Intertemporal income shifting and taxing owners of closely held businesses

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Abstract

[PRELIMINARY - WORK IN PROGRESS - PLEASE DO NOT CIRCULATE]

Owners of closely held businesses often receive favourable tax treatment and are highly responsive to the tax system. We show that the high responsiveness of owners of closely held UK businesses is entirely explained by intertemporal income shifting. Individuals shift income across years to smooth taxable income around tax kinks, but they also shift income to company liquidation, allowing them to access favourable capital gains tax treatment. Ignoring income shifting leads to an overestimate of the potential deadweight loss from taxing these individuals. Our results are informative about the avoidance costs associated with tax breaks offered to "entrepreneurs".

Keywords: income shifting, elasticity of taxable income
JEL classification: D12, D62, H21, H23
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1 Introduction

Many governments tax income earned through business ownership at lower rates than employment income, typically because owners of closely held businesses are thought to be entrepreneurial and important for economic growth. Previous research has shown that business owners are particularly responsive to tax, in large part because they have significant flexibility over which legal form to adopt (Mackie-Mason and Gordon (1997)) and can often switch between tax bases when withdrawing taxable income from their business (Gordon and Slemrod (2000)). In both the US and UK, owners of closely held businesses are important drivers of the aggregate elasticity of taxable income (ETI) (Adam et al. (2017), Saez (2010)); however, it is well known that when individuals can easily shift income across time and tax bases the ETI is no longer a sufficient statistic for the efficiency cost of taxation. Unpacking the mechanisms that these individuals use to respond to tax is therefore important for policy design. It is also informative about the costs that inevitably arise from tax avoidance and therefore about the trade-offs involved in favouring capital income over labour income.

The contribution of this paper is to decompose the ETI and show that the high responsiveness to tax of owners of closely held UK business is entirely explained by intertemporal income shifting. To do this we use a novel link between a panel of personal and corporate administrative tax records. UK tax rules incentivise business owners to operate through a company, which in turn provides flexibility over when to withdraw personal income from the company. Those with incomes that fluctuate around kinks in the nonlinear tax schedule can retain and withdraw profits from year to year to smooth their taxable income, and therefore their marginal tax rate, across time. Those able to retain profits within their company until liquidation can access a preferential capital gains tax rate. There is no evidence of owners adjusting total income created to respond to kinks in the tax system. Both forms of intertemporal shifting mean that the ETI is not a sufficient statistic for the efficiency cost of a marginal tax increase (see Slemrod (1995), Slemrod and Yitzhaki (2002)). We use a simple model to derive and estimate the statistics that are sufficient in this setting. We also consider the implications of the observed forms of avoidance for tax design.

The taxation of business owners is of growing interest, in part because business owners are a fast growing group. Since 2008, around 40% of the growth in the UK workforce has come from people working for their own businesses, rather than as employees of others' businesses. Growth in incorporation has been outstripping UK employment growth since the early 1990s and has been seen across many European countries. In many countries this is driven to a substantial degree by tax motivated moves from the personal to the corporate tax base (de Mooij and Nicodème (2008)). US tax incentives mean that owners of closely held businesses have a strong incentive to operate as a "pass-through" entity rather than being taxed as a corporation. The number of such entities has grown substantially in recent decades and has been linked to a rise in income inequality – 40% of the growth in the US top 1% income share since 1980 is due to pass-through business income (Cooper et al. (2016)).

Owners of closely held businesses have been shown to be highly responsive to the tax system. These individuals have much more control over their labour supply, which reduces the attenuating effect that adjustment costs have on observed labour supply elasticities (Chetty et al. (2011)). However, they also have more scope to adjust the timing and form of their taxable income to avoid paying higher rates of tax (le Maire and Schjerning (2013)), and the lack of third party reporting means that they have more scope for evasion (Kleven et al. (2011)). A common approach to measuring responsiveness to the tax system is to estimate the ETI (see Gruber and Saez (2002)). Part of the reason for the popularity of the ETI is that, under certain conditions, the marginal welfare change from raising the income tax rate can be expressed purely as a function of the ETI (Feldstein (1995, 1999)), sidestepping the need to separate out all the different margins of response.[1] However, this sufficiency breaks down if there are spillovers to other tax bases (see Slemrod (1995), Slemrod and Yitzhaki (2002)), as is the case in our setting.

We require repeated observations of accurately measured total (at the business level) and taxable (at the personal level) income for owners of closely held businesses to unpack the relative importance of different mechanisms used by these individuals to respond to the tax system. This is only available via a

[1]It has also been used more widely, for example, Saez (2001) shows how earnings elasticities can be used to make inferences about the optimal progressive income tax schedule in the Mirrlees (1971) model.

new link between a panel of personal and corporate administrative tax returns. We show that bunching in annual taxable income implies an elasticity of taxable income of 0.2. Around half of this is due to short term shifting – the elasticity of average taxable income is 0.1. This remaining responsiveness is due to longer term, across base, shifting. There is no evidence of bunching in average total income, which suggests that owner-managers are not adjusting real activity (or the amount of income they create) to respond to the increase in the marginal rate at the kink. Our main results focus on behaviour around the higher rate threshold, an increase in the marginal tax rate of 20 percentage points, at approximately £40,000 p.a. We use two policy reforms – the introduction of a 50% top rate of tax, and withdrawal of the tax-free allowance for incomes above £100,000 in 2010/11 – to show robustness of our results; while taxable income is sensitive to changes in the marginal rate, total income does not respond.

When individuals can easily shift income across time and tax bases, the ETI is no longer sufficient to evaluate the deadweight loss or the revenue effects of changing tax rates. We use a simple model to illustrate individuals' incentives to respond to tax kinks when they have volatile incomes and the ability to shift across time and across bases. We build on the model developed by le Maire and Schjerning (2013), who extend the bunching framework developed by Saez (2010) in two important ways: (i) agents' incomes are subject to fluctuations that are outside their control, and (ii) they have the ability to shift income across tax years. We extend their model to allow for longer term income shifting by retaining of profits until company liquidation. We use the model to show that a weighted average of the elasticities of average total and average taxable income are sufficient for the efficiency cost of increasing the tax rate; this is an application of the formula derived by Chetty (2009a). Using this expression results in a much lower estimate of the deadweight loss, compared with using the elasticity of annual taxable income that is more commonly used.

An additional reason to unpack the response mechanisms underpinning the ETI is that it is well known that the ETI depends on the institutional environment. A large ETI may be driven by lots of opportunities for avoidance. Piketty et al. (2014) notes that, "A large tax-avoidance elasticity e_2 is a symptom of a poorly designed tax system." However, it is worth noting that although shutting down opportunities to avoid taxes could lead to welfare and

revenue gains, some mechanisms used for tax avoidance may also be used to produce desirable outcomes. We show that around half of the responsiveness of closely held business owners' taxable income to the higher rate tax threshold is driven by people around the kink bunching to smooth their taxable income. The incentive to shift year-to-year to smooth taxable income across a tax kink is only there for individuals whose incomes fluctuates around the kink. This mechanism ensures that people with volatile incomes are not penalized by the progressive tax schedule.

Conversely, we show that the remaining response is driven by people retaining profits to take advantage of lower tax rates on company liquidation. This incentive exists for all individuals with a total income in excess of the higher rate threshold. It is less clear that this is a desirable feature of the tax system. One of the explicit justifications for policies that more lightly tax business income taken out on liquidation (or at least not immediately) that it encourages investment. We show that there is no evidence that individuals who retain more in the company to bunch at kink points engage in more investment. We do not attempt to quantify the benefits from the UK's Entrepreneur's Relief – a preferential 10% rate of capital gains tax available to business owners. Doing so would also require understanding of how this tax break affects the number of businesses started and, ideally, the spillovers associated with additional activity. However, our results suggest that there is a potentially large revenue cost due to the tax avoidance facilitated by Entrepreneurs' relief, and little evidence it encourages investment among people already incorporated. We use the kink at thresholds to estimate the importance of longer-run shifting locally, but it is important to note that individuals potentially far above the kink may, at least partially, use this mechanism. We find that higher income individuals retain a greater proportion of income in their company: retained profits are almost 40% of total income for individuals with total income in excess of £100,000. This is informative about how the benefits of tax avoidance vary with the income distribution.

The rest of the paper is structured as follows. In the next section we describe the institutional setting and tax incentives faced by closely held business owners. In Section 3 we set out a simple stylized model that extends the Saez (2010) bunching model to account for volatile incomes and the ability of agents to shift income across tax years. In Section 4 we present our empirical results. A final section concludes and discusses the implications for policy.

2 Institutional setting

In this section we describe our population of interest – closely held business owners – and the tax incentives that they face. Our interest is in the individual and the decisions that he/she makes. The tax system treats an individual and the company that they work for as two distinct entities. Getting a complete picture of the behaviour of these individuals has historically been difficult because data is recorded separately for these two entities: corporate tax records contain information on the company, and personal tax records contain information on the taxable income of the individual. In this paper we have access to data that links the corporate and personal tax records, which is crucial if we want to better understand how these individuals respond to tax.

2.1 Organizational forms

Business owners can choose to operate as either an incorporated or unincorporated business owner; these organizational forms face different tax treatment. Although differences in tax treatment vary across countries, one fairly common feature is that business assets are often subject to lower rates of capital gains tax, often with an explicit policy goal to incentivise business owners. Another important feature is whether income is taxed at the personal level in the year it flows into the company (as is the case with pass-through treatment), or whether the individual can retain income in the company in order to shift personal taxable income over time. To date, the ability to adjust the timing of personal taxable income withdrawals has been less important for US business owners, who overwhelmingly choose to operate in a tax-advantaged pass through form (S-corps), although this may change if the Tax Cuts and Jobs Act leads more business owners to choose to operate as C-corps.[2].

In this paper we focus on the behaviour of owners of closely held *incorporated* businesses i.e. "owner managers". This population have grown rapidly over the previous decade and they have more flexibility in how they can respond to the tax system than the unincorporated self-employed.

[2]The recent US tax changes have reduced the tax differential between S and C-corps owners. It is possible that the additional timing flexibility offered to C-corps owners encourages movement to this form

Company owner-managers

A company owner-manager is an individual who works for an incorporated business (a company) in which they are also a controlling shareholder. Their economic activity produces revenue for the company. After deducting allowable costs (including some investment costs and the remuneration costs of any employees) and the wage that she chooses to pay herself, she is left with corporate profit. This profit is subject to corporation tax, after which she can withdraw dividends, which are taxed again at the personal level or choose to retain profits in the company. Profits can be used (e.g. for investment) or withdrawn as dividends in later years. If the owner chooses to liquidate or sell part or all of the company, she will face capital gains tax on the difference between the initial investment and final value of the shares.

The timing of tax due is important in this setting. On both the corporate and personal side, the tax is only due in the year in which the relevant entity receives the income. This means that corporation tax is paid in the year in which the company makes profits, and personal taxes on wages, dividends and capital gains are due only when income is withdrawn from the company and paid to the individual. This creates an incentive to retain profits in the company to smooth personal taxable income over time and reduce the total tax liability.

Self-employed sole proprietorships

In the UK, the majority of individuals working for their own business choose to be self-employed (running an unincorporated business) rather than a company owner manager. Unlike owner-managers, their opportunities for shifting income across time are more limited. Self-employed profits are taxed in the year they are earned at personal income tax rates. While the self-employed may be able to invest in plant and machinery to shift income across time, this is more difficult than the opportunities afforded to owner-managers through the use of retained income. In our empirical analysis we compare the importance of intertemporal shifting as a response mechanism for the self-employed with company owner managers.

Given the tax advantages of operating as an owner manager, it may be surprising that more self-employed individuals do not incorporate more often. This will be partially explained by the additional burden imposed by filing

company accounts that likely does not outweigh the tax benefit to owner-management at relatively low levels of income. Furthermore, certain industries, such as accountancy and legal services, tend to operate as partnerships (and are taxed under the self-employed regime) for both historical and practical reasons.

2.2 Data

We use administrative tax records for company owner-managers in the UK, made available by Her Majesty's Revenue Customs (HMRC). We have access to a new link between the personal tax records of the owner-managers and the corporate tax records of their companies. We also have access to the company accounts, which contains information on the company's ownership, assets, liabilities and financial position. These three data sources provide a much more complete picture of the behaviour of individuals who run their own incorporated businesses that has previously been available.

We use two concepts of income in the rest of the paper. We define *annual total income* as the maximum amount of a given year's income that the individual could withdraw from the company in that year, after deducting allowable costs. This is measured as the corporate profits of the company, which is recorded in the corporate tax records, and the wage paid to the owner-manager, which is recorded in the personal tax records. We define *annual taxable income* as the amount of income that the individual chooses to withdraw from the company in a given year. This is measured as the wage the individual pays herself, plus dividend income. The difference between annual total income and annual taxable income is *retained income (or profits)*. This can be negative if an individual chooses to withdraw earnings that were retained in previous years (thereby increasing taxable income at the personal level above the total amount earned in that year). Annual taxable income is recorded in the personal tax records of the owner-manager; we construct the annual flow retained profits by subtracting annual taxable income from annual total income.

Our main analysis focuses on companies with a single director who is also the sole shareholder and employee. The personal and corporate tax records are matched for the 2012-13 tax year, with histories for both the individual and the company spanning 2005 to 2015. On average, owner-managers are in the

sample for 4 years. The match rate of single director-shareholder companies in the firm accounts data with the personal tax records of their owner-manager is 60%; according to the HMRC, who carried out the match, the less than 100% match is effectively random.

Table 2.1: *Summary statistics of one director, one shareholder businesses*

Variable	Mean	SD
Corporate profit (£)	18,150.4	32,389.3
Firm age (years)	4.0	3.8
Shareholders' funds (000s £)	19.4	68.7
Total assets (000s £)	78.8	195.6
Have positive capital allowances?	0.41	–
Capital allowances/pre-tax profit	0.21	–

Notes: Shown for the 2013-14 tax year.
Source: Calculations based on HMRC administrative datasets.

Table 2.2: *Industry shares*

Industry	Share of owner managers
Retail & hotels	0.16
Construction	0.11
Washing and dry cleaning	0.07
Publishing (software & other)	0.11
Legal activities	0.30
Real estate	0.04
Transport	0.03

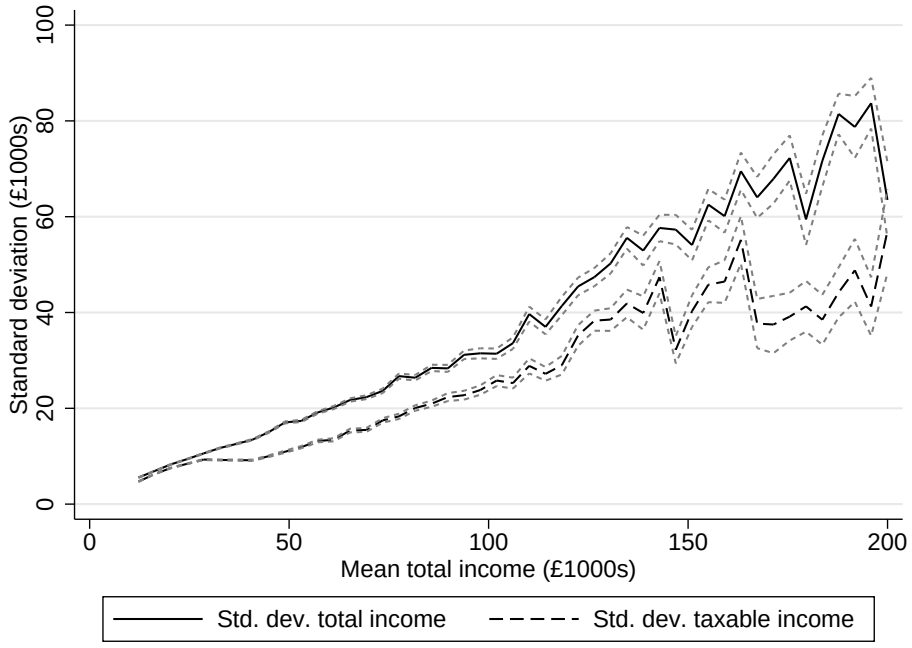
Notes: Shown for the 2013-14 tax year.
Source: Calculations based on HMRC administrative datasets.

Table 2.1 presents summary statistics on one director, one shareholder businesses. Average corporate profit is roughly £18,000 in the tax year 2013-14, but there is substantial variation in this. On average, shareholders' funds, which is a measure of the value of the company (assets minus liabilities), is just under £20,000 but again, there is large variation in this. Less than half (41%) use capital allowances (deductions for investment on plant and machinery); capital allowances are, on average, 21% of pre-tax profits. However, there is variation across industry in the use of capital allowances – some industries such as publishing and legal activities (e.g. consultancies, accountancy) are much less investment intensive, with only 12% of owner managers in these industries

reporting positive capital allowances. Table 2.2 shows that a substantial share (41%) of owner managers are located in these two industry types.

The incomes of individuals who run their own businesses are more volatile than those who work as employees in businesses run by others. Figure 2.1 shows the within-individual across-time standard deviations in total and taxable income against the individual's mean total income. There is greater volatility in the incomes of individuals with a higher average income. Taxable income is less volatile than total income: on average, the standard deviation of taxable income is roughly 20% of the mean of total income, while the standard deviation of total income is around 40% of the mean of total income. The magnitude of these income fluctuations, and the fact that taxable income is much less volatile than total income, is in line with data on the Danish self-employed in le Maire and Schjerning (2013). Fluctuations in total income provide an incentive for individuals to retain income in the firm to smooth their taxable income, and hence their marginal tax rate, over time.

Figure 2.1: *Volatility of average taxable and total income*



Notes: Horizontal axis show the mean total income of individuals over the period in which they are in the sample; the vertical axis plots the average standard deviation of total and taxable income, conditional on each level of mean total income.
Source: Calculations based on HMRC administrative datasets.

2.3 Tax incentives

Operating as a company owner-manager is the most tax advantaged legal form in the UK. Taxation of dividends (at the personal and corporate level combined) is lower than personal taxes on wage income or self-employed profits. Furthermore, being an owner-manager provides additional benefits, such as the ability to retain profits in the company and thus smooth taxable income over time.[3] In this section, we focus on tax incentives as they apply to company owner-managers (our group of interest), while briefly comparing these incentives to those faced by the self-employed (owners of unincorporated businesses).

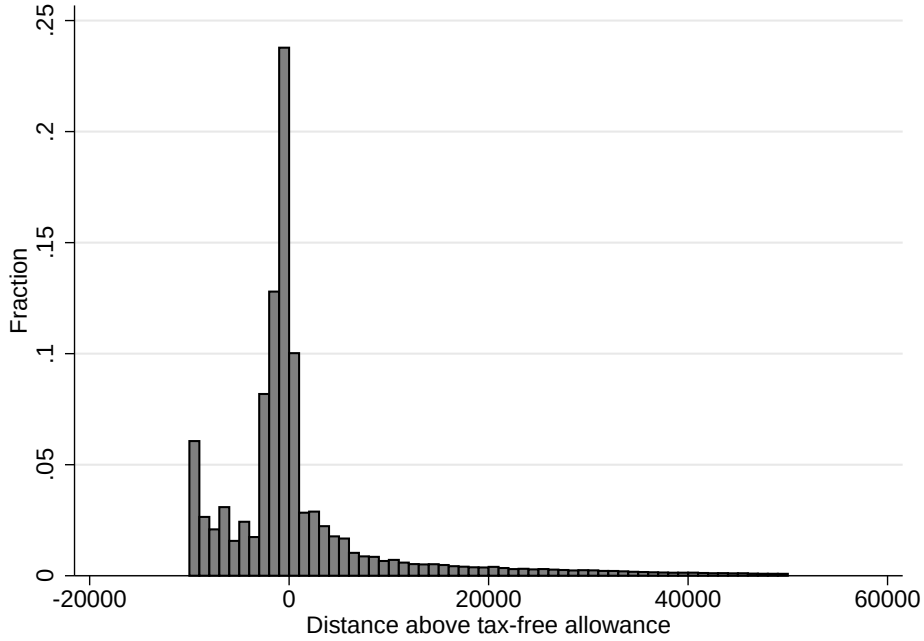
Personal tax incentives

The structure of the personal income tax system was broadly stable over our time period. In every year, the tax minimising way for an owner-manager to take income out of the company in a given year involved taking a wage close to the personal allowance (the level at which the marginal income tax rate increases above zero) and withdrawing the remainder through dividend income.[4] Figure 2.2 shows the distribution of wage income around the personal allowance: a large proportion of individuals in our sample follow this optimal strategy, paying themselves a wage equal to the personal allowance, and paying themselves dividend income above this point.

[3]For a full discussion of the different treatment of legal forms, see Adam et al. (2017). There are laws that seek to prevent genuine employment (i.e. where there is a contract of employment between an individual and a third party) being disguised as a more tax advantaged legal form (IR35 rules). While this constrains who can incorporate for tax purposes, there will remain some one person companies where the owner looks more like am employee than a business owner.

[4]Precisely, the optimal wage level is the point at which the marginal personal tax rate (including income tax and National Insurance Contributions (NICs)) exceeds the corporate tax rate. The National Insurance system operates with slightly different thresholds to the income tax system, which means that the optimal wage in most years is equal to the primary thresholds, the point at which employee NICs becomes payable.

Figure 2.2: *Distribution of wage earnings for company owner-managers*



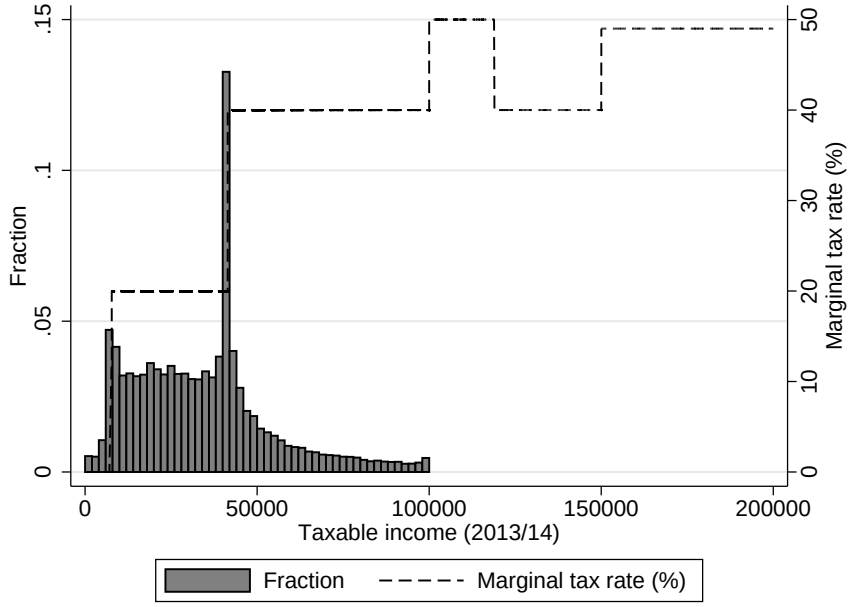
Notes: Wage earnings are reported employment income for individuals in our sample over the period 2001-2016.
Source: Calculations based on HMRC administrative datasets.

In Figure 2.3 we plot the marginal rate schedule for personal income (accounting for taxes at the corporate and personal level) in 2013/14 for an individual who follows the optimal withdrawal policy. Dividends attract an effective 0% marginal rate at the personal level (and 19% corporation tax at the corporate level, assuming the total profits of the company are below 300,000) below the higher rate threshold. Above that threshold, dividends attract a 25% marginal rate at the personal level (and incur the same corporate liability), creating a large convex kink in the tax schedule. Since the 2010/11 tax year, additional marginal rate bands were created at £100,000 and £150,000 (fixed in nominal terms).[5] The exact position of the thresholds in the personal tax system and the rates in the personal and corporate systems have changed over time, but the shape of the schedule and the incentives over how to take income have been stable over our period of observation.

[5]The non-convex nature of the schedule between £100,000 and £150,000 is a result of a policy that withdraws the personal allowance above £100,000: an individual loses 50p of personal allowance for every £1 she earns above £100,000 until the personal allowance has been reduced to zero.

These kinks introduce incentives for individuals to bunch at the thresholds. Figure 2.3 also plots the distribution of taxable income in 2013/14. There is strong evidence of bunching at the higher rate threshold, with many individuals choosing a taxable income that places them at the kink point. One of the objectives of this paper is to understand what mechanisms individuals are using to locate at the kink. We truncate the distributions above £100,000 for data disclosure reasons, however there is evidence of bunching at these kinks. In the appendix we show the distribution of taxable income in each year of our sample (2005/6 – 2015/16).

Figure 2.3: *Distribution of taxable income for company owner-managers, 2013/14*



Notes: For a description of the tax systems, see the text. Distributions truncated above £100,000 due to data disclosure requirements.
Source: Calculations based on HMRC administrative datasets.

The personal tax system described above relates to the withdrawal of income from the company in the form of dividends or wages. A different system applies when an individual chooses to sell their company or liquidate the shares on company dissolution. At this point, any retained earnings are subject to capital gains tax at the personal level. In almost all cases, capital gains tax rates faced by owner-managers are lower than dividend tax rates

when income is above the higher rate threshold.[6] However, rates are higher than those levied on dividend income below the higher rate threshold. Up to 2007, capital gains above an exempt amount (around £8,000) were taxed at marginal income tax rates, but business assets were subject to taper relief which reduced the liability by up to three quarters if the asset had been held for a sufficient period of time (more than two years from 2002 onwards). After 2007, rates were reduced below marginal income tax rates and taper relief was replaced by Entrepreneurs' Relief, which applied a reduced rate of 10% to the first £1 million of qualifying gains in a lifetime. Most owner-managers' gains will qualify. The lifetime limit was steadily extended, up to £10 million after 2011. These reductions in capital gains tax have increased the incentive for individuals to retain income in the company and to realise them on sale or dissolution.

Corporate tax incentives

Corporate taxable profits are calculated, broadly, as annual revenue net of allowable deductions, the most notable of which are employees' costs (including wages, employer NICs and pension contributions) and capital allowances. Incentives at the corporate level were stable for the majority of our time period. Companies with profit below £300,000 faced a flat corporation tax rate (between 19% and 21%).[7] Individuals do bunch below the £300,000, but only a small fraction of individuals have total income near this threshold. The corporate tax schedule thus does not affect the incentives for individuals to adjust their salary or dividends over time.

An important feature of the corporate tax system is how investment, or capital spending, is deducted from company revenue in order to calculate corporate profits. Capital allowances determine how quickly investments in different assets can be deducted from revenue. Broadly, the main capital allowance regime is supposed to mimic economic depreciation, but throughout this period smaller companies faced a more generous regime (at least for certain assets). Until 2008 plant and machinery investments were subject to a

[6]The capital gains rate on business assets above the higher-rate threshold would be higher than the dividend tax rate only if the business was sold before 2002 and the individual had owned the business for less than three years.

[7]Above this level there was a marginal rate scheme in place that increased the rate from the Small Profits' Rate to the main rate, which varied from 25% to 30%.

first year allowance, which doubled the allowable deduction to 40% in the first year for SMEs. After 2008, first year allowances were replaced by an Annual Investment Allowance (AIA), which allowed between £25,000 and £500,000 (depending on the year) of plant and machinery to be fully deducted from profits. Kinks in the personal and corporate tax schedules can affect choices over when to make tax deductible investments. A firm looking to undertake genuine business investment has a greater incentive to do so in a year in which profits are taxed at a higher rate (i.e. above a kink in the corporate tax schedule) because capital allowances are more valuable as a tax shield at this point. This would be one mechanism through which taxable income is shifted over time and may lead to bunching at corporate tax kinks.

Another possible use of capital allowances is as a means of avoiding or evading the tax due on personal use assets. An owner-manager may, for example, purchase a laptop for personal use but claim it as a business expense. Under the AIA this allows the asset to be purchased out of income that is untaxed at either the corporate or personal level. Owner-managers face an tax incentive to do this (subject to anti-avoidance and evasion rules) regardless of their level of income, although it may be particularly attractive if it allows total annual income to be brought below a kink in the corporate tax system. Brockmeyer (2014) shows that companies used investment, especially in fast depreciating assets, in response to the £10,000 kink in the tax schedule in the early 2000s.

In our empirical analysis, we investigate whether individuals who systematically retain more income in their companies, due to the incentives created by the tax system, invest more. This is informative about whether one of the stated aims of lighter capital gains tax treatment for business income (i.e. to encourage investment) is achieved in practice.

Other tax incentives

Owner-managers may also have other opportunities to reduce their tax liability. As with employees, they are able to save in pensions, which are a tax advantaged form of saving. The downside of this form of saving is its inflexibility: while retained earnings in a company can be withdrawn at any time, pension pots can only be accessed when the individual reaches retirement age. The corporate form also creates an opportunity to split income with a spouse

or other family member. If the spouse has low earnings, making the spouse an equal shareholder means more income can be withdrawn from the company at lower marginal rates (the UK taxes personal income on an individual rather than joint basis). Our focus on one director, one shareholder companies means that this mechanism is not available to the owner managers in our sample, but in future work we plan to identify spouses using ownership information from company accounts and investigate the behaviour of married co-owners.

3 Model

In this section we describe a stylized model we use to decompose the bunching response of owner-managers into various mechanisms used. We build on the dynamic extension to the Saez (2010) bunching formula developed by le Maire and Schjerning (2013). The Saez (2001) model links the observed bunching of individuals at kinks in the tax schedule to the elasticity of taxable income, which is a sufficient statistic for the deadweight loss of a marginal tax change. The le Maire and Schjerning (2013) extension incorporates two features that we think are of first-order importance for company owner-managers: (i) the ability to shift taxable income across years, and (ii) volatility in income that is outside of the individuals' control. We add to this model the ability of individuals to shift taxable income to company liquidation, which is a potentially important response mechanism for company owner-managers.

3.1 Set-up

An agent (owner-manager) works during multiple periods, indexed $t = 1, \ldots, T-1$, and in a final period, T, she does not work and liquidates the company. We assume that the liquidation decision is exogenous. In each period, $t = 1, \ldots, T-1$ she exerts effort, e_t, at a utility cost, $\psi(e_t)$ (where $\psi(\cdot)$ is continuously differentiable increasing function; $\psi(\cdot) \geq 0$ and $\psi'(\cdot) \geq 0$). Total income, $z_t = e_t + \eta_t$, earned in each period is directly affected by her effort choices, but also by mean zero income shocks, $\eta_t \sim G$ (we assume that the distribution of η_t is bounded). We define z_t to be net of capital and labour costs; we consider below an extension in which agents can choose investment.

In each period, the agent also chooses taxable income, $y_t = z_t - r_t$, where r_t denotes the flow of profits retained in the firm. Effort and retention choices

are made after learning the value of this period's shock, η_t. It is the ability to retain profits that introduces a wedge between total and taxable income. Let $R_t = \sum_{s=0}^{t-1} r_t$ denote the stock of retained profits in period t. At company liquidation, the agent withdraws all remaining retained profits, $y_T = R_T = -\sum_{s=0}^{T-1} r_t$. We impose the restriction that the stock of retained profits is always weakly positive, $R_t \geq 0$, for all t. We also assume that there is some cost to the agent of shifting income to liquidation, $\phi(R_T)$ (where $\phi(\cdot)$ is continuously differentiable increasing function; $\phi(\cdot) \geq 0$ and $\phi'(\cdot) \geq 0$).

During firm life (i.e. $t = 1, \ldots, T-1$), the agent faces a progressive piecewise linear tax schedule with a kink at y^*. The tax levied on income y_t is:

$$\mathcal{T}(y_t) = \tau_0 \min(y_t, y^*) + \tau_1 \max(y_t - y^*, 0) \tag{3.1}$$

i.e. taxable incomes below y^* are taxed at a low marginal rate τ_0, and taxable income above y^* is taxed at a higher marginal rate, τ_1. There is a different tax system in the final liquidation period, capturing the fact that the capital gains tax rate, τ_k applied to income withdraw on company liquidation is lower than τ_1:

$$\mathcal{T}_L(y_T) = \tau_k y_T \tag{3.2}$$

where $\tau_k \in [\tau_0, \tau_1)$. Note that the marginal rate paid on taxable income below y^* is τ_0 in both firm life and liquidation. The marginal tax rate functions are defined as:

$$\mathcal{T}'(y_t) = \begin{cases} \tau_0 & \text{if } y_t < y^* \\ [\tau_0, \tau_1] & \text{if } y_t = y^* \\ \tau_1 & \text{if } y_t > y^* \end{cases}, \qquad \mathcal{T}'_L(y_T) = \tau_k$$

We assume that agents derive utility that is quasilinear in taxable income, minus effort costs, $\psi(e_t)$, and shifting to liquidation costs, $\psi(R_T)$, and we abstract from discounting within company life (the function $\phi(\cdot)$ can be interpreted as partly capturing the discounting associated with shifting income to company liquidation). We assume that agents use the ability to shift income intertemporally as a way to reduce tax liability, and that they have other savings vehicles available at the personal level, once they have withdrawn taxable income from the company.

3.2 Solution

The agent's problem is to maximise the sum of expected utility over the company life by choosing effort and retained profits in each period:

$$\max_{\{e_t,R_t,\}_{t=1}^{T-1},R_T} \mathbb{E}\left\{\sum_{t=1}^{T-1}(y_t - \mathcal{T}(y_t)) - \psi(e_t) + R_T(1-\mathcal{T}_L(R_T)) - \phi(R_T)\right\} \quad (3.3)$$

$$s.t. \quad y_t = e_t + \eta_t - r_t,$$

$$R_{t+1} = \sum_{s=0}^{t} r_s \geq \underline{R}, \qquad R_T = \sum_{t=1}^{T} r_t, \qquad r_t = R_{t+1} - R_t$$

which yields the following first order conditions:

$$\frac{\partial \mathcal{L}}{\partial e_t} = (1 - \mathcal{T}'(y_t)) - \psi'(e_t) = 0 \quad (3.4)$$

$$\frac{\partial \mathcal{L}}{\partial R_{t+1}} = -(1 - \mathcal{T}'(y_t)) + \mathbb{E}_t[(1 - \mathcal{T}'(y_{t+1}))] + \lambda_t = 0, \qquad \forall\ t < T-2 \quad (3.5)$$

$$\frac{\partial \mathcal{L}}{\partial R_T} = \mathbb{E}_t[-(1 - \mathcal{T}'(y_{T-1})) + \lambda_{T-1} + (1 - \mathcal{T}'_L(R_T)) - \phi'(R_T)] = 0 \quad (3.6)$$

where λ_t is the Lagrange multiplier on the constraint that $R_{t+1} \geq \underline{R}$, where $\underline{R}$ is some borrowing limit. We focus on the case in which this constraint does not bind, therefore $\lambda_t = 0$ for all $t < T-2$. This is motivated by the fact that owner managers can use "directors' loans" to effectively borrow in order to withdraw higher more income today, and pay it back into the company tomorrow. Expectations are taken at time t over the distribution of possible future income shocks, η.

Condition (3.5) states that agents choose effort and retained profits today, such that the tax rate today equals the expected tax rate tomorrow.[8] This condition implies that if the agent chooses $\{e_t, R_{t+1}\}$ such that $y_t < y^*$, then they must expect to locate strictly below or at the kink tomorrow ($y_{t+1} \leq y^*$). Conversely, if the agent chooses $\{e_t, R_{t+1}\}$ such that $y_t > y^*$, then they must

[8]The expected tax rate in $t+1$ is:

$$\mathbb{E}_t[\mathcal{T}'(y_{t+1})] = \begin{cases} \Pr[y_{t+1} < y^*]\tau_0 + \Pr[y_{t+1} > y^*]\tau_1 & \text{if } \Pr[y_{t+1} = y^*] = 0 \\ [\tau_0, \tau_1] & \text{if } \Pr[y_{t+1} = y^*] > 0 \end{cases}$$

i.e. it is a convex combination of the low and high tax rates, weighted by the probability that taxable income is above or below the kink next period. If there is positive probability that taxable income will be set equal to the kink, then the expected tax rate can take any value between τ_0 and τ_1.

expect to locate strictly above or at the kink tomorrow ($y_{t+1} \geq y^*$). Finally, if they locate at the kink today ($y_t = y^*$), this is consistent with an expected tax rate in the range $[\tau_0, \tau_1]$, and therefore that taxable income tomorrow could be above, below or at the kink. The intuition for this result is that it is not optimal for agents to locate strictly below the kink in period t and expect to locate strictly above in the next – given the assumption that there is no cost to shifting income across periods, they would be better off by locating at the kink in period t.

As well as shifting income across years within company life, some agents have an incentive to adjust their effort choices and shifting income to liquidation in response to the changes in the marginal rate at y^*. This creates an incentive for some individuals to bunch by either reducing how much effort they exert, on average, or by retaining profits to withdraw on company liquidation. Whether agents do this depends on their ability, ψ', their shifting costs, ϕ', and also the path of income shocks they receive over the life of their company. We illustrate this using simulations below.

3.3 Sufficient statistics analysis

Agents' ability to costlessly shift income across years within company life, and also to shift income to company liquidation, on which tax is paid (albeit at a lower rate), has implications for welfare calculations. Chetty (2009b) shows how when there is shifting across tax bases (or, in our case, across tax bases and within-base across years), the elasticity of taxable income is not sufficient to evaluate the deadweight loss of a tax increase.

Following the literature, the conceptual experiment that we consider is a marginal increase in the higher rate of tax, τ_1 by $d\tau$. Revenue is assumed to be redistributed lump sum to agents. Social welfare is therefore defined as the sum of agents' expected lifetime utilities (which is money metric given the quasilinear form of utility):

$$W(\tau) = \frac{1}{T}\mathbb{E}\left\{\sum_{t=1}^{T-1}(y_t - T(y_t)) - \psi(e_t) + R_T(1-\tau_k) - \phi(R_T) + \sum_{t=1}^{T-1} T(y_t) + \tau_k R_T\right\} \tag{3.7}$$

where expectations are taken over the possible stream of income shocks.

Taking the derivative with respect to τ yields:

$$\frac{\partial W}{d\tau} = \frac{1}{T}\mathbb{E}\left\{\sum_{t=1}^{T-1}\left(\frac{\partial z_t}{\partial \tau}(1-\psi'(e_t))\right) + (-\phi'(R_T))\frac{\partial R_T}{\partial \tau}\right\}$$

where we note that the envelope conditions imply that $(1-\psi'(e_t)) = \mathbb{E}_t[T'(y_t)]$. Note also that the envelope conditions imply that agents in every period face the same marginal tax rate or are located at the kink. Otherwise there are gains from reallocating income across periods. This means we can divide agents into three sets: those whose optimal choices imply that taxable income is always at or below y^*, and those whose optimal choices imply that taxable income is always at y^*, and those whose taxable income is always at or above y^*. Since we are considering a marginal increase in τ_1, this only affects the behaviour of the latter group. This means that:

$$\begin{aligned}
\frac{\partial W}{d\tau} &= \frac{1}{T}\mathbb{E}\left\{\sum_{t=1}^{T-1}\tau_1\left(\frac{\partial z_t}{\partial \tau}\right) - \phi'(R_T)\frac{\partial R_T}{\partial \tau}\right\} \\
&= \mathbb{E}\left\{\tau_1\left(\frac{\partial \frac{1}{T}\sum_{t=1}^{T-1} z_t}{\partial \tau}\right) - \phi'(R_T)\frac{\partial \frac{1}{T}\sum_{t=1}^{T-1}(z_t - y_t)}{\partial \tau}\right\} \\
&= \mathbb{E}\left\{\left(\frac{\partial \bar{z}}{\partial \tau}\tau_k\right) + \phi'(R_T)\frac{\partial \bar{y}}{\partial \tau}\right\}
\end{aligned}$$

i.e. the expected deadweight loss is proportional to the responsiveness of average total income over the lifetime and average taxable income over the lifetime. This is a direct application of the formula derived by Chetty (2009b) but with the elasticities of total (which he refers to as "earned") and taxable income replaced with the elasticities of average total and average taxable income:

$$\frac{\partial W}{d\tau} = \mathbb{E}\left\{-\frac{\tau_1}{1-\tau_1}[(1-\mu)\bar{z}\epsilon_{\bar{z}} + \mu\bar{y}\epsilon_{\bar{y}}]\right\} \tag{3.8}$$

where $\epsilon_{\bar{z}} = -\frac{\partial \bar{z}}{\partial \tau}\frac{(1-\tau_1)}{\bar{z}}$ and $\epsilon_{\bar{y}} = -\frac{\partial \bar{y}}{\partial \tau}\frac{(1-\tau_1)}{\bar{y}}$, and $\mu = \frac{\phi'(R_T)}{\tau_1}$ denotes the fraction of the total cost of avoidance accounted for by resource costs. The larger the difference between the τ_1 and τ_k, the more weight is placed on the responsiveness of taxable income. In the limit, if the tax rate τ_k is equal to zero, then the elasticity of average taxable income is sufficient for the efficiency cost of raising τ_1. This is because shifting does not create any spillovers to other tax bases that need to be taken into account.

We estimate the elasticities of average taxable and total income using reduced form bunching methods, described in Section 4.

3.4 Simulations

To provide some intuition for agents' behaviour, we simulate a simplified version of the model set out above. We assume that there are only 3 periods; periods 1 and 2 constitute company life, in which the agents choose work effort and retained profits, and the final period they take out profits shifted to liquidation. To simplify things, we assume that in period 1 agents receive the shock η, and in period 2 they receive $-\eta$; in period 1 they foresee the value of the shock in period 2. Although this simplifies the simulations of the model, the results derived above do not depend on it; as discussed, the incentive remains for agents to bunch at kink points intermittently in order to ensure that their expected marginal tax rate over time remains constant. They also have incentives to adjust effort and shifting to liquidation given this expected marginal tax rate, ability, shifting costs, and their income shocks.

We assume the following functional forms for effort and shifting costs:

$$\psi(e_t) = \frac{1}{\gamma^{1/\varepsilon}} \frac{e_t^{1+1/\varepsilon}}{1+1/\varepsilon}, \qquad \phi(R_t) = \alpha_0 R_t + \frac{1}{2}\alpha_1 R_T^2$$

which means that optimal effort choice when facing linear tax rates τ_0 is $\bar{e}^0 = \gamma(1-\tau_0)^\varepsilon$, and when facing τ_1 is $\bar{e}^1 = \gamma(1-\tau_1)^\varepsilon$.

We define three sets of agents, based on their ability, γ. Low ability agents, those with $\gamma < \gamma_L = \frac{y^*}{(1-\tau_0)^\varepsilon}$ are unaffected by the kink. The optimal policy for these agents in periods 1 and 2 is as follows. In period 1, if the income shock, η, means that total income exceeds y^*, retain any excess until the next period, $r_1 = \max\{0, \bar{e}^0 + \eta - y^*\}$. In period 2, withdraw $z_2 = \bar{e}^0 - \eta$ and any retained profits from the first period. This means that taxable income is $y_2 = 2\bar{e}^0 = y^* \leq y^*$, because $\bar{e}^0 \leq y^*$ by definition of these agents. Therefore, agents shift and withdraw income over the two periods to smooth shocks to total income, but do not retain any profits to company liquidation (because there is any associated cost, ϕ), nor do they have any incentive to reduce effort (which is set optimally on the basis they face τ_0 in both periods).

Mid ability agents, those with $\gamma_L \leq \gamma \geq \gamma_H \frac{y^*}{(1-\tau_1)^\varepsilon}$, find it optimal to bunch in taxable income in both periods. However, whether they also bunch

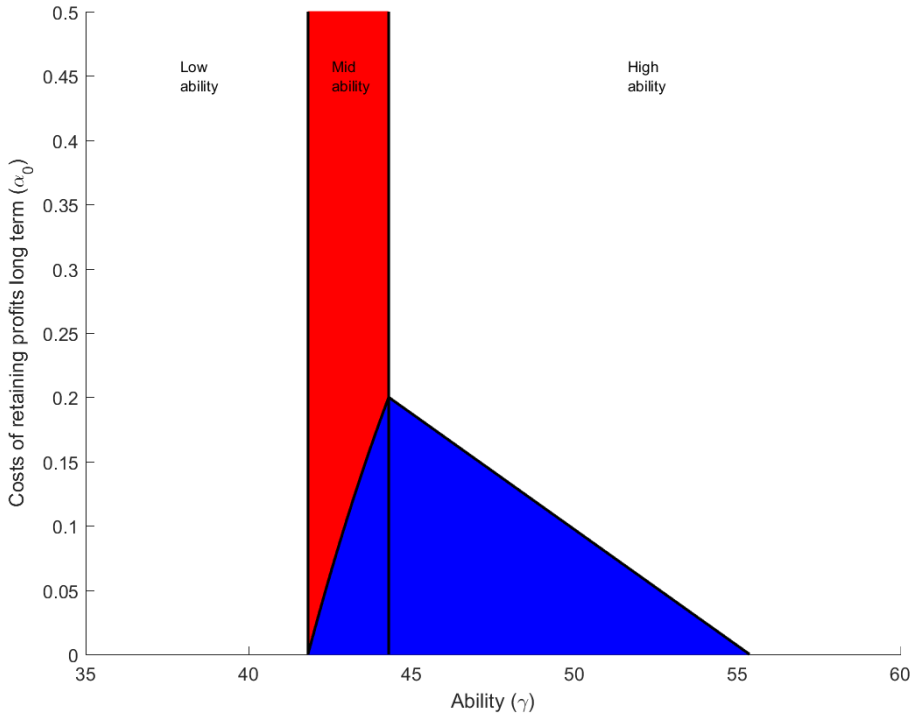
in average total income depends on the relative magnitude of their shifting costs, (α_0, α_1), and ability, γ. Figure 3.1 illustrates the combinations of (α_0, γ) (conditional on α_1) for which agents bunch in average total and taxable income (red area), and only in average taxable income (blue area). Intuitively, agents with higher shifting costs prefer to adjust their work effort in response to the increase in marginal rates at y^*. All else equal, a smaller value of ε, means that a smaller proportion of agents bunch in average total income.

Finally, high ability agents, those with $\gamma > \gamma_H$, do not bunch in average total income, but those with sufficiently low shifting costs retain profits in periods 1 and 2 to bunch in taxable income in both of these periods. Figure 3.1 shows that this depends on the how much the marginal cost of shifting increases with each additional pound retained, α_1. Smaller values of α_1 mean that agents of higher ability, all else equal, find it optimal to retain profits in order to bunch in taxable income in periods 1 and 2. It is also worth noting that agents for whom $\alpha_0 < \tau_0 - \tau_1$ optimally retain positive profits to liquidation, even if they do not necessarily bunch in taxable income in periods 1 and 2. It is also the case that high ability agents (even those who do not find it optimal to retain profits to liquidation) have an incentive to retain and withdraw in periods 1 and 2 to ensure the face the same marginal tax rate in both periods.

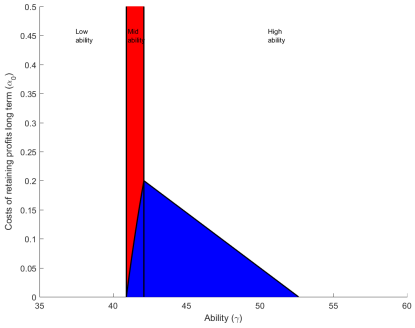
We simulate the model, given the optimal policy functions for agents, and draw the distributions of annual taxable and total, and average taxable and total income. Figure 3.2 plots these distributions. The existence of income shocks and the ability to short term shift create large differences in the distributions of different income measures. The most pronounced bunching can be seen in the distribution of annual taxable income: this consists of people shifting income across periods within company life, to liquidation, and reducing effort. No bunching is observed in the distribution of annual taxable income; this is because although some agents adjust effort to bunch in average total income, the η shocks mean that they do not bunch at the kink in any given year. Bunching in average taxable income is more pronounced than bunching in average total income; this is because the some agents bunch only in average taxable by shifting profits to liquidation.

Figure 3.1: *Simulations: optimal policy functions*

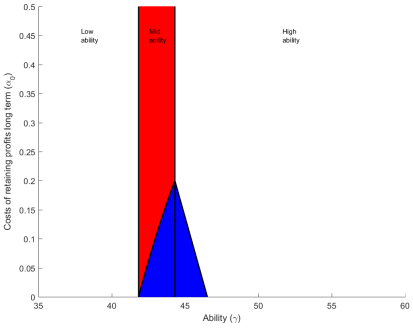
(a) $\alpha_1 = 0.01, \epsilon = 0.2$



(b) $\alpha_1 = 0.01, \epsilon = 0.1$



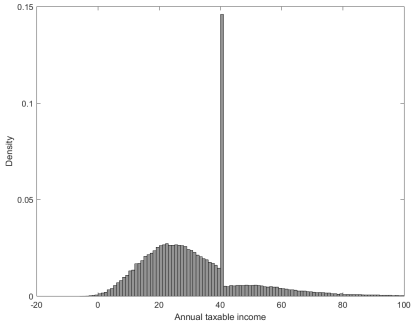
(c) $\alpha_1 = 0.05, \epsilon = 0.2$



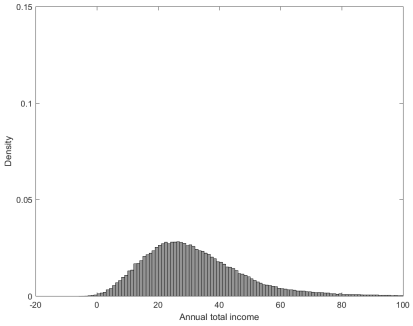
Notes: Simulations from the model described in the text, parameters: $\tau_0 = 0.2, \tau_1 = 0.4, y^* = 40$. *Values for* α_1 *and* ϵ *specified in the caption to each subfigure;* α_0 *varies along the vertical axis and* γ *varies along the horizontal axis in each figure. The red shaded area indicates combinations of* γ *and* α_0 *for which agents bunch in average taxable and average total income; the blue shaded area indicates combinations of* γ *and* α_0 *for which agents bunch in average taxable, but not average total income.*

Figure 3.2: *Simulations: bunching*

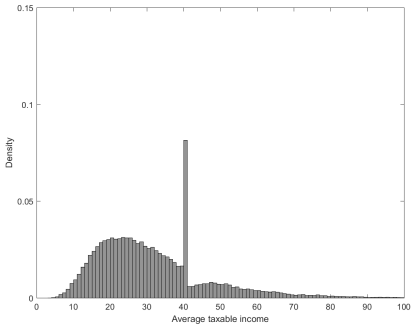
(a) Annual taxable income



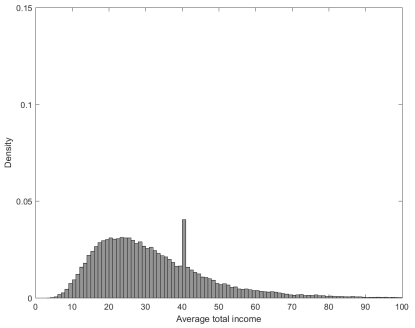
(b) Annual total income



(c) Average taxable income



(d) Average total income



Notes: Simulations from the model described in the text, parameters: $\tau_0 = 0.2, \tau_1 = 0.4, y^* = 40$*,* $\alpha_1 = 0.01$*,* $\varepsilon = 0.2$*.* $\alpha_1 \sim U[0, 0.3]$*,* $ln\gamma \sim \mathcal{N}(,)$*.*

4 Empirical analysis

In this section we present our empirical results. Our main results focus on behaviour around the higher rate threshold – an increase in the marginal tax rate of 20 percentage points at approximately £40,000. We show that we get similar results when we look at behaviour following policy reforms that introduced kinks at £100,000 and £150,000.

4.1 Quantifying the use of response mechanisms

We estimate the bunching mass, and corresponding elasticities, in the distributions of annual taxable, average taxable and average total income around kinks in the tax schedule.

Estimating the excess mass and elasticities

In order to estimate the excess mass due to bunching we need to estimate the counterfactual density in the absence of the kink. We estimate the bunching mass in annual taxable income, y_t, average taxable income, $\bar{y}$, and average total income, $\bar{z}$. Let x denote the income measure of interest. We follow Chetty et al. (2011) by fitting a flexible polynomial to the observed distribution of income, excluding observations in the a window, $[x_- = x^* - \delta, x_+ = x^* + \delta]$ around the threshold x^*. We account for the fact that individuals who bunch come from above the kink point by imposing the integration constraint that the area under the counterfactual distribution of earnings must equal the area under the empirical distribution. In practice, this involves increasing the excluded area above the threshold and repeatedly estimating the polynomial.

We group individuals into income bins indexed by j; c_j is the number of individuals in bin j, x_j is the income level in bin j, $[x_-, x_+]$ is the excluded range and p is the order of the polynomial. We use an iterative procedure to estimate the counterfactual distribution, $\hat{c}_j = \sum_{i=0}^{p} \hat{\beta}_i (z_j)^i$ as the fitted values from:

$$c_j \cdot \left(1 + \mathbf{1} \cdot [j \geq x_+] \frac{\hat{B}_N}{\sum_{j=x_+}^{\infty} c_j} \right) = \sum_{i=0}^{p} \beta_i \cdot (z_j)^i + \sum_{i=x_-}^{x_+} \gamma_i \cdot \mathbf{1}[z_j = i] + \nu_j$$

where $\hat{B}_N = \sum_{i=x_-}^{x_+} \hat{\gamma}_i$ and we define $\hat{b}$ as the excess mass around the kink relative to the average density of the counterfactual earnings distribution between x_- and x_+:

$$\hat{b}_x = \frac{\hat{B}_N}{\sum_{i=x_-}^{x_+} \hat{c}_j / (x_+ - x_-)}$$

We estimate the bunching mass b_x for each $x = \{y_t, \bar{y}, \bar{z}\}$ (pooling across years for y_t). We can use the estimated bunching mass to estimate the elasticity associated with bunching in that income measure:

$$e_x \approx \frac{\hat{b}_x}{x^* \log \left[\frac{1-\tau_0}{1-\tau_1} \right]}$$

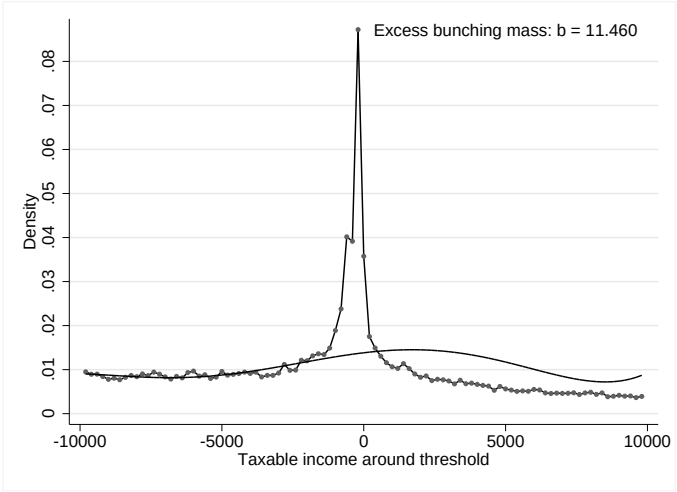
We use a bootstrap method to get standard errors for the bunching mass. We also show robustness of our results to the degree of polynomial, p, and the excluded region around the kink, δ.

Bunching at the higher rate threshold

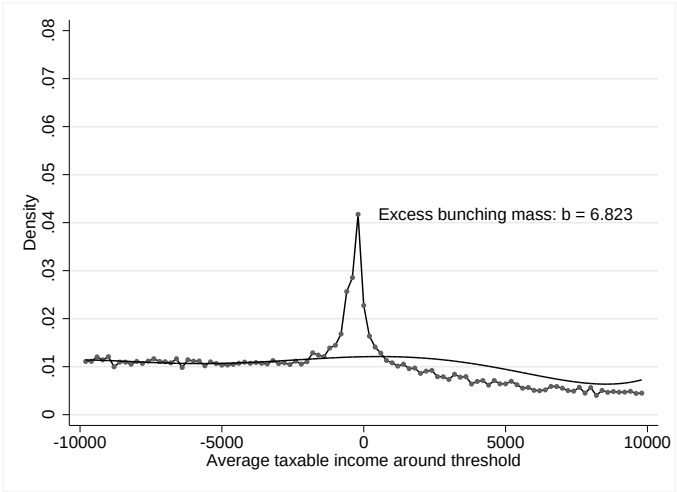
We use the method outlined above to estimate the bunching mass, and associated elasticities, in annual taxable, average taxable, and average total income. Figure 4.1 shows the estimated excess mass at the kink in these three income measures. There is a large excess mass in annual taxable income at the kink. Much of this is driven by intertemporal income shifting: the excess mass in average taxable income is only around half the size. However, the excess mass in average earned income is zero. This suggests that individuals are shifting taxable income to take out when they liquidate the company, rather than adjusting total income to locate at the kink.

Figure 4.1: *Bunching in annual taxable, average taxable and average total income*

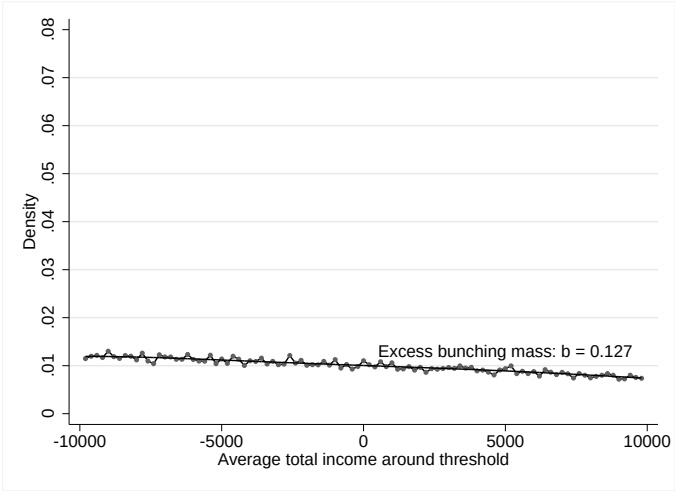
(a) Annual taxable



(b) Average taxable



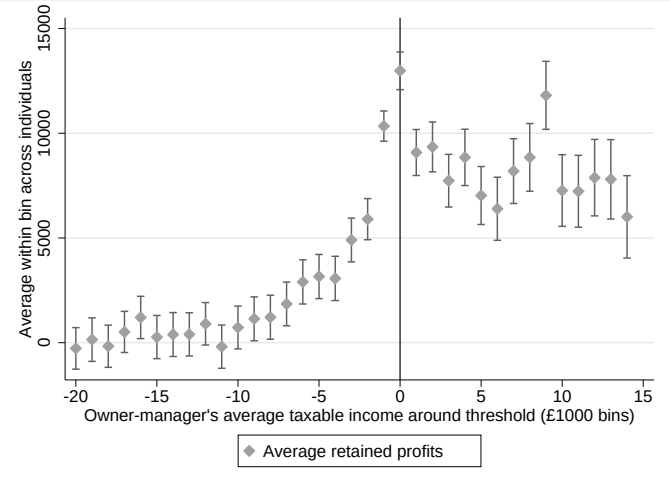
(c) Average total



Notes: Method for estimating the counterfactual density described in the text. Bin width is £100.
Source: Calculations based on HMRC administrative datasets.

Figure 4.2 provides additional support for the use of this mechanism. We group owner managers in £1000 on the basis of average taxable income. For each owner manager, we calculate their average retained profits over time, and the figure shows the mean of this variable across owner managers within each bin. The figure shows a sharp increase in average retained profits for owner managers locating consistently at (or just below) the kink. We also see a drop in average retained profits just above the kink, which is also consistent with model predictions: many owner managers who have total income just above the kink have taxable income at the kink, and are using profit retention to do bunch. This is what we would expect to see if owner managers were systematically retaining profits in order to locate at the kink.

Figure 4.2: *Average retained profits, conditional on average taxable income*



Notes: Within each £1000 bin we calculate the average retained profits.
Source: Calculations based on HMRC administrative datasets.

Table 4.1 shows the elasticities implied by the bunching in the three different income measures. The elasticity of annual taxable income is 0.2, suggesting that these individuals are very responsive to tax. This is of a similar magnitude found by Adam et al. (2017). However, around half of this is driven by shifting of dividend income across tax years: the elasticity of average taxable income is around 0.1. The elasticity of total income is not significantly different from zero. This could be for two reasons: either their effort choices are not particularly responsive to tax, or because they are using other avoidance strategies to avoid paying the higher rate of tax.

Table 4.1: *Income elasticities*

Income measure	Elasticity
Annual taxable income	0.199
	[0.180, 0.218]
Average taxable income	0.112
	[0.108, 0.129]
Average total income	0.002
	[-0.005, 0.009]

Notes: Method for estimating the elasticities described in the text. 95% confidence interval shown.
Source: Calculations based on HMRC administrative datasets.

This has implications for the calculations of the efficiency cost of taxation for this group. We derive in Section 3 the sufficient statistics for the deadweight loss of increasing the marginal tax rate τ_1, which is a variant of the formula derived by Chetty (2009a). The efficiency costs are proportional to a weighted average of the elasticities of average taxable and total income. The tax rate paid on liquidation, τ_k could be either 0.3, if the stock of retained profits exceeds y^* and the individual withdraws the stock of retained profits as a lump sum in a single period, or 0.2 if the stock is less than y^* or the choose to draw down as dividend income (not exceeding y^* in any period) over a longer time frame. If $\tau_k = 0.3$, then $\mu = 1/4$, and if $\tau_k = 0.2$, then $\mu = 1/2$. This means that if we were to use the elasticity of annual taxable income to estimate the deadweight loss associated with increasing τ_1, we would overestimate it by a factor of between 3.6 and 7.1 (depending on the value of τ_k), relative to using the weighted average of the elasticities of average taxable and total income. This shows how ignoring the presence of intertemporal income shifting among this highly responsive group leads to considerable misestimation of the efficiency costs of taxing them.

Robustness

We show robustness of our results to varying the degree of polynomial used to estimate the counterfactual and to the excluded region around the kink. We also check robustness of our results to focusing only on the sample of owner-managers who are in the sample for a minimum number of years.

Results to be included (waiting on security clearance).

Responses to policy reforms

We explore whether our results hold when the tax system changes. In 2009/10 it was announced that from the following year, taxable income in excess of £150,000 would be taxed at a higher rate of 50%. In addition, individuals with incomes in excess of £100,000 would have their tax-free allowance withdrawn (at a rate of 50p for every £ earned above £100,000) from the following year. This creates incentives for individuals to bunch at £100,000 and £150,000. However, as with the higher rate threshold, there are incentives to shift taxable income across years within company life, as well as to company liquidation, in addition to the incentives to reduce work effort.

We repeat the bunching estimation for behaviour around these kinks. An advantage of policy reforms is that we can compare the distributions before and after the introduction of the kink. One concern with the bunching estimates around the static kink is that we might not pick up the effect of the kink on average total income, because it is difficult for individuals to target the kink exactly. However, we can estimate the distributions of total income before and after the introduction of the kink. If total income is responsive to changes in the marginal rate, then we would expect to see a shift in this distribution, even if we do not see any bunching due to the volatility of incomes.

Results to be included (waiting on security clearance).

4.2 Cost and benefits of income shifting

Our results suggest that intertemporal income shifting is the key mechanism that owner managers use to respond to changes in the marginal tax rates that they face. In this section we discuss the implications of the two different forms of shifting – smoothing across tax years due to income volatility and longer term income shifting to company liquidation.

Value of short term shifting

The ability to choose when to retain and withdraw income from the company allows owner managers to smooth their taxable income, and hence, their marginal tax rate, over time. This ensures that volatility in their incomes does not mean that they are penalized by the progressivity of the tax sys-

tem, relative to someone with the same average, but stable income. This can therefore be considered a positive feature of the tax system.

Both the magnitude and frequency of income fluctuations around an owner managers's average affect the benefit that they derive from being able to shift income across tax years. To get an idea of the benefits of this ability to shift to owner managers with incomes that fluctuate around the kink, we compare the tax that they would pay if they were taxed annually on the basis of their total income, compared with the tax that they would pay on the average of their total income. Figure xx compares these two tax liabilities at different total income levels.

Results to be included (waiting on security clearance).

Retained profits and investment

Table 4.2 shows that the estimated elasticities of annual taxable, average taxable and average total income are similar across business in industries that require less investment (owner managers in business and legal services and publishing). This suggests that incentives to invest are not driving our results.

Table 4.2: *Income elasticities, by investment level*

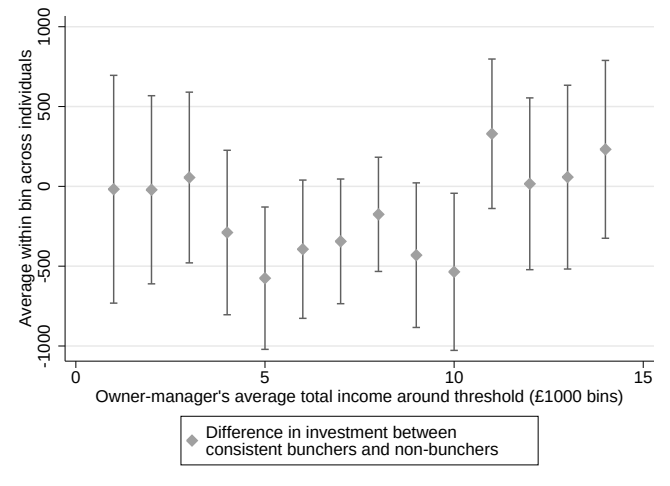
Income measure	Elasticity	
	Full sample	Low investment
Annual taxable income	0.199	0.187
	[0.180, 0.218]	[0.157, 0.216]
Average taxable income	0.119	0.111
	[0.108, 0.129]	[0.095, 0.128]
Average total income	0.002	0.013
	[-0.005, 0.009]	[-0.002, 0.028]

Notes: Method for estimating the elasticities described in the text. 95% confidence interval shown. Low investment includes individuals in business and legal services and publishing. Source: Calculations based on HMRC administrative datasets.

An explicit aim of the favourable capital gains tax treatment offered to business owners ("Entrepreneur's Relief") is to encourage business investment. We investigate whether increased profit retention due to the tax incentives to shift to liquidation is associated with higher investment. We group owner managers into £1000 bins based on average total income and calculate the difference in the use of capital allowances (investment in plants and machinery)

by those that bunch consistently in taxable income and those that do not, see Figure 4.3. If the increase in retained profits induced by the tax incentives increased investment, then we would expect to see larger investment among those who consistently bunch in taxable income versus those that do not. However, the figure shows that there is no difference in investment behaviour across those that consistently bunch in taxable income and do not, conditional on average total income. This suggests that the retained profits are not being used to boost investment.

Figure 4.3: *Average investment by bunchers and non-bunchers in average taxable income*



Notes: Within each £1000 bin of average total income we calculate the difference in average investment between those that bunch in average taxable income and those that do not.
Source: Calculations based on HMRC administrative datasets.

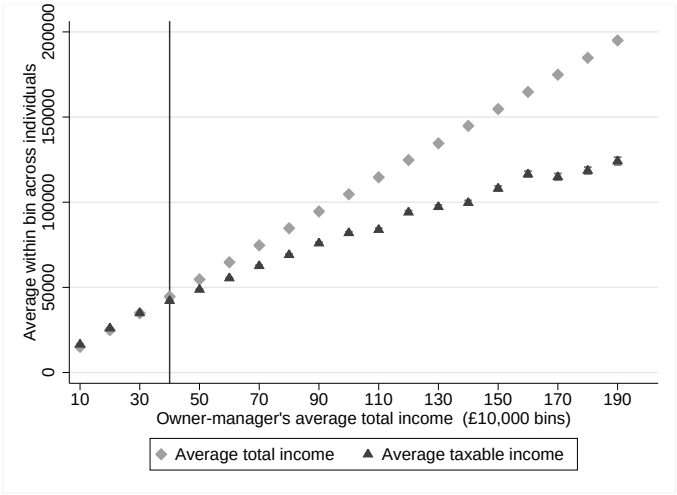
Retained profits over the income distribution

The incentive to shift income across tax years within company life exists for owner managers whose total income fluctuates around the kink point. However, the incentive to shift income to liquidation exists for all owner-managers whose average total income exceeds the higher rate threshold. The extent to which they do this depends on their shifting costs. Figure 4.4 shows how average total and taxable income, and average retained profits vary over the average total income distribution. On average, owner-managers with average total income below the higher rate threshold do not systematically retain profits, which is consistent with the fact that they do not have an incentive to shift income to withdrawal on liquidation. However, as average total income increases, average taxable income increases at a much slower rate, which is

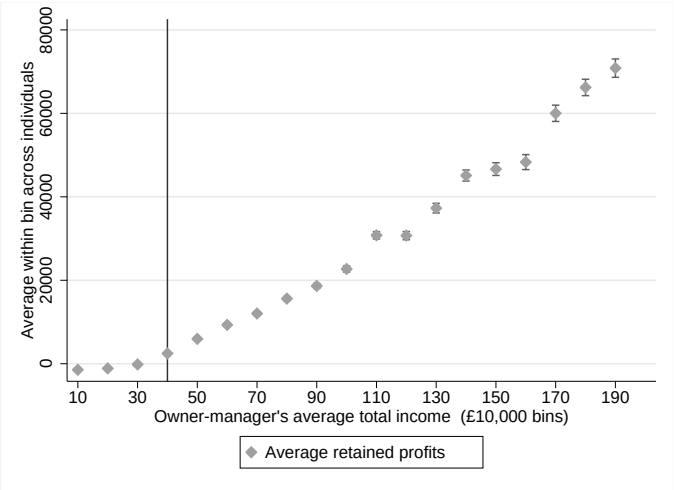
captured by the fact that average retained profits increase significantly. Owner managers with average total incomes of roughly £150,000 retain, on average, around £50,000 income in their companies each year. This suggests that there are potentially large revenue costs to offering lower capital gains tax rates on business income, and that this inhibits the ability of the tax system to tax the incomes of higher income individuals.

Figure 4.4: *Retained profits over the total income distribution*

(a) Average total and taxable income



(b) Average retained profits



Notes: Bin width is £1000.
Source: Calculations based on HMRC administrative datasets.

5 Conclusion

To conclude, we use a new link between personal and corporate tax returns to investigate how individuals who run their own incorporated businesses respond to tax. We confirm previous results that they respond strongly to changes in the marginal rate that they face, both in the personal and corporate tax schedule. However, a substantial proportion of the response to a 20 percentage point increase in the personal marginal tax rate can be attributed to short-term income shifting across tax years. Individuals bunch at the threshold in order to smooth fluctuations in their income, and hence their marginal tax rate. We show that the remaining response is driven by individuals retaining profits in the company longer-term to take advantage of more favourable tax treatment available on company liquidation.

Our results have important implications for designing tax policy. For example, how should tax policy be designed to treat people with volatile incomes? How should capital gains tax treat the income of company owner managers? And how does investment respond to changes in the tax system? Our findings provide useful evidence that can contribute to answering questions such as these.

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