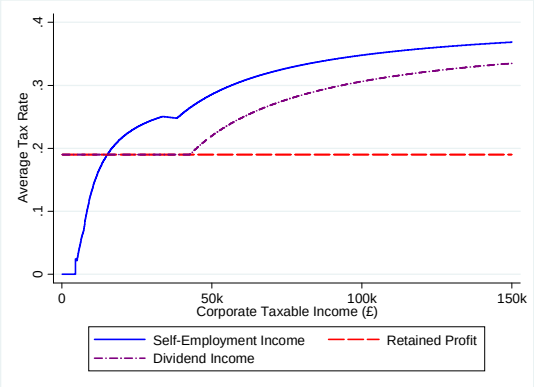
(a) 2002/03-2003/04



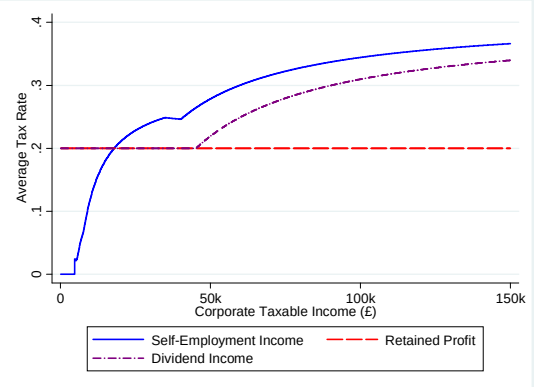
(b) 2004/05-2005/06



(c) 2006/07



(d) 2007/08



Notes: the average tax rate for dividend income accoutns for taxation of corporate profit and taxation of dividend income at the shareholder level. The average tax rate for self-employment income accounts for income taxes and Class 2 and Class 4 NICs on self-employment income.

B Appendix Tables

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. Likelihood of Failure in Obtaining External Finance: Coefficient Estimates

Dependent variable:	Overall Failure (1)	Denied (2)	Depressed (3)	Discouraged (4)
LLC	-0.418***	-0.282*	-0.209	-0.659***
	(0.140)	(0.154)	(0.170)	(0.198)
Firm age	-0.013**	-0.006	-0.017*	-0.048***
	(0.006)	(0.005)	(0.010)	(0.013)
LLC × Age	0.011*	0.004	0.018*	0.042***
	(0.006)	(0.005)	(0.010)	(0.014)
Total Asset (£mils)	-0.002	-0.002	-0.001	-0.141*
	(0.003)	(0.005)	(0.002)	(0.079)
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: This table reports the regression coefficients based on equation (1). The dependent variables are outcome indicators in obtaining 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. Depressed equals 1 if the SME was offered less than what was requested for external finance, and 0 otherwise. 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 of overall failure takes value of 1 if any of the three indicators equals to 1. The coefficients are estimated on the sample of firms that 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 clustered at firm level and reported in parenthesis.