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Small business property tax reductions and job growth

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Abstract The incomplete devolution of taxation powers to English Local Government has been constrained by central government's doubling of reductions in property taxes for small firms. The aim is to stimulate local growth, but we question the economic logic. We analyse reductions in place since 2005, with a newly linked dataset for all firms that incorporate administrative data down to local units. We find the reductions do not overcome supposed market failures, do not stimulate job growth and once we control for firm age, that the targeted small firms do not produce extra employment. Young firms and larger firms have better growth rates, but there is no systematic size effect. We conclude that the tax reductions fail because they do not account for tax capitalisation (i.e. incidence shifts from firms to property owners), the basic characteristics of the average small firm or develop a clear mechanism for change among heterogeneous economic actors.

Keywords Local Property Taxation · Capitalisation · Devolution · Growth · Firm age

JEL codes C55 · D22 · H22 · H25 · J21 · L25 · L26 · O43

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1 Introduction

The UK Government announced the "end of the national tax on local growth" (HM Treasury 2016 p. 9) in the autumn of 2015. The Government planned to devolve the setting and administration of English[1] Business Rates (BR), a property-based tax historically levied on all firms, from the national to local governments in 2020.[2] A principal element of this policy was greater local flexibility to reduce (not increase) rates set nationally for specific projects or types of firms and stimulate local growth. Yet, in the March 2017 Budget, the same national Government undermined this flexibility. The Government significantly expanded and made permanent the current policy of National (English) reductions in the property tax for small firms (called Small Business Rate Reliefs or SBRR). The reductions now remove 600,000 firms (i.e. one third of all firms) from local tax bases and will reduce revenue by £9bn over 5 years (HM Treasury 2017). This raises concerns about future revenue, greater reliance on a small number of large firms and restrictions on local autonomy to achieve local objectives.

[1] Northern Ireland, Scotland and Wales have slightly different BR systems and devolved responsibility, which mean these plans do not necessarily apply to these nations.

[2] The timetable for the devolution of local finance has become unclear following the unexpected national elections in June 2017, which interrupted the legislative progress of the Local Government Finance Bill 2017. 50% Retention of BR began in April 2013, with 50% returned to central government for redistribution. Increasingly BR funds local activities, but the ability to vary rates is restricted and infrequently employed.

The policy to expand and reduce the property tax follows a persistent campaign by the small business community. The then Prime Minister told the Federation of Small business in 2014 that small business' number 1 complaint was Business Rates, which had risen relative to other costs (Adam and Miller 2014; Cabinet Office 2014). In April 2017, we also saw a vociferous campaign against BR increases in areas such as London that led to some minor changes in that year's budget. Yet, at the same time, there were offsetting declines in rates across most of the country given the instruments revenue neutral structure, which received much less attention.

The narratives supporting this high profile policy draw together preconceptions about the universal negative effects of tax on firm growth and small firms' transformative growth potential, both of which are superficially plausible. In a novel combination of economic literatures, we question the theoretical and empirical cogency of these arguments using rich newly linked micro data. In support of SBRR, introduced in 2005, it is argued (e.g. repeated in HM Treasury 2016) that BR forms a greater proportion of small firm's fixed costs than those of large firms and limits their ability to compete or innovate. This is not a sufficient condition for differential tax reductions unless there is a greater social benefit from small firm's growth and becomes immaterial, if through tax capitalisation,[3] the economic cost/benefit transfer to property owners.

We first address the policy mechanism and contribute to the tax capitalisation literature by exploring where the economic incidence falls and hence how the tax reduction could generate growth or innovation. Secondly, we explore the policy's target of small firms, which is based on the perception small firms contribute more to employment levels than their share of gross value added. This is a fundamental issue, as whether firm size has a systematic effect on employment has not been clearly resolved for the UK (Hijzen et al. 2010).

Critical to our novel combination of literature and analysis of the current tax reductions is our access to rich administrative data. We base our analysis on the Office of National Statistics (ONS, 2016) Annual Respondents Database X (ARDx). The ONS recently (July 2016) released this dataset, which is a combination of the Annual Business Inquiry and the subsequent Annual Business Survey. These are the largest datasets collected by the ONS, as they are an annual census of large firms and a sample of smaller ones. Importantly, they include firm level administrative data on employment and turnover at both local unit and parent firm levels, making it a reliable and rich source, which overcomes a number of limitations on earlier work.

Our analysis of the tax reductions in place between 2005 and 2014 shows these tax reductions have not enabled any growth in employment; in fact, we argue that there is no feasible channel through which they could. We then show that even if there were a mechanism the principal recipients, small old firms, are the least likely to be the catalyst for local employment growth. These findings bring into question the Treasury's homogeneous micro management of local property taxes.

We structure this paper in the following manner. In Sect. 2, we describe BR and their relevance. In Sect. 3, we discuss the two strands of theory that this policy combines on capitalisation and employment growth and confront them with the existing empirical evidence. In Sect. 4, we describe the data source, and in Sect. 5, we discuss the estimation framework. We report the findings in Sect. 6 and then conclude.

2 The business rates system

Business Rates (officially known as Non Domestic Rates) is a tax levied on all occupiers of commercial properties based on the property's estimated rental value. BR constitute a significant UK tax instrument, which raised £29bn in the 2017 tax year (Office of Budget Responsibility 2017). For context, this is equivalent to over half that raised by the more widely analysed Corporation Tax. The UK is the most reliant country in the OECD on property taxes. In 2015, the UK collected 13% of tax revenue from properties (including domestic property), whilst the OECD average was 6% (OECD 2017). BR are particularly salient to the business community because the statutory incidence falls on all commercial property *occupiers* rather than the property *owners* and consequently they perceive it as a substantial additional fixed cost. However, we argue below that this is a perception given economic incidence ultimately transfers to property owners following capitalisation into rents.

[3] Capitalisation in this case, is when economic incidence of SBRR passes backwards to the property owner via offsetting rent (property price) increases.

Prior to 1990, each local government set its own BR; however, since 1990, central government (and latterly devolved governments of the UK nations) has this power. The Valuation Office Agency (VOA) assesses the rateable value (RV) of each commercial property based on type of property, location, some types of installed machinery and other specified factors. The VOA revalues RVs on a 5-year cycle, except for the 2010–2015 cycle, which was extended to 2017. The 2010 revaluation was based on 2008 valuations.

Firms pay a proportion (multiplier) of the RV, e.g. for the financial years 2013–2014, it was 47.1%. This can constitute a significant fixed cost and underscores the salience to firms. As and when BR are devolved, local governments would use the setting of the multiplier to encourage specific economic or social activities. Until April 2018, the annual increases in the multiplier were limited to increases in the Retail Price Index (RPI). Following wider pressure, they are now linked to the generally lower Consumer Price Index, rather than the RPI or indeed underlying property valuations.

The Local Government Act of 2003 introduced Small Business Rate Relief (SBRR) from 2005, until then BR was principally a flat tax. This relief (reduction) is partially funded by a supplement on the BR of firms occupying properties with slightly higher RVs. Initially, the supplement was on RVs above £15,000 (£21,500 in the city of London) then from 2010 above £18,000 (£25,000) and from 2017 above £51,000. The SBRR started at 50% for properties with RVs up to £5000 and tapered to zero at £10,000. In 2010, SBRR increased to 100% for properties with RVs up to £6000 and tapered to zero at £12,000. This increase was for 1 year, but following pressure became permanent. As discussed in the introduction, the government brought forward the doubling of reliefs from 2020 to 2017. The 100% threshold rose to £12,000 and tapered to zero at £15,000. This change increased from 400,000 to 600,000 the number of firms not paying BR and 900,000 (approximately half of all firms) receiving some reduction. The cumulative 5-year reduction in revenue of this and other changes from 2017 is estimated at £9 billion (HM Treasury 2016b, 2017).

Table 1 provides a summary of the SBRR in England for the period we study. The nominal value of the relief rose rapidly to over £1 billion in 2014–2015, more than double the value in 2010–2011 and quadruple the 2007–2008 revenue loss. The supplement paid by firms in more expensive properties has consistently failed to cover 50% of this relief; yet, the multiplier supplement has risen from 0.82% in 2009–2010 to 2.3% in 2014–2015.

3 Policy debate and literature review

This growth policy through reductions in property taxation covers two bodies of theory and empirical evidence, one for the policy mechanism and one for the economic group driving the desired growth. First, the policy's homogenous changes in taxation for small firms putatively overcome market failure, from financial and market power constraints. Givord et al. (2013) suggest that relative to larger firms, small firms tend to be financially constrained and this may mean they are more responsive to tax incentives. Secondly, the government focuses these reliefs on small firms occupying cheaper properties. This focus reflects policy makers' heuristic position (Shane 2009), from which entrants and small firms can transform depressed economic regions, as they are believed to be more innovative and create more jobs than larger established firms. We argue that both the mechanism and the choice of the target group are poorly defined.

Small Business Economics has nurtured a robust and wide-ranging debate on the linkages between taxation or subsidies and entrepreneurial activity and this has generally found that neither is critical to future growth (Holtz-Eakin, 2000, b; Bruce and Mohsin 2006; Fotopoulos and Storey 2018). Although others who have examined general taxation rates (Baliamoune-Lutz and Garello 2014), corporation and income taxation (Nam and Radulescu 2007; Darnihamedani et al. 2018) or innovative forms of support (Henrekson and Sanandaji 2018) have identified institutional sets up in which tax (subsidy) incentives can assist start up or investment decisions. We extend this debate in a new direction through our examination of property taxes and job growth.

Occupiers lobby against BR because they face the statutory responsibility for payment but ultimately there is little evidence they face the economic incidence. Policy maker's failure to differentiate between the statutory and economic incidence of the instrument leads them to accept it distorts the decisions of small firms. However, taxation theory (e.g. Stiglitz and Rosengard 2015; Fischel et al. 2011) illustrates how property taxes will fall on the owners of immobile factors, land and

Table 1 Business Rates Collected by Councils in England: 2005 to 2015 £ million (nominal values)

Year	2005–2006	2006–2007	2007–2008	2008–2009	2009–2010	2010–2011	2011–2012	2012–2013	2013–2014	2014–2015
Net value of BR collected	15,677	16,853	17,138	18,722	19,039	18,927	20,661	21,352	20,541	21,610
Cost of SBRR granted	Not pub	Not pub	− 259.9	− 298.2	− 333.2	− 506.5	− 784.3	− 900.3	− 985.9	− 1061.5
Business funding of SBRR[a]	Not pub	Not pub	132.3	176.3	176.6	372.8	375.6	399.2	447	543.2
Net SBRR[b]	104	57	− 147.8	− 144.8	− 187.9	− 162.5	− 432.1	− 550	− 590.5	− 580
SBRR multiplier (pence)[a]	41.5	42.6	44.1	45.8	48.1	40.7	42.6	45	46.2	47.1
BR multiplier (pence)[a]	42.2	43.3	44.4	46.2	48.5	41.4	43.3	45.8	47.1	48.2
Additional multiplier to fund SBRR (pence)	0.7	0.7	0.3	0.4	0.4	0.7	0.7	0.8	0.9	1.1
Number of properties (000)	1651	1663	1681	1692	1698	1718	1735	1759	1771	1787
Total rateable value[c]	46,280	47,094	47,314	46,888	46,721	56,337	57,864	57,178	57,154	57,069

£ million (nominal)

Negative figures indicate relief being given

BR business rates, *Not pub* not published

[a] The Small business rate multiplier applied to firms with rateable value below £15,000 (city of London £21,500) between the financial years 2005–2006 and 2009–2010. From 2010 to 2011, the thresholds rose to £18,000 (city of London £25,000). The national Domestic (standard) rate applies from this threshold and incorporates a supplement for the Small Business Rate Relief

[b] Includes adjusts with respect to any previous year

[c] This figure multiplied by the multiplier does not equal the net value of BR collected as the net value accounts for reliefs, collection costs, adjudications

Source: Department for Communities and Local Government (DCLG) Official Statistics 2011, 2012, 2013, 2014 to 2015, author's construction

buildings, ceteris paribus. Property prices and rents then reflect differences in taxes, with lower taxes increasing the purchase price of property if the statutory incidence falls on the property owner or increasing the level of rent occupants are willing to pay if it falls on the occupant. Whichever the statutory incidence, the relative immobility of the capital would see capitalisation, i.e. economic incidence passes backwards to the property owner. Rents and taxation do not move independently but combine to give a total cost threshold for occupation. If basic theory holds then there would be no social benefit from SBRR as it is captured by property owners, a group very different to the perceived beneficiaries.[4]

Bond et al. (1996)[5] provide one of the few papers on BR post 1990. They examine the 1990 change from local government rates to the national uniform BR using rental data for a sample of 2964 properties between 1987 and 1992. They show rents fell in response to BR rises more than in areas that saw a fall in BR during this transition period. They do not reject a pound for pound negative relationship between rents and BR, although with a wide confidence interval.[6] Bond et al. (1996) thought institutional rigidities in the frequency of rent reviews, typically at 5-year intervals in UK commercial property agreements, implied full capitalisation of changes would take a number of years. Yet, over a short 2-year period, they find that there is a significant incidence on rents from changes in BR for retail properties. This would suggest there is only a short window in which any variation in BR could influence employment or other outcomes.

Duranton et al. (2011) reinforce this finding on capitalisation of BR, although they also show some negative effect of higher rates on expansion. The authors apply innovative spatial methods to BR during 1984–1989, when local governments previously set rates. They focus on large English manufacturing establishments and find BR had a significant negative impact on

[4] In terms of value, 55% of UK commercial property was rented in 2016 (PIA, 2017). This is a skewed statistic, given it reflects size, sector and location as much as number of properties. Owner-occupiers should have longer lasting gains from any SBRR reduction, as they will be capitalized into higher property values.

[5] Also see Bond et al. (2013) for work on capitalisation in Enterprise Zones

[6] Commercial research employing rental data finds 75% capitalisation of BR over a period of two to three years (Regeneris, 2015)

the level of (logarithmic) employment, for some growing firms. This indicates manufacturing occupiers still bear some of the incidence. The authors suggest that revaluation of a firm's BR obligations following expansion discourages the development of premises and hence employment or encourage them to move to areas with a lower BR. Although these factors will be limited by high relocation costs and because any change in BR will be net of the existing tax costs.

Duranton et al. (2011) find a positive but insignificant association between BR and entry into areas, after matching entrants within 1 km, i.e. higher BR does not deter entrants. They suggest that selection effects may be driving these findings, with capital-intensive firms leaving areas and opening up space for less capital-intensive firms to enter, as commercial space is limited in its supply response. This may be the case, although it would suggest that the vacant space meets new occupants' needs in terms of facilities and access to markets. More importantly, it indicates that there is some capitalisation of BR into new rents, otherwise entry would be in matched areas. In terms of local revenue, we can speculate there would be a limited effect on tax revenue and employment effects would depend on the selection of firms (with young and expanding firms entering as well as exiting) produced by relative BRs and demand conditions across areas.

We cannot simply contribute to the literature on property taxes and capitalisation in isolation if we are to provide comprehensive analysis of the policy framework. Integral to the policy and pressure from the business community is the perceived need to target reductions on small firms, which could transform local communities.

The narrative of transformative small firms implies that SBRR reduces financial constraints and this drives growth-enhancing pass through of lower prices or higher quality. Alternatively or in combination, firms may exploit market power and capture the tax reductions via increased mark ups. The pass through would lead to increases in market share at the expense of other firms, given there is no general demand stimulus. Holtz-Eakin (2000, b) challenges this narrative, arguing studies that suggest finance restrictions limit small firms have not shown too few or the wrong firms are funded. This finding weakens the efficiency arguments for intervention. Nightingale and Coad (2013) and Anyadike-Danes et al. (2015) show the distribution of growth from small firms is skewed by a very small proportion of high performing firms, away from the vast majority, which produce much lower growth. Consequently, we argue the principal recipients of SBRR will be old small firms creating limited growth. Given these findings, mark up increases would be more prevalent than pass through as small firms enjoy a softer budget constraint aiding short-term survival, but not growth.

Reinforcing these conclusions is the output from research exploiting rich firm level datasets. The output frequently contests the perception that there is an inverse relationship between firm size and net employment growth (Nightingale and Coad 2013). Rijkers et al. (2014), Lawless (2014) and Anyadike-Danes et al. (2015) attribute this perception to the work of Birch in the late 1970s. Birch's work has subsequently been criticised for its failure to account for attrition and its ability to differentiate between gross and net flows.

Haltiwanger et al. (2013) using US Census Bureau data and Huber et al. (2017) using Austrian data provide the recent leading studies into net employment growth that challenge the view on small firm employment growth. Both these studies use a current average of employment growth as the dependent variable, rather than logarithmic change to overcome regression to mean effects and enable an integrated approach to entry and exit. They both employ a saturated non-parametric OLS approach, whilst Huber et al. (2017) additionally use their own two-step approach, which produces similar findings. These authors find that once they control for age, small firm's average growth is lower than that of larger firms, counter to the perception on which the reliefs are based. These findings are robust across institutional frameworks with Rijkers et al. (2014) work in Tunisia reaching similar conclusions. Haltiwanger et al. (2013) find a very limited positive relationship with size for firms with ten or more employees. This relationship weakens for continuing firms. Huber et al. (2017) and Rijkers et al. (2014) find a stronger relationship for all firms, but again less so for continuing firms. Lawless (2014) for Ireland finds that there is no systematic effect of size, once she excludes the smallest firms.

These papers consistently show that small firms do not drive growth because young firms, which tend to be small, have a particularly large volatile effect on employment growth if they survive. These large effects dissipate quickly. Haltiwanger et al. (2013), Rijkers et al. (2014) and Lawless (2014) find that the effect of youth is over by year 5. Huber et al. (2017) by about year 3 and in periods of crisis slightly older firms may contribute more to employment growth given their greater stability.

In terms of UK research on small firm employment growth, Hijzen et al. (2010) argue that it is rather limited and confined to the manufacturing sector. They also highlight the important debate over the relevance of firm size in employment growth is far from decided. These authors use decomposition methods on the Inter-Departmental Business register for the period 1997–2008. They conclude small firms across a wide range of sectors contribute a greater proportion of job creation than their employment share and a slightly greater proportion of job destruction. Overall, they find jobs created by small firms are no less persistent than jobs created by large firms. These findings are a little misleading for our purposes.

The findings need challenging. Firstly, they define small firms as those which employ less than 100 people, which seems unnecessary when the data contains finer detail and is at odds with the finer groupings in the papers cited above. De Wit and de Kok (2014) called for more dynamic classification method when determining the contribution of small businesses towards job creation. Thus, our research divides firms below 100 employees into four groups, 0–9, 10–19, 20–49 and 50–99 to more clearly decipher growth patterns. Secondly, they conflate age and entry. They show entrants, which tend to be small, contribute a significant proportion of growth. The introduction of age is one important additional firm characteristic, which even if it is not sufficient to capture the complexity of dynamic firm environments (Shane 2009; Anyadike-Danes et al. 2015), is sufficient to empirically question the targeting of SBRR.

The literature underscores the clear and significant disparities between basic tax theory, the evidence on small firm's transformative potential and the relevance of the assumptions underpinning the homogeneous SBRR policy. There are also clear points of contention in the application of the property tax as; it leads to a significant level of resistance, it is collected from a group that is not aligned with the economic incidence and it will limit the flexibility of local governments in meeting local needs. Our strategy directly confronts these disparities between the different literatures and practice in order to comprehend how elements may support but not inform policymaking.

4 Data source

Critical to our novel combination of literature to provide comprehensive policy analysis is our access to rich administrative data. We employ the ONS' (2016) Annual Respondents Database X (ARDx) first released in July 2016. The ARDx combines two existing surveys, the Annual Business Inquiry (1998–2008) and the subsequent Annual Business Survey (2009–2014). These are the largest datasets collected by the ONS (62,000 questionnaires and over 600 variables) and firms' representatives are legally required to complete the instrument.[7] It is a census of firms with 250 plus employees and a complex stratified sample across size, sector and region of smaller firms. The sample framework is constructed using administrative data on employment and turnover from PAYE and VAT[8] registrations. This can provide key information out of sample on changes in these variables as well as on births of firms.

The power of the ARDx comes from the detailed information on both the dynamics of firms (*reporting units*) and their constituent units (*local units*). Access to administrative unit level data means we can control for mergers and acquisitions, which, if only observed at firm level, would lead to spurious measures of employment change due to changes in firm structures rather than true employment growth. Whilst data at parent level enables us to control for growth within appropriate age and size categories, as we can differentiate local unit activity from that of small single unit firms. Consequently, we can identify firms' organic growth, within appropriate classifications.

Firms report the BR paid in the survey period (October to October). This is not administrative data and hence it comes with the usual survey reporting issues. From this payment, we recover the rateable value and calculate firm's SBRR for those that observably meet the SBRR criteria. Please see the appendix.

In line with the recent net job creation literature, our dependent variable is the Davis and Haltiwanger (1992) net average job creation measure. This enables an integrated treatment of entering, exiting and continuing firms. It is a bounded symmetrical measure between minus and positive two for exiting and entering firms, between which we find net employment creation of continuing firms. Frequently firm-level employment growth is zero or negative and this precludes the use

[7] Response rates vary by sector and year but overall oscillate between the high 70 and low 80% ONS (2017).

[8] Pay As You Earn (PAYE) tax returns are collected by employers from each employee. Value Added Tax (VAT) registration is for firms above a turnover threshold who must then collect the tax on the goods and services they provide.

of logarithmic differences. Huber et al. (2017), Haltiwanger et al. (2013) and Tornqvist et al. (1985) discuss the use of the current average to overcome negative biases from using a base year size classification, resulting from mean revision effects or positive biases from an end year classifications.

At the local unit *i,* at time *t,* employment growth *g* is measured as a change in employment *L*, from the preceding year relative to the average employment over these years, i.e.

$$g_{it}=(L_{it}-L_{it-1})/(0.5(L_{it}+L_{it-1})) \quad (1)$$

We aggregate eq. 1 up to the firm/reporting unit as a weighted sum of local unit growth (g_{ft}) for the year in which the firm *f* controls a given unit, i.e.

$$g_{ft}=\sum_{it}\left(0.5(L_{it}+L_{it-1})/\sum_{i\in f}0.5(L_{it}+L_{it-1})\right)g_{it} \quad (2)$$

This weighted aggregation from local to firm level allows us to account for a number of spurious changes in growth stemming from changes in local unit ownership as well as regression to the mean effects. The growth changes at local units will be greater than for firms given that the method accounts for within firm redistributions as well as non-organic growth.[9]

In Fig. 1, we report the cumulative distributions of employment growth by the level of relief in the 2005–2013 period. We group firms by their maximum relief, zero, up to 25, 50, 75 or 100%. We also explode the central portion of these distributions between negative and positive 0.2 growth, given their proximity. This proximity of the distributions strongly suggests relief has little or no systematic effect on employment growth. The darker broader band represents those with zero reliefs. These firms have the greatest proportion of firms with negative growth, but also the largest proportion of firms with positive growth. Over the range of positive values, the differences from other groups, except that for firms with up to 100% relief, are difficult to untangle. Firms with up to 100% relief have the smallest proportion of both negative and positive values. Only 20% of this distribution reports positive current growth. The pattern changes sharply as we approach the upper bound of two, indicating there is a larger proportion of entrants that qualify for the highest reliefs.

[9] In a firm's year of birth there would be a missing value, consequently we insert two if there is any employment or zero if none.

5 Empirical strategy

We employ a saturated OLS estimation framework of interacted independent indicator variables[10];

$$g_{ft}=\sum_{e=2}^{6}\beta_e Size+\sum_{a=2}^{6}\beta_a Age+\sum_{r=2}^{6}\beta_r SBRR+\sum_{n=2}^{3}\beta_n BRperiod+\sum_{s=2}^{96}\beta_s Sector+\sum_{y=2}^{15}\beta_y Year+\sum_{x=2}^{\tau}\beta_x(Size,Age,SBRR,BRperiod)+\sum_{z=2}^{\omega}(Sector,Year)+\varepsilon_{ft}, \quad (3)$$

where *size* is the vector of indicators, which varies with the employment groupings of 0–9 employees, 10–19; 20–49; 50–99; 100–249 and 250 plus. *Age* is a vector of the categories, *entrants* and years; 1; 2–4; 5–9; 10–19; 20 plus. The division provides detailed information on the critical initial years of young firms. After year 1, the other groupings are divided to give balanced numbers and provide reliable estimates. *SBRR* captures categories of percentage reliefs, i.e. zero, greater than zero to $\leq$ 25%; > 25% to < 50%; > 50% to $\leq$ 75%; > 75% to $\leq$ 100%. The variable *BRperiod* separates the periods by the revaluation periods 2000, 2005 and 2010. *Sector* is a vector of indicators for 96 two-digit Standard Industrial Classifications (SIC revision 2007). We include indicators for the years 2000–2013, the period we use for the analysis. We do not use the final year of 2014 in the dataset in order to avoid conflation of all observations and subsequent exits. The dataset does not give specific information on local unit and firm exit. However, identifiers are specific to units and are not recycled, as such we use exit from the sample frame as an indicator of exit. The errors are Huber-White cluster robust errors as observations within firms are unlikely to be independent.

Initially, we estimate the average effects of *size* on weighted employment before adding controls for *Age* to assess its effect on the average adjusted effects for all firms and just continuing firms. We then add the *SBRR and BRperiod* indicator variables to estimate the average

[10] We undertook all work within the Secure ONS Virtual Microdata Laboratory on Stata 14. This limited the number of variables. We explored smaller divisions of firm size/age with greater saturation. These produced results in line with this specification.

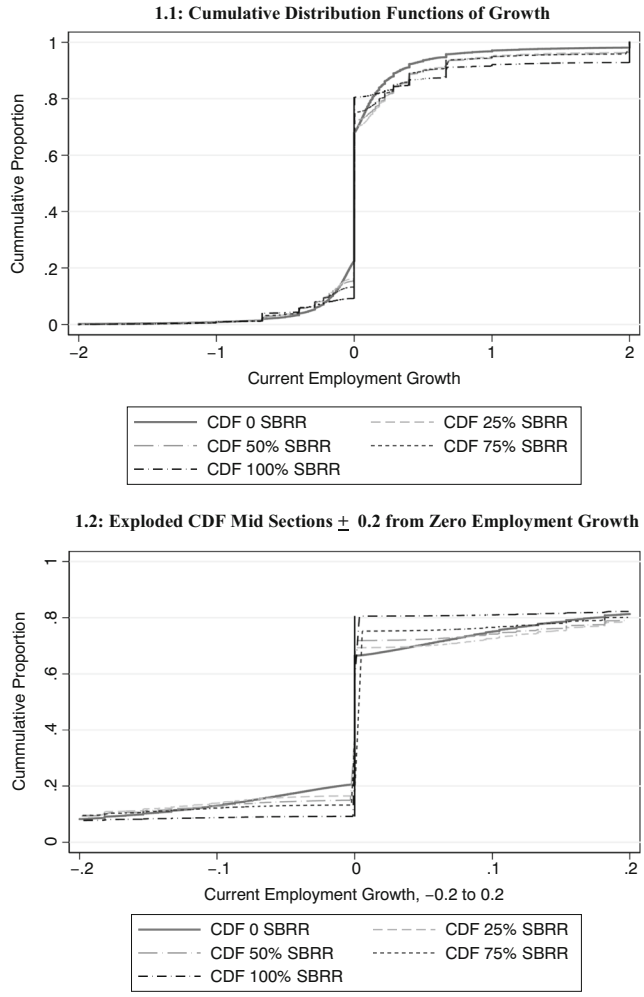

Fig. 1 Cumulative distribution functions of growth by maximum SBRR 2005 to 2013. **a** Cumulative distribution functions of growth. **b** Exploded CDF mid sections ± 0.2 from zero employment growth. Source: ARDX dataset, Author's calculations

effects of SBRR on current employment growth. Finally, we focus on a subset of high growth firms, as defined by the EUROSTAT-OECD (2007). These are firms, excluding their year of entry, with three or more consecutive years of annualised employment growth of at least 20%, and in the initial year at least ten employees.

Given the use of a bounded dependent variable, we employ saturated models of the discrete variables, i.e. we have coefficients for all main and interaction effects possible for all independent variables. Angrist and Pischke (2009), Haltiwanger et al. (2013) and Huber et al. (2017) provide discussions on this approach, which provides a best estimate of the examined variation in employment. The downside is that we estimate a large number of coefficients (our largest estimate has 1421 coefficients). Consequently, we only report the average effects of principal variable groupings, adjusted for interactions.

6 Findings

Table 2 contains the principal estimated average adjusted effects of firm size and age. It also reports Wald tests of the differences between average effects within each variable grouping. In Fig. 2, we represent these outcomes in a graphical format for easier comparisons.

In the results with no age controls, we simply explore firm size and find that the smallest firms (0–9 employees) are associated with a level of growth that is three times that of the next size grouping. The groups with employees from 20 to 249 employees do not have statistically different growth. However, the subsequent inclusion of controls for the distribution of age produces a dramatic shift in growth patterns.

The estimates with age group controls now show that growth of the smallest firms, 0–9 and 10–19 employees

Table 2 Adjusted average employment growth, with age controls

	1: No age control		2: Age control		3: Continue only[a]	
Variable	Average Effect	Difference Test[b]	Average Effect	Difference Test[b]	Average Effect	Difference Test[b]
Size	β/SE	β/SE	β/SE	β/SE	β/SE	β/SE
0–9	0.229***		0.214***		0.094***	
	0.001		0		0	
10–19	0.076***	−0.153***	0.229***	0.015***	0.111***	0.018***
	0.001	0.001	0.001	0.001	0.001	0.001
20–49	0.077***	0.001	0.284***	0.055***	0.164***	0.052***
	0.001	0.001	0.002	0.002	0.002	0.002
50–99	0.078***	0.001	0.271***	−0.013***	0.169***	0.005
	0.001	0.001	0.005	0.005	0.003	0.004
100–249	0.073***	−0.005	0.249***	−0.022***	0.151***	−0.017***
	0.002	0.002	0.006	0.008	0.005	0.006
250+	0.083***	0.009***	0.204***	−0.045***	0.134***	−0.017*
	0.002	0.002	0.01	0.012	0.007	0.009
Age: Entrant[c]			1.971***			
			0.001			
1			0.732***	−1.239***	0.768***	
			0.001	0.002	0.002	
2–4			0.103***	−0.629***	0.118***	−0.65***
			0	0.001	0	0.002
5–9			0.022***	−0.081***	0.031***	−0.087***
			0	0	0	0.001
10–19			−0.003***	−0.025***	0.003***	−0.028***
			0	0	0	0
20+			−0.009***	−0.006***	−0.005***	−0.008
			0	0	0	0
Year	Yes		Yes		Yes	
Sector	Yes		Yes		Yes	
R^2	0.02		0.591		0.199	
N	8,708,887		8,551,485		7,027,722	
DF	1143		1172		1164	

(β/SE) In each entry, the first row is the adjusted average and the second is the standard error ***1%; **5%; *10%

[a] Excludes entrants and final year of firms not subsequently in the sample frame

[b] Wald test of the hypothesis there is no difference between successive averages

[c] Firm age in years

DF number of variables, *Year*: year controls, *Sector*: 96 2 digit SIC revision 2007controls

Source: ONS (2016) ARDX dataset, Author's estimates

is significantly lower than that of the other size groups excluding the largest group for the firms with 250 plus employees. There is no systematic size effect for firms with 20 to 249 employees. The strong inverse relationship between age and growth leads to this dramatic shift. The average growth for entrants (year 0) is by definition close to the upper bound of two and that for firms a year after entry is still approximately a third of this level. Thereafter, there is a sevenfold fall to the 2–4 years age group and after 10 years, there is a marginally negative but significant effect of age. The youth effect then dissipates quickly for most firms.

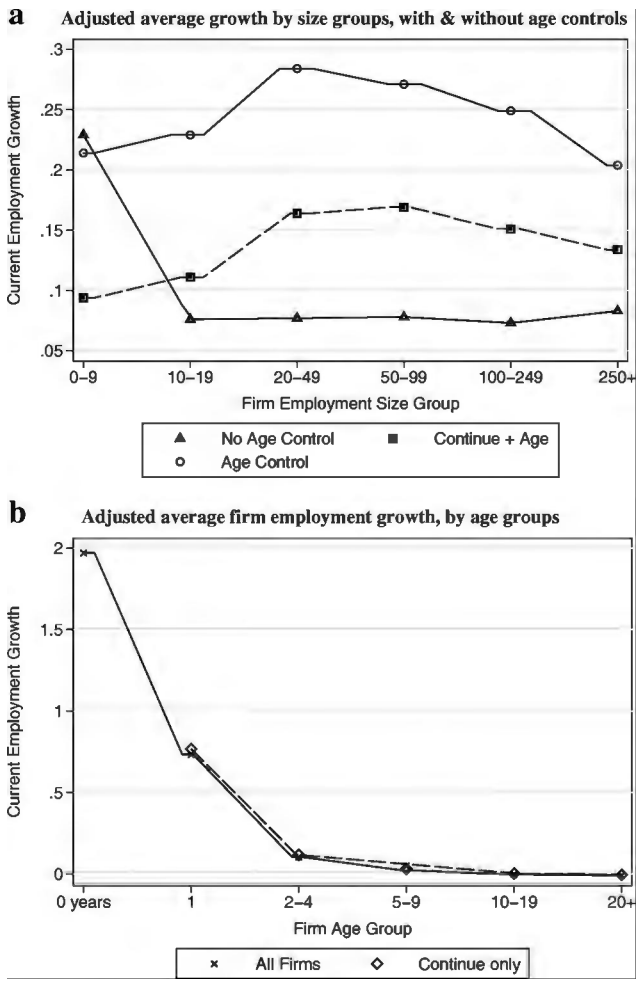

Fig. 2 Adjusted average growth by size and age groupings. **a** Adjusted average growth by size groups, with and without age controls. **b** Adjusted average firm employment growth, by age groups. *Note:* Continue denotes firms not in the first year of operation or the last year in the dataset

Although the final patterns of average growth by size and age are similar to that in the cited literature, we show in Fig. 2a the shift in average size effects comes through an increase in the average effects of larger firms, when we hold the age distribution constant, rather than a large reduction in the average effect of small firms. We present both the adjusted average coefficients and graphics with these same effects, whereas the cited authors do not generally present the adjusted average effects and the graphics are relative to the largest or oldest category. If we had simply followed suit, then we would have also presented similar findings, which seem to show a large drop in the average growth effect of small firms.

Finally, for the estimates of continuing firms, i.e. those that do not enter this period or leave in the next, the number of observations falls by 18% to just over seven million. The age effects follow a similar pattern to the preceding estimates but there is a consistent uplift in the scale of average effects reflecting the effect of exits and older firms are still worse performers. The size effects are all reduced in scale given the exclusion of entrants. The pattern in coefficients is similar to the preceding estimates, but differences are weaker. Firms with at least 250 employees now have growth greater than that the 0–9 and 10–19 employment reflecting the stronger effect of entry on smaller firms' rates.

The findings are consistent with the work of Haltiwanger et al. (2013), Rijkers et al. (2014), Huber et al. (2017), and in particular Lawless (2014), although the shift in estimated size effects comes from increases for firms with more than ten workers, rather than declines for smaller firms. The findings are also in line with the broad-brush findings of Hijzen et al. (2010) for the UK. They established that firms with less than 100 employees in the manufacturing and service sector grew more rapidly than larger firms did. However, they were not able to distinguish

the patterns below this threshold or patterns among older firms. They did not observe that the smallest firms, which generally attract the highest reliefs, had the weakest mean growth. This final point is in line with Anyadike-Danes et al. (2015) and Nightingale and Coad (2013) who characterise the population of small firms as dominated by a large number of small old firms which contribute very little to employment growth.

In Fig. 3 and Table 3, we report results incorporating the SBRR and BR period controls for all firms, continuing firms and a subset of high growth firms. Even though we see a sharp reduction in the number of observations, small firms continue to have significantly lower average adjusted growth, but the size effects for groups with 20 to 249 employees are no longer significantly different from each other. Age groups maintain the same inverse relationship, but the decline between 1- and 2–4-year-old firms is now by a factor of 5.4 for all firms and 5.25 for continuing firms, rather than a factor of seven estimated above.

Importantly, the SBRR coefficients do not identify any systematic effect on employment for all firms and continuing firms. There is very little difference in mean effects for firms receiving zero relief, through to those receiving 75% relief. Thereafter, there is some evidence of lower growth for those receiving up to 100% relief by between 11 and 16% to both the 75% and zero SBRR groups, respectively. Consequently, we demonstrate that the tax mechanism is ineffective in increasing employment and reliefs would seem to capitalise into occupation costs.

Finally, we focus on the subgroup of high growth firms. In Table 4, we group firms by the relief rates and observe the proportions, which meet the high growth criteria, decline rapidly from 8.5% for firms attracting zero relief to around 0.5 of a percent for firms claiming up to the maximum.[11] Some care is needed with these figures, given that the higher rates of relief will have only been available from 2010 and as such will have been initially affected by the 2007/8 recession. we identify gazelles, firms that become high growth before their fifth birthday, these only constitute 0.98 of a percent of pooled observations of firms between 3 and 7 years old, whilst for older firms, the percentage is 1.85.

Given the size and age thresholds, the employment estimates for high growth firms show a strong rise in overall average effects relative to the preceding estimates. Age is also less important, with a much shallower decline as we move from 1-year-old firms to 1–4-year-old firms of approximately 1.8, compared to the previously estimated fivefold decline in growth.

Importantly, we now find significant differences by SBRR group. Firms that receive up to 25% relief have a lower average adjusted effect than those firms that receive zero relief. Thereafter, the average growth effect is significantly higher than both these groups, peaking for firms with up to 75% relief. The estimated effect for the 100% relief group is now in line with the preceding two groups rather than being significantly lower than all other relief groups.

It would be difficult to say that there is a systematic effect of SBRR on employment growth, given the findings from the larger sample of all firms. This suggests that we are picking up location effects for these very small groups of firms (between 1.5 and 0.4% of observations), which are stronger for those occupying cheaper or smaller units. This is something we wish to examine with detailed geographical information in future research.

7 Conclusions

The "end of the national tax on local growth" may simply reflect political rhetoric, yet the underlying policy perspective (Shane 2009) of taxation constraining transformative small firms pervades the supporting consultation and policy documentation on SBRR (see HM Treasury 2016). In this paper, we confront the assumptions that taxation restricts growth and small firms produce greater growth than larger firms with rich firm level data.

We show that the chosen policy mechanism of property tax reductions is not associated with employment growth, which we argue reflects their capture by property owners. It also suggests that this tax is unlikely to have a long run effect on occupiers, as its level and changes pass backwards via rents and building value adjustments. The complications arise from the misalignment of statutory and economic incidences. If property owners became liable, the salience to firms would be significantly reduced, as would the political pressure. It would be clear the tax is on the economic rents (capital gains), which in part derive from the social context rather than a confusion with economic activity. Other gains would be a return to a flat tax, as the power of arguments for preferences declines and a fall in the number of valuation appeals, if the reformed tax only valued property.

[11] Some firms have more than three years in which they are classified as high growth

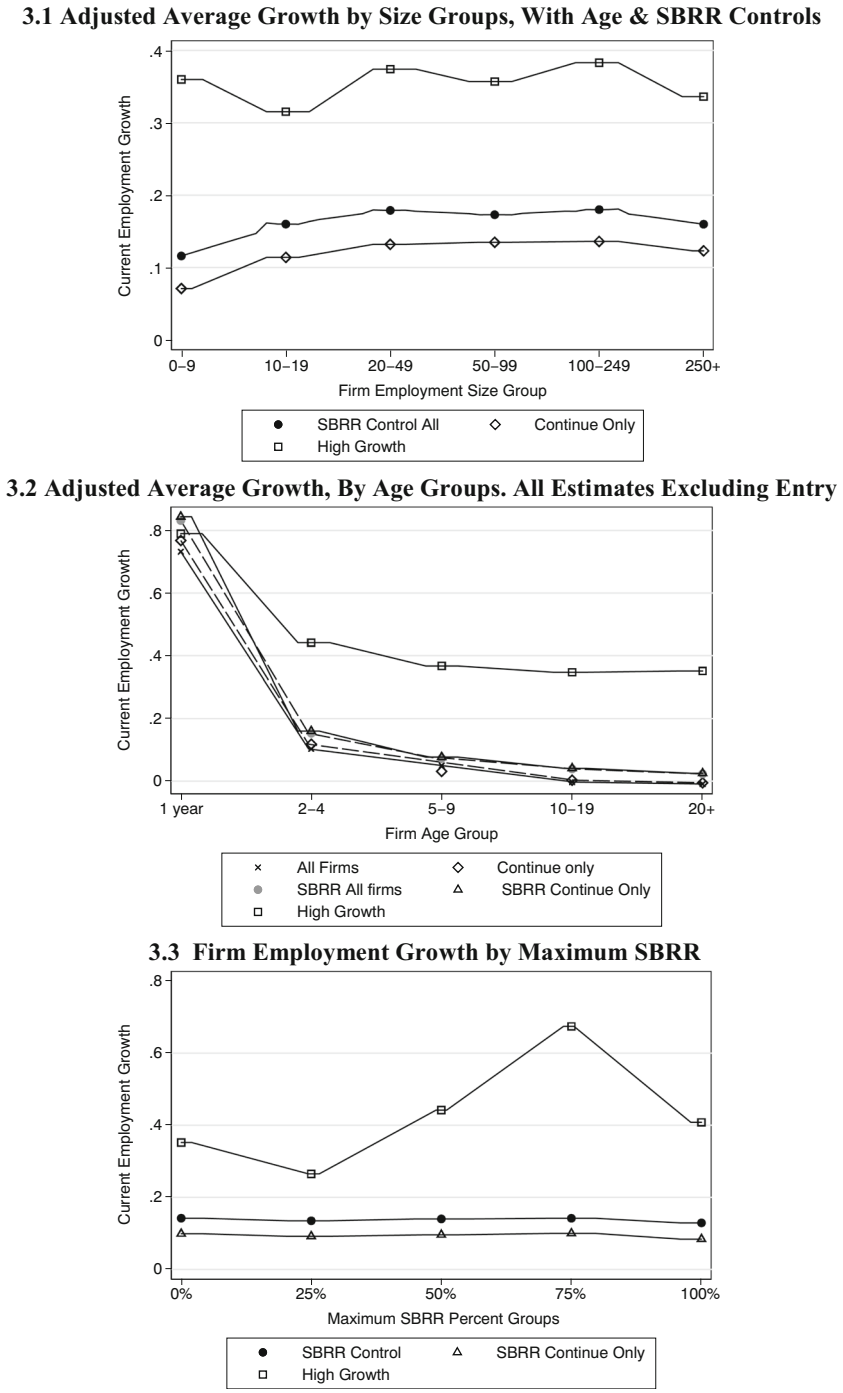

Fig. 3 Adjusted average growth with SBRR controls. **a** Adjusted average growth by size groups, with age and SBRR controls. **b** Adjusted average growth, by age groups. All estimates excluding entry. **c** Firm employment growth by maximum SBRR. *Note:* Continue denotes firms not in their first year of operation or the last year in the dataset. High growth, EUROSTAT-OECD (2007) definition. SBRR, estimates include controls for SBBR and age. Source: ARDX dataset, Author's estimates

Yet, even if the SBRR had an effect on costs, the target group would not provide any greater job creation, once we simply account for age differences. We find medium-sized firms provide greater and probably more stable employment growth. Young firms also provide strong employment growth, but this rapidly dissipates and is conditional on these new firms surviving. There may be a positive association between the larger reliefs

Table 3 Adjusted average employment growth, with SBRR controls

	4: Full model		5: Continue[a]		6: High growth	
Variable	Average	Difference[b]	Average	Difference[b]	Average	Difference[b]
Size: 0–9	0.116***		0.071***		0.360***	
	0.001		0.001		0.028	
10–19	0.160***	0.044***	0.114***	0.043***	0.315***	− 0.044
	0.002	0.002	0.002	0.002	0.012	0.031
20–49	0.179***	0.019***	0.132***	0.018***	0.374***	0.059***
	0.003	0.004	0.003	0.004	0.008	0.014
50–99	0.173***	− 0.006	0.135***	0.003	0.357***	− 0.017
	0.006	0.006	0.005	0.006	0.008	0.012
100–249	0.180***	0.006	0.136***	0.002	0.383***	0.026**
	0.007	0.009	0.007	0.009	0.008	0.012
250	0.160***	− 0.02*	0.123***	− 0.013	0.336***	− 0.047***
	0.008	0.011	0.008	0.011	0.007	0.01
Entrant	1.887***					
	0.009					
Age 1	0.832***	− 1.056***	0.844***		0.789***	
	0.01	0.014	0.011		0.081	
Age 2–4	0.153***	− 0.679***	0.160***	− 0.684***	0.442***	− 0.346***
	0.003	0.011	0.004	0.012	0.022	0.084
Age 5–9	0.073***	− 0.079***	0.078***	− 0.081***	0.367***	− 0.075**
	0.002	0.004	0.002	0.004	0.01	0.024
Age 10–19	0.039***	− 0.034***	0.041***	− 0.037***	0.347***	− 0.02*
	0.001	0.002	0.001	0.002	0.005	0.011
Age: 20 +	0.023***	− 0.016***	0.025***	− 0.016***	0.351***	0.004
	0.001	0.001	0.001	0.002	0.004	0.006
SBRR[c]: *Zero*	0.142***		0.099***		0.352***	
	0.001		0.001		0.004	
SBRR *25%*	0.135***	− 0.007	0.092***	− 0.008*	0.265***	− 0.087***
	0.004	0.004	0.005	0.005	0.037	0.038
SBRR *50%*	0.140***	0.006	0.096***	0.004	0.442***	0.177***
	0.004	0.006	0.005	0.006	0.044	0.057
SBRR *75%*	0.142***	0.002	0.100***	0.004	0.674***	0.232***
	0.005	0.007	0.005	0.007	0.056	0.069
SBRR *100%*	0.129***	− 0.013**	0.084***	− 0.016	0.408***	− 0.266***
	0.003	0.006	0.003	0.006	0.027	0.062
R^2	0.416		0.142		0.354	
N (DF)	900,101	(1421)	795,871	(1381)	23,413	(1129)

The first row is the adjusted average and second is the standard error ***1%; **5%; *10%

[a] Excludes entrants and final year of firms not subsequently in the sample frame

[b] Wald test of the hypothesis there is no difference between successive adjusted averages

[c] SBRR category numbers indicate upper bound of mutually exclusive groups

(DF): number of variables, estimates include year, BR period and 96 2 digit SIC (2007) controls

Source ONS (2016) ARDX dataset, Author's estimates:

Table 4 High growth firms, proportion of pooled observations by relief level 2000–2013

SBRR maximum	Proportion high growth
0	0.085
25%	0.018
50%	0.015
75%	0.006
100%	0.004

Some firms will have more than the minimum 3 years of annualised growth of 10%, entrants excluded. Source ONS (2016) ARDX dataset, author's calculations

and high growth firms' employment, but identifying this small number of firms' ex-ante is problematic.

In line with Holtz-Eakin (2000, b), Shane (2009), Anyadike-Danes et al. (2015) and Fotopoulos and Storey 2018, we conclude generic reliefs based on naïve assumptions about homogeneous jobs and supply side restrictions do not facilitate employment growth. Institutional frameworks, which target time constrained assistance on specific complex and shifting productivity and growth constraints as well as the quality and stability of employment may be better alternatives, but these require a richer understanding of firm level dynamics. The OECD (2015) document some viable alternatives that do not erode tax bases. Even these interventions cannot succeed in isolation. They need well-developed local and inclusive infrastructure, education and healthcare and rigorous sectoral analysis if they are to succeed. These factors require locally directed provision, which in turn requires a stable and diversified tax base.

In addition to research on the local business context, both the individual firms and institutional framework provide opportunities for further research. We are already exploring whether SBRR has any effect on firm level productivity and survival, see Matikonis and Gobey (2019). Research into the mechanisms underlying capitalisation has been limited given the lack of access to detailed data. This will soon be resolved as VOA (ND) 2010 and 2017 compiled rating lists now include data down to local units on the characteristics and valuations of rateable properties. If matched with the ARDX data, there will soon be a sufficient period over which rent reviews, relocations, use and investment in spaces and indeed cyclical shifts in the lengths of tenures can be explored to establish the pace, scale and distribution of capitalisation's costs and benefits. At the institutional level, local authorities will become fully dependent on local domestic and business property taxes rather than transfers, and this may shift the relative influence of local voters and business owners. For example, Asatryan et al. (2017) found in Germany that business taxes rather than personal taxes rose in response to improvements in local democracy. In the UK, this may be particularly interesting, given the much greater reliance on property taxes than in other OECD countries.

Appendix

Recovery of Business Rates paid by firms:

$$BR = Rv(M)(1-SBRR), \tag{A1}$$

where BR is what is paid, RV is Rateable Value, M is the multiplier in the relevant year and $SBRR$ is the proportionate level of relief. In order to reduce the number of unknown values, we first define the SBRR in terms of Rateable Value and the interval (int) over which the relief declines from a maximum (Mx) value of either 50%, or 100% to zero and insert this into eq. 1, i.e.:

$$\begin{aligned} SBRR &= Mx\left[1-\left(\frac{Rv}{int}-1\right)\right], if\ Rv \leq 2(int) \\ SBRR &= Mx\left(2-\frac{Rv}{int}\right) \end{aligned} \tag{A2}$$

Placing eq. 2 in equation one, we get:

$$\begin{aligned} BR &= (M)Rv\left(1-Mx\left(2-\frac{Rv}{int}\right)\right) \\ BR &= (M)Rv-2Mx(M)(Rv)+\frac{Mx(M)(Rv^2)}{int} \qquad , if\ Rv < 2(int) \end{aligned} \tag{A3}$$

Given the maximum relief (Mx) can only take two values we can simplify and solve for rateable value in each case. First when maximum relief is 0.5, for the period 2005–2009:

$$\begin{aligned} BR &= (M)Rv-(M)\ Rv+\frac{Mx(M)(Rv^2)}{int} \\ BR &= \left(Rv^2\right)\frac{Mx(M)}{int} \\ Rv &= \sqrt{\frac{(NDR)int}{Mx(M)}} \end{aligned} \tag{A4}$$

Then when the maximum value is one for the period 2010–2017. In this case, we find the rateable value via the positive route of the quadratic in eq. 5. Once these steps are completed, the calculation of relief in a given year is quite straightforward.

$$\begin{aligned} BR &= (M)Rv - 2(M)Rv + \frac{(M)Rv^2}{int} \\ BR &= -(M)Rv + \frac{(M)Rv^2}{int} \\ 0 &= \frac{(M)}{int}Rv^2 - (M)Rv - NDR \end{aligned} \tag{A5}$$

If a firm meets the criteria for SBRR and has paid zero BR we assume the relief is 100%.[12] We place the recovered rateable value and associated SBRR into factor variables in order to implement our saturated OLS model approach and to recognise that there may be some errors in the collection BR paid data, as is survey rather than administrative data.

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