Starting from Scratch?
A New Approach to Subnational Public Finance

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Abstract

In many countries, the arrangements for lower-level governments to finance the public goods and services they provide are highly complex. These intricate combinations of grant mechanisms and local taxes are often regarded as unfair, opaque or ineffective, and tend to lack legitimacy as a result. This paper explores a set of transparent and intuitive guidelines for the design of a new fiscal framework for regional public finance. It builds these from principles rather than an ad hoc process dictated by political expediency. It also accounts for the possibility that one or more regions may choose to leave the federation or union. To offset this possibility, and within certain bounds, our framework allows subnational jurisdictions to unilaterally decide how much tax autonomy and fiscal responsibility they wish to adopt. Our paper therefore offers a fresh perspective on subnational public finance.

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1 Introduction

In most federations, or countries with other forms of multi-level governance, lower-level (subnational) governments only partially finance their expenditures from their own taxes or user fees. The resulting 'vertical fiscal gap' between subnational expenditures and revenues is bridged by central government grants, or by subnational borrowing. [1] Convincing arguments in favour of such arrangements exist, yet they also come with significant drawbacks. [2] Because of their complexity and implicit or explicit redistribution, central government grants are often regarded as unfair, opaque or ineffective, and tend to lack legitimacy as a result. Furthermore, existing attempts to promote local accountability through the transfer of tax-raising powers are frequently seen as insufficient.

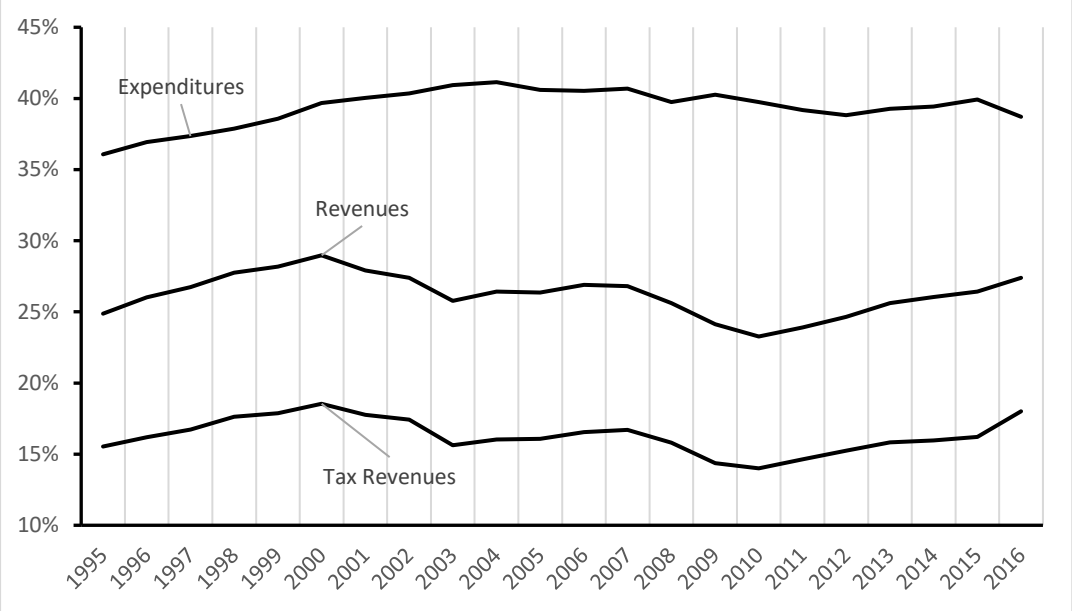
In the UK, for example, the main element of the financing scheme has been the Barnett formula', introduced in 1979 as a short-term, 'stopgap' measure based on actual spending in England, but continues to this day to determine funding allocations to Scotland, Wales and Northern Ireland. Following the independence referendum of 2014, the Scottish Parliament acquired significantly more tax and welfare powers than the other nations of the UK, so that different versions of the Barnett formula now apply to allocate grants to the devolved institutions. [3] Many other countries operate with similar levels of complexity embedded in their fiscal frameworks. These are often perceived as ineffective or lacking legitimacy.[4] In Spain, Belgium and Canada, for example, subnational governments have frequently demanded increased tax autonomy, triggering far-reaching state reform and even threats to secede. Even in Germany and Italy, the current fiscal framework is increasingly under pressure. It therefore seems these systems have mainly solved short-term political concerns, but have been less successful in forming a stable long-term solution to the question of how to distribute fiscal powers and organise equalisation payments. In this paper, we explore a set of equitable, transparent and intuitive guidelines for establishing such a stable framework for subnational finances.

Figure One shows why an outdated framework for subnational finance may be unstable. Using aggregated, weighted data from 24 OECD countries, it shows that the revenue streams needed to finance devolved spending are large: on average, lower-level governments account for around 35-40% of total public spending. Only around half of these expenditures are covered by subnational own revenues, so that all subnational governments in these OECD countries are highly dependent on transfers from central government. The form of fiscal framework in each

[1] We use the term subnational to reference the regional/state tier of government in this paper. Our proposals would also apply to the municipal level, however, even within a technically unitary country.
[2] See e.g. Boadway and Shah (2009) for a detailed overview of the literature on fiscal federalism.
[3] Within England itself, devolution of fiscal powers has been less extensive and is limited to some property taxes and user charges. London has the widest range of powers: for other city-regions limited changes have been linked to customised "city-deals".
[4] See Boadway and Shah (2007) for an extensive overview of existing fiscal frameworks, and a thorough analysis of their shortcomings.

country is therefore fundamental to determining both taxation and the provision of public services at subnational level. Flaws in these frameworks, such as ill-conceived choices regarding the degree and nature of tax autonomy or grant design, can have negative economic and political implications. In their most extreme form, fiscal frameworks that are widely perceived as unfair can be a threat to the continuation of the federation, or union.

Figure One: Regional expenditures and (tax) revenues in % of total public spending



Source: own calculations, based on the OECD fiscal decentralisation database. We constructed a balanced panel data set out of the uninterrupted time series of 24 OECD countries, including: Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Luxembourg, Netherlands, Norway, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, and the United Kingdom. (http://www.oecd.org/tax/federalism/oecdfiscaldecentralisationdatabase.htm). Means are population weighted.

To resolve the common difficulties faced by existing fiscal frameworks, we propose an entirely new design. It is built from a transparent set of principles, such as efficiency, accountability and equality of opportunity, rather than on an *ad hoc* process dictated by political expediency. Crucially, we also recognise that any fiscal arrangement will give rise to a 'participation constraint', which we define as the cost of participating in the federation (or union) and which can vary across subnational jurisdictions. Hence, our arguments have a political economy element that accounts for the willingness of subnational jurisdictions to leave the federation, or union. In short, we consider the possibility that real or perceived unfairness in the distribution of public resources across jurisdictions could undermine confidence in the federation.

Our proposed framework therefore allows subnational jurisdictions to determine how much tax autonomy and fiscal responsibility they wish to adopt, which, as a formalised

blueprint for subnational public finance, is entirely novel. [5] Of course, to guarantee the stability of overall national public finances, this kind of subnational discretion has to be limited in some way. There is a trade-off between subnational autonomy and the federation's economic stability. By introducing nationally-defined restrictions on subnational fiscal discretion, our proposals can at most 'soften' the participation constraint, rather than eliminate it. This approach is aimed at making the federation more credible to its citizens, as well as more resilient to both internal and external credibility challenges.

Lastly, the principles-based approach outlined here is flexible and can be generalised across federations. In what follows we will draw on the UK setting to exemplify a current case where the fiscal framework is both asymmetric and lacks transparency, and where the possibility that the Union will be dissolved is significant.

2 Principles

Economists generally agree on which functions of government can be devolved to local government, and which competences to retain at the centre. As a general rule, powers that can be tailored to local demographies, needs or preferences are better organised at the regional or municipal level, *if* no economies of scale are lost as a result, or coordination failures are incurred (Oates, 1999). Discretion over education, welfare, health care, infrastructure, transport, or skills policies is therefore often assigned to subnational governments. Conversely, if such devolution were to lead to large losses in agglomeration economies or significant coordination failures between local governments, policy levers should be kept in the hands of the highest level of government (Oates, 1972). As a result, areas such as defence, macro-economic stabilisation, most of social security, trade or foreign policy tend to remain the prerogative of central governments (Boadway and Shah, 2009).

Unfortunately, there is no similar consensus regarding the collection of revenues to pay for these devolved functions. Finding the optimal division of revenue-raising powers almost always boils down to striking the right balance between a variety of interrelated principles, that vary in importance according to local conditions. We describe the most important principles below.

2.1 Efficiency & Accountability

Tax autonomy among subnational governments can lead to harmful tax competition, reducing the welfare gains from locally financed expenditure (Wilson, 1986; Keen and Kotsogiannis, 2002; Wilson and Wildasin, 2004). If, for example, Northern Ireland were to be given powers

[5] There are earlier, ad hoc, examples of such an asymmetric approach. For example, in Canada, where opt-out arrangements allowed Québec to replace transfers by its own Personal Income Tax, which it then could shape to its own preferences which are more progressive and more pro-family.

to reduce tax on company profits so that it could compete with the Republic of Ireland, businesses from Great Britain might move to Northern Ireland just to take advantage of the lower corporation tax rate.[6] Revenue reductions resulting from such tax competition can then reduce public service provision below welfare maximizing levels. Moreover, differences in local tax rates will cause misallocation of production factors across regions, ranging from labour to capital.

To avoid this, central government can simply provide cash transfers to subnational governments instead of granting them tax autonomy. The downside of this approach is that voters are less able to hold local politicians to account because the link between spending and revenue raising is absent (Boadway and Tremblay, 2012). Indeed, the transparency of the fiscal framework is undermined in this case, so that voters have less incentive to understand the link between revenue raising and public spending and are hence less likely to punish underperforming politicians at the polls (Lockwood, 2006). Similarly, poorly informed voters are more likely to acquiesce to excessive regional borrowing if subnational governments have the power to raise debt on financial markets. This may lead to defaults if subnational governments wrongly assume that they will bailed out by higher levels of government, which is more likely the more they are dependent on grant-based finance. [7]

2.2 Responsibility

There is clearly a trade-off between the efficiency losses of tax competition and the benefits of accountability in relation to tax powers. [8] However, tax autonomy also brings about fiscal incentives, which rely on the positive feedback loop between 'good' policies and consequent financial rewards (Weingast, 1995; Jin et al., 2005; Weingast, 2009). The crux of the argument is that if a policy measure boosts regional growth, it is likely to affect the tax base of e.g. personal income, business, or property taxes positively as well. A certain degree of devolved tax autonomy incentivises subnational governments to seek to grow the local tax base. And since rent-seeking incumbents will never have enough funds to further their goals or win over potential voters, it will be in their own 'fiscal interest' to invest in such growth-enhancing policies. [9] A virtuous cycle is thus set in motion, where the right policies increase tax revenues which, in turn, provide the incentive to continue and extend the policies.

[6] This strategic behaviour will not materialise in regions with strong local agglomeration features, however, where the exact opposite can happen as local taxes are increased at the expense of weaker regions (Baldwin and Krugman, 2004). See also Collier and Venables (2018) for a recent illustration of such a 'race to the top', focusing on land taxation at city level.

[7] Aside from a more detailed description of both theoretical arguments regarding regional borrowing, an empirical validation is given by Rodden et al. (2003), Baskaran (2012), or Foremny (2014) for evidence. Note that some degree of regional borrowing discretion should be guaranteed in any case when taxation is devolved, to smooth regional-specific shocks to the fiscal base.

[8] Other arguments, which rely more on the benefits from scaling up and harmonising tax bases, support the case for centralised taxation (Oates, 2005).

[9] These rents can be thought of as public revenues siphoned off for private, socially unproductive purposes such as personal consumption, campaign finance, or rewarding cronies, but also as political 'slacking' (Alesina and

Since local growth often also promotes local welfare, politicians are therefore held responsible for their policies through their tax revenues, if an 'uptick' in regional growth can be attributed to their actions. This possibility is perhaps particularly important in settings where democratic accountability is weak, and politicians are corrupt or inept. Also, the degree to which subnational governments retain the revenues raised in their jurisdictions – what we will call the 'retention rate' – will be vital here. Importantly, grants from central government can also be made 'responsibility sensitive', linking their implicit retention rate to regional growth or perhaps to other performance-based measures such as participation/unemployment rates or schooling levels, which are better indicators to capture the efficacy of policies as we will discuss below.

2.3 Horizontal Equity

Crucially, even if local politicians are incentivised to take local welfare into account, the state-wide welfare effects of such a 'responsibility-sensitive' fiscal framework may not be realised. When, for example, education or welfare policies are devolved and partially financed on the basis of (economic) performance as suggested above, underperforming regions will have less finance available to keep schools and welfare programs equivalent to those in more prosperous regions. The notion of 'horizontal equity', generally understood as the equal treatment of otherwise equal citizens by the government, regardless of their location, would be violated. To compensate for such imbalances, an equalisation mechanism is required to realign inter-regional differences in fiscal capacities (Boadway and Shah, 2007).[10]

However, such equalisation payments reduce the 'retention rate' and therefore erode the fiscal independence and responsibility of local politicians. Equalisation transfers between subnational jurisdictions are often also politically controversial, especially if inter-regional inequalities (e.g. in income per capita) are persistent. [11] In what follows, we propose funding instruments that uphold fairness in a less contentious way, without excessively eroding local political responsibility and accountability. In doing so, we trace the issue of horizontal equity back to more normative grounds and specifically to the notion of 'equality of opportunity'. We propose to extend the normative argument that individuals should only be held accountable for those circumstances that are within their control, to the case of subnational governments. They should therefore experience the gains (or losses) of only those actions for which they can justifiably be held responsible (Cohen, 1989; Roemer, 1998). Conversely, circumstances and events beyond their control should be compensated by some form of public insurance so as to maintain 'equality of opportunity'. Our argument is that if local officials cannot reasonably be

Tabellini, 2008). Politicians then earn 'ego rents' from holding office, but also incur a 'cost' of having to provide an amount of public goods to attain their position.

[10] Equalisation mechanisms also provide insurance against region-specific, cyclical shocks, see e.g. Andersson (2008) or Arachi et al. (2010).

[11] Sas (2017) lastly, shows that standard equalisation schemes also fail to fully mitigate harmful tax competition in realistic settings where taxes are raised on an ad valorem basis.

held responsible for adverse (or beneficial) local outcomes, then it is justifiable for the central government to offer some compensation (or to extract rent). In contrast, no compensation should be paid for outcomes that are a clear consequence of local policy decisions.

2.4 Continuity & Predictability

The longevity of inter-governmental fiscal arrangements is contingent on continued participation by central and subnational governments. New arrangements will be required if national or subnational governments fail to adhere to fiscal rules or if external shocks undermine compliance. Several countries address these issues through an institutional mechanism that is independent of central government, such as a fiscal council (Braun, et al., 2016). These are usually designed to assess the overall stability of the system, provide a platform for representatives of all parties involved to negotiate on possible reform, fiscal rules, and budgetary projections. If all else fails, subnational governments may quit the federation if their electorate takes the majority view that autonomy is preferable to compliance with fiscal agreements. Obviously, such a decision would also have monetary implications, but since our framework no longer applies in this case, we focus only on fiscal issues. Given the thresholds we allow central government to impose on the degree of fiscal autonomy regions can select, we can safely assume that the question of monetary policy is only relevant when secession becomes a real possibility.

3 A new fiscal framework

Combining the principles touched upon above, an 'ideal' framework of regional public finance would implement a positive feedback loop between political performance and (tax) revenues. It would also remain *transparent* to the electorate and robust, both to competitive pressures between subnational governments, as well as to credibility challenges from all actors.

3.1 Tax autonomy

A first option would be to devolve only those tax instruments which are to some measure linked to economic activity and are raised on a relatively inelastic, yet salient, tax base. Decentralised arrangements for income tax and property taxes would be obvious candidates for the UK, in the sense that these automatically funnel the proceeds of growth-enhancing policies back into local revenues, are highly visible, and are raised on less mobile tax bases. Thus, if subnational governments manage to successfully promote local growth, they will reap the rewards through higher tax takes, which can then be used to increase re-election chances. The increased visibility of policy interventions will also improve electoral outcomes, if the policies being pursued are sound. As a result, because higher levels of economic activity can be linked to higher levels of welfare, local politicians are held both accountable and responsible for their actions, to the benefit of their electorate.

Note that tax sharing, where revenues from a specific tax base are shared explicitly between national and subnational governments, apparently provide an alternative mechanism for increasing regional tax autonomy. However, tax sharing can be implemented in many ways and these vary considerably in the extent to which they genuinely extend subnational fiscal autonomy (Blöchliger & King, 2006). For example, the UK government agreed with the Scottish Government, to share half of VAT revenue raised in Scotland from 2019. This measure significantly increases Scotland's tax retention rate but has little effect in extending the Scottish Government's fiscal powers given that it will not control either the VAT tax base, or the rates at which VAT is applied. Moreover, as it is difficult to link measures of local social and economic performance to local VAT revenues, variations in these revenues have no effect on the incentives faced by local politicians. The 'responsibility feedback loop' as described above, will fail.

3.2 The need for a new grant mechanism

As discussed above, devolving tax powers to lower levels of government will almost always reduce horizontal equity between regions. The more a subnational government has to rely on its own fiscal base, the more inter-regional differences in needs come to the surface, which are due to a variety of factors often beyond the control of politicians. This then trickles down into the quality of local public services, leading to spatially differentiated treatment of otherwise equal citizens. Equalisation mechanisms to correct for such imbalances are generally designed to equalise both with respect to differences in fiscal capacity as well as regional need, which does not come without its own set of problems. Because of their focus on equalisation, these systems are often very complex.[12] Moreover, since these designs use various proxies for fiscal capacity which are potentially affected by regional policies, these are subject to manipulation.[13] Equalisation based on fiscal capacity also reduces the retention rate, and therefore weakens the responsibility feedback loop described above. Lastly, a relatively poorer, yet resource-rich region may end up paying into the system to the benefit of richer regions, if natural resources are counted as part of fiscal capacity.[14] For all of these reasons, this form of inter-regional redistribution has fomented socio-political unrest in the past, and put the stability of the union under pressure.

The responsibility effect of tax autonomy tends to be rather blunt as well. The purpose of the responsibility feedback loop is to reward local politicians for policies that increase local

[12] The Australian system for example, calculates revenue disabilities for 18 tax bases and expenditure disabilities for 41 programs. Whereas the first stage of the German system is fairly clear (using land tax, income tax and corporate tax to calculate fiscal capacity), its second stage formula is very complex, and mixes demographics with fiscal capacity (Boadway and Shah, 2007).

[13] Although representative systems in Canada, Australia or Switzerland avoid a direct link between the fiscal capacities of the region in question and its equalisation payments, an indirect link always remains (affecting the tax base or average tax rate used in the formula). In many other countries (e.g. Germany, Spain, Belgium) actual fiscal capacities are used (Boadway and Shah, 2007).

[14] This has re-emerged as a drawback of the Canadian system, with oil-rich states such as Alberta increasingly critical of the equalisation in place (Boadway and Shah, 2007).

welfare. But what are such policies and how do they interact with the evolution of tax revenues? Tax autonomy boosts the economic growth *objective* for subnational governments: it expands the fiscal base and therefore provides local policy makers with additional tax revenues *if* they can boost regional growth. But growth depends on a plethora of drivers. Public policy is just one of these. Also, if growth is based on the attraction of foreign investment in polluting industries, or on developers who run down natural resources, welfare may actually be reduced in line with tax revenues. Timing matters too, since investments in, for example, education, skills and infrastructure are likely to have medium- to long-term effects on local growth and prosperity, but may be less attractive to current politicians because they do not offer a sufficiently rapid political return via the fiscal base. Although economic growth may seem an obvious objective of responsible policymaking, it is necessary to consider a wider range of criteria to direct local fiscal incentives towards longer term objectives that enhance welfare.

To remedy both shortcomings of full tax autonomy – in that it erodes horizontal equity and offers a blunt measure to boost local welfare – without losing too many of its advantages, we propose a new grant mechanism in what follows. It allows for a more explicitly transparent, flexible and intuitive interpretation of horizontal equity, and also takes into account various responsibility criteria to nudge local politicians in the right direction. It would, however, always operate alongside a substantial degree of devolved tax autonomy to preserve the transparency benefits of the latter, while offsetting its deficiencies. Subnational governments should therefore also be given some discretion over borrowing decisions to smooth region-specific revenue shocks.

3.3 Designing a new grant mechanism

In designing a new grant mechanism, we separate outcomes for which local politicians can and should be held responsible from those that are beyond their control. Hence, we propose that subnational fiscal frameworks should *explicitly* comprise both 'responsibility' and 'compensation' elements. This concept draws on the axiomatic formulation of both principles developed by Flearbaey (2008) and is founded on an 'equality of opportunity' ethical framework. Such fiscal frameworks should therefore explicitly and transparently combine a compensation *and* a responsibility element in a relatively simple and understandable formula. The compensation element reflects equity considerations by reducing the disadvantages that citizens face due to the circumstances of the area in which they happen to live. It will therefore compensate for differences in regional needs. The responsibility mechanism rewards authorities that drive 'favourable' welfare outcomes in policy areas over which they have discretion. The last element of our proposal is that, within specified limits, subnational governments should have the right to determine the relative importance of the responsibility and compensation elements in their revenues. These limits relate to the requirement that subnational fiscal autonomy should not undermine the overall economic stability of the federation, and will be the result of national deliberation and consensus. We remain agnostic

as to how national consensus will be found exactly, as this will be very country-specific. It could be based on a qualified majority across the federation, or on simple majorities in each region preceded by a citizen's assembly, etc.

3.3.1 The formula

In practice, our approach implies that grants from central to subnational governments will have two components. The first will be linked to observable performance-related factors relating to local welfare such as mean per-capita income, measures of inequality, labour market outcomes or capital formation (tangible and intangible, social and natural). This comprises the *responsibility* element. The second component of the grant will be determined by needs-based factors comprising demographic, geographic and other indicators. This comprises the *compensation* element. We discuss both the criteria for establishing the compensation and responsibility elements in more detail in Section 3.3.2.

Both mechanisms are then rolled into the same formula expressed by Eq. (1), which spells out how an annual lump sum (G_t) assigned by the central state for spending in all regions in year *t* would be allocated to subnational government *i*.

$$G_{it} = \underbrace{(\beta_{it}.G_t)}_{Compensation} . \underbrace{\left[1 + \left(\mathbb{I}_E.\omega_{ij}.(\alpha_{it} - \bar{\alpha}_t)\right)\right]}_{Responsibility} \qquad (1)$$

Where β_{it} is the needs-based coefficient for Region *i* at time *t*

$\mathbb{I}_E$ in an indicator function that determines whether or not Region *i* will receive a responsibility bonus at time *t*.

ω_{ij} is a weight that reflects the level of fiscal autonomy that Region *i* has opted for in the decision period, j. [15]

α_{it} is the selected performance measure for Region *i* at time *t* and $\bar{\alpha}_t$ is the average performance of *all* regions at time *t*.

To illustrate, suppose the grant mechanism only finances one function, for example, education. The lump sum G_t in Eq(1) would then cover the total amount deemed sufficient to cover spending on education by all subnational governments in the State at the time of introduction of the new grant scheme. Following its introduction, the lump sum evolves based on pre-defined indices such as inflation π_t and/or average 'performance ($\bar{\alpha}_t$), so that:

$$G_t = G_{t-1} . (1 + \bar{\alpha}_t) . (1 + \pi_t) \qquad (2)$$

[15] We call this decision period an 'epoch' and will probably be a period of several years in which time the regions are not able to select a new level of fiscal autonomy, for example. As the epoch comes to an end, the State would invite the regions to select, and commit to a (new) weight.

However, this adjustment only keeps the lump sum G_t from eroding in real terms but does not properly allocate it across the subnational governments. This is achieved by the compensation mechanism in Eq.(1), since one, or more needs-based indicators are used for this allocation. Sticking to our example, the lump sum could thus be split across regions based on an appropriate and simple measure of need, N_{it}, such as the population of school age, where:

$$\beta_{it} = {N_{it}}\Big/{\sum_{i=1}^{k} N_{it}} \tag{3}$$

Next, and to reward regional politicians for pursuing their welfare-enhancing policies, the responsibility mechanism introduces performance-based indicators, α_{it}, to the grant scheme, which could be numbers of graduated students in our example. These indicators determine the *growth* of the sub-divided lump sum, and thus provide any of the *k* regions with a bonus *if* they perform better than the average for the entire State ($\bar{\alpha}_t$), where:

$$\bar{\alpha}_t = {\sum_{i=1}^{k} \alpha_{it}}\Big/{k} \tag{4}$$

This allows the indicator function to be computed as:

$$\mathbb{I}_E(\alpha_{it} - \bar{\alpha}_t) = \begin{cases} 1, if\ \alpha_{it} > \bar{\alpha}_t \\ 0, \text{otherwise} \end{cases} \tag{5}$$

which then sets out the conditions for receiving the bonus. Any region that achieves an above-average performance in the selected measure will receive additional funding from the State, while all those that fall at, or below the average, will fail to do so.

Crucially, Eq.(1) allows each subnational jurisdiction to decide on the potential size of the responsibility bonus, albeit within certain nationally agreed-upon bounds. As specified in Eq. (1), the size of the bonus will be defined by the responsibility weight, $\omega_{ij} \in \left[\underline{x}, \overline{x}\right]$ chosen by and agreed with Region i for epoch j, with x setting the upper and lower bounds on regional discretion.

Our grant scheme has the advantages of being both pragmatic and conceptually attractive as it simultaneously combines responsibility and compensation elements. It is more intuitive and politically operational than standard equalisation grants that tend to be solely equity-oriented and are far less underpinned by responsibility arguments. Moreover, by linking needs directly to funding, the scheme offers an element of horizontal equity which is highly visible. This, and its ability to incorporate a 'responsibility' element, improves its chances of finding broad support across a federation where views differ between subnational governments on the desirable level of accountability and inter-regional fairness. In addition, our formula is fixed and transparent, yet automatically adapts to changes in needs and performance through time,

setting it apart from discretionary regional finance schemes that are open to political meddling (also known as pork-barrel politics) and the resulting inefficiencies. [16]

The grant scheme is also highly flexible, in the sense that it can be applied separately to specific policy areas, as in our education example above, or to the sum total of regional spending to be financed by grants. [17] Since we can also attribute weights to the responsibility component of the grant formula, the scheme not only allows for flexibility in the choice of needs-based and performance-based criteria, but also reflects their *relative* importance. It would thus be possible to allow the relative weight of responsibility to vary across lower-level governments, as the latter can decide, separately and unilaterally, on the likelihood or appropriateness of achieving a bonus.

The transparency of this approach with respect to inter-regional fairness, responsibility and local needs can facilitate the democratic debate that would precede the establishment of a new fiscal framework. As a result, and more so than other existing mechanisms, our grant scheme can respond to the demands of any real-world objective setting elicited through the electoral process.

3.3.2 How to measure compensation and responsibility?

Choosing which criteria are relevant to introduce as needs- or performance-based indicators will follow from national consensus obtained through the democratic process. The 'compensation' mechanism would rely on indicators and measures of need, also to simplify this deliberation. Once the criteria are elicited, an institutional process would still be needed to identify appropriate indicators, their weighting, and how they might be adjusted over time. There are international exemplars of such institutions, including the Australian Grants Commission (Boadway & Shah, 2007). To ensure trust, this institution would have to be transparent and independent from government at all levels.

Focusing on the UK in what follows, and based on the functions of government currently devolved to the UK nations, the accessible indicators might include the numbers older people (>80); dependent children (<18); people claiming income-related benefits, or; with a long-term limiting illness, or; from a minority ethnic group, or; living outside communities of 10,000 people , or living on remote islands, for example. All of these are based on population numbers and are highly transparent, and for this reason, applicable to other developed countries seeking to establish stable fiscal frameworks. They will always be expressed as regional population shares in the relevant nationwide population, before being inserted into the grant formula spelled out in detail in Eq.(1).

[16] Since the compensation component of the grant scheme is largely shock-proof for the same reason, the grants will implicitly maintain a lower bound of interregional insurance.

[17] In this latter case the lump sum G_t would simply capture overall devolved spending, and the aggregate needs-based and performance-based indicators could be the average of various specific and relevant indicators. If applied to one policy area furthermore, the grant scheme also allows for the grant to be hypothecated or 'earmarked'.

Moving on to the responsibility mechanism, the retention of revenues will be based on achievement of particular objectives. For reasons set out in Section 3.2, responsibility incentives should not be limited to the retention of additional tax revenues. They could also include targets for the outcomes of spending programs such as increases in new firm formation or participation rates, improvements in life expectancy, reductions in inequality or increases in skills formation. Also, broader objectives such as increased life expectancy or improved productivity might be agreed, without interfering with governmental strategy as to how these should be achieved. The fact that our mechanism allows each government to determine the relative importance of the responsibility bonus as explained in Section 3.3.1, can be expected to reduce frictions here, as we discuss further in section 3.5.

3.4 Bridging tax autonomy and grant finance

In most countries the degree of devolved taxation usually follows from consensus-driven deliberation on a national scale. However, as was the case when determining the responsibility bonus in our grant mechanism set out in Section 3.3, unilateral discretion could also be granted in relation to regional tax autonomy. This implies a transfer of risk which the devolved governments will embrace with varying degrees of enthusiasm. They could opt for a high degree of compensation via the grant mechanism and relatively little fiscal responsibility, or they could opt for full tax autonomy, which implies a complete transfer of fiscal risk. If local borrowing limits are fully relaxed in the process, this would differ from complete independence only insofar as control of monetary policy would still be the responsibility of the central government, and there would be a requirement to pay for those services financed by it that are necessary to support the state. [18] To guarantee a minimum amount of compensation via the grant mechanism, and also to safeguard the public finances underpinning the union, nationally-agreed limits to regional fiscal autonomy would be required to stabilise the fiscal framework at the federal level. [19] The extent to which unilateral discretion is bound by such nationally-agreed thresholds will also serve as a check on inter-regional spillovers.

To illustrate the workings of this choice, suppose the grant scheme proposed in Section 3.3 always functions alongside a certain amount of regionally devolved tax autonomy. Denoting regional revenues from devolved taxation by T_i, we can write overall regional revenues R_i of region i as

$$R_{it} = T_{it} + G_{it}, \qquad (6)$$

Where T_{it} is the amount to be raised via devolved taxation in region i in year t, and

G_{it} is the amount to be given to region i in year t via the grant mechanism.

[18] As is currently the case for Navarra and the Basque country under the Spanish fiscal framework arrangements.

[19] Similarly, the feedback loop from fiscal to monetary policy through bond yields and interest rates would likely require agreement on deficits and debt between the different levels of government.

We introduce a measure X_t that represents the State's total desired spending on all devolved functions in all regions in year *t*. If we follow a compensation-based approach to compute how much of this nationwide budget X_t should be allocated to each region *i*, Eq.(6) becomes

$$R_{it} = T_{it} + G_{it} \equiv \underbrace{\beta_{it}.X_t}_{Compensation} \qquad (7)$$

Now that we know the total size of the pie per region, the question is how much of it will be raised via devolved taxation. The extent to which subnational governments are then allowed to decide on tax autonomy is denoted by γ_i in Eq.(8) and is bound by nationally-agreed thresholds $\left[\underline{y}, \overline{y}\right]$ with $0 < \underline{y} < y_i < \overline{y} < 1$. This unilaterally-chosen percentage γ_i is then applied to the regionally allocated nationwide budget R_{it}, so that the revenues from tax autonomy in the starting year *t* of the new system in region *i* would be calibrated to equal:

$$T_{it} = \gamma_i . \underbrace{(\beta_{it}.X_t)}_{Compensation} \equiv \tau_{it}.B_{it} \qquad (8)$$

where τ_i^t is the tax rate to be levied by the region *i* authority on its own tax base in year *t*, and

B_{it} is the value of the tax base in region *i* at time t

- which evolves over a time following the growth rate of the various tax bases devolved for the purpose of tax autonomy. If a counterfactual evolution of the nationwide budget X_t is maintained, for example using the indexation method used in Eq.(3), the unilateral choice defined by γ_i in Eq.(8) can be re-made after the end of the pre-defined epoch, as was the case regarding the responsibility bonus in Eq (1). Next, the grant scheme would cover the residual of the regionally allocated budget as follows:

$$G_{it} = (1 - \gamma_{ij}) \underbrace{(\beta_{it}.G_t)}_{Compensation} . \underbrace{\left[1 + \left(\mathbb{I}_E.\omega_{ij}.(\alpha_{it} - \bar{\alpha}_t)\right)\right]}_{Responsibility} \qquad (9)$$

-where the conceptualisation of the grant mechanism is exactly the same as before, in Eq.(1).

Bridging tax autonomy and grant finance in this way, has two main advantages. First, we use needs-based indicators (such as regional population shares given by Eq.(3) in the Appendix) to define how much of the national budget X_t to allocate to each region. This links tax autonomy to the compensation-inspired approach set out earlier, independent of the unilateral choice of how much tax autonomy each region takes on. Second, by allowing regions to unilaterally determine how much of this allocated budget they want to raise themselves by means of devolved tax authority, and how much will be financed through grants, the participation constraint – as discussed in the previous section – will be "softened" even more. Of course, the main implication of such flexibility will be asymmetric degrees of tax authority between the national and regional levels of government, yet often with regard to the same tax

bases. [20] Some regions may opt for a higher degree of autonomy over e.g. a shared income tax base, others for a relatively lower degree.

3.5 Towards a softer participation constraint

A 'fair' combination of responsibility and compensation may seem normatively sound and intuitive but will not necessarily be perceived as such. Preferences regarding horizontal equity may differ across regional jurisdictions for many reasons, and more importantly, are susceptible to change. Preference instability of this kind will then influence the process of devolution itself. If for example an equalisation mechanism becomes politically unpopular in a given region, the fact that it is normatively fair from a nationwide perspective will matter less. As resistance to interregional fairness mounts, calls for more responsibility in the form of (tax) autonomy or even full independence can increasingly be expected. To different degrees this has happened, or is ongoing, in Spain, Italy, Belgium, the UK, Canada, and Germany.

By allowing each subnational government to set the relative weights ω_{ij} and γ_{ij} in Eq. (9) of responsibility and tax autonomy directly and unilaterally, our proposed framework is meant to mitigate these issues. Moreover, and from a dynamic point of view, this flexibility of the participation constraint is guaranteed across time, as each regional government can unilaterally decide to refashion its desired trade-off at pre-defined points – ideally after nationally agreed periods of time (epochs). The price of this flexibility will largely be paid by central government, since any shifts in subnational support paid through the grant scheme will ultimately be financed from the national budget, and/or public borrowing. Understanding of the game theoretical implications of a softer participation constraint is therefore crucial if the framework is to be kept stable. On the one hand, regions performing above average at a consistent rate will be driven to set their responsibility weights at the maximum level as a best response in equilibrium, whilst those below the average would do the opposite. However, as economic fortunes and policies will vary over time, below-average regions would still be tempted to outperform the average in the medium term, after which they would re-adjust their weights. The incentive to do better is therefore present for underperforming regional governments, even when a certain lower bound of compensation is always guaranteed as is the case in our scheme. Nonetheless, the responsibility and tax autonomy weights will need to be bounded by certain thresholds, framed by a nationally agreed consensus, as described above. Much in the same way as the output indicators for both compensation and responsibility themselves are chosen.

[20] Formulas of tax sharing between the central and lower levels of government could be based on the "split rate" approach, where e.g. two entirely different tax schedules would be applied on the same, shared labour income tax base. Alternatively, a regional surcharge – or "piggy-back"– tax rate could be levied on central tax revenues, which are then lowered for the purpose. In generic form, both can be modelled as a reduction of the central tax base.

Additionally, we also foresee the need to introduce at the start, a transition mechanism to facilitate political compliance, which would compensate for the differences between the old and new systems. Over a sufficiently wide – and to be agreed upon – time frame, the net budgetary effects of introducing the new grant system for each subnational government would be neutralised. Such a correction could then be phased out gradually as the envisaged transition period draws to an end.

4. Simulations

4.1. Illustration of the simulation model

To model our proposed fiscal framework, we construct an imaginary State which exists over 40 periods that are subdivided into eight 'epochs'. [21] This State is comprised of three regions, 'A', 'B' and 'C', that start with the following demographics:

Table One
Period One Regional Demographics

Region	A	B	C
Total Population	100,000	50,000	30,000
of which, are Taxpayers (%)	75,000 (75%)	30,000 (60%)	15,000 (50%)
Mean Regional Tax Receipts per taxpayer	£1,500	£1,200	£1,000

Region A is the largest and has the highest percentage of high-value taxpayers. Region C is the smallest, with the smallest share of taxpayers, who have the lowest per-capita taxable income. These populations and per-capita tax values are increased by inflators over the 40-year period simulated. The State has already devolved three public service functions ('1', '2' and '3') to the regions and has allocated £10 million in the first year to be divided between them to spend on these functions as each sees fit (this amount is subsequently adjusted via an 'inflator'). [22]

Each devolved function has its own needs assessment metric: Function 1 uses the numbers of non-taxpayers in each region *at the dawn of each new epoch*, Function 2 the number of taxpayers, and Function 3 the total population. Eq.(2) is therefore expanded in two stages Firstly, function-specific betas are calculated as:

[21] i.e. Epoch '1' would be periods 1-5; Epoch '2', 6-10 and so on.
[22] Any one of which would be functions such as Social Care or Transport, for example, related to a relevant metric, such as the number, or proportion of non-taxpayers and general population, respectively.

$$\beta_{Ak1} = \frac{N_{Ak1}}{\sum_{1=A}^{C} N_{ik1}} \beta_{Bk1} = \frac{N_{Bk1}}{\sum_{1=A}^{C} N_{ik1}}; \beta_{Ck1} = \frac{N_{Ck1}}{\sum_{1=A}^{C} N_{ik1}}$$

-where, $\beta_{Ak1}$is the period 1 share for Region A arising from function *k*, for example and,

N_{Ak1} is the relevant metric for Region A in period 1 (in this case, the number of non-taxpayers).

So, for example, the regions' Function 2 betas for period one would be:

$$\beta_{A21} = \frac{25000}{(25000 + 20000 + 15000)} = 0.417$$

$$\beta_{B21} = \frac{20000}{(25000 + 20000 + 15000)} = 0.333$$

$$\beta_{C21} = \frac{15000}{(25000 + 20000 + 15000)} = 0.250$$

Stage two then computes an overall beta for each region by combining each function-specific beta, as the simple average: i.e.

$$\beta_{A\ddot{\imath}} = {}^{(0.417 + 0.625 + 0.556)}/_{3} = 0.532 \qquad [10]$$

$$\beta_{B\ddot{\imath}} = {}^{(0.333 + 0.250 + 0.278)}/_{3} = 0.287$$

$$\beta_{C\ddot{\imath}} = {}^{(0.250 + 0.125 + 0.167)}/_{3} = 0.181$$

In establishing our base case scenario, no region opts to take any responsibility for raising any revenue, so the £10 million available to them would be allocated in these ratios.

Each region's population is then grown/shrunk by an index of net (birth – death) rates, assumed to apply equally to both the number of taxpayers and non-taxpayers. We assume that there will be some inter-regional migration of non-taxpayers attracted towards a region that has a relatively high level of per-capita public spending. [23] Given the period one allocations and the demographics in *Table 1*, the per capita spends are:

$$A = \frac{£532{,}407}{100{,}000} \cong £5.32; B = \frac{£287{,}307}{50{,}000} \cong £5.74; C = \frac{£180{,}556}{30{,}000} \cong £6.02$$

With the State average spending *per capita* being £5.56, we might envisage that some non-taxpayers living in Region A may be inclined to migrate to either Region B, or particularly,

[23] In doing this, we recognise that there will be many more affects on regions arising from both differences in per capita public spending and regional tax rates than direct migration, as discussed in section 2 but do not consider these effects in this model.

Region C and also that some in Region B may be attracted to Region C. The numbers of '(public) spending migrants' (SM_{it}) is modelled as:

$$SM_{it} = \frac{0.001(Average\ spend\ per\ capita_{it} - Average\ spend\ per\ capita_{t})N'_{it}}{N'_{it} \Big/ \sum_{i=A}^{C} N'_{it}}$$

- where N'_{it} is the number of non-taxpayers in Region *i* at time *t*.

Any region that spends less than the State-average *per capita* will witness some outward migration. The elasticity of the migration response of non-taxpayers is set, arbitrarily, at 0.001. Accordingly, in period 1, the inter-regional flows of non-taxpayers would be:

$$SM_{A1} = \frac{0.001\left(£5.32 - \frac{(£5.32 + £5.74 + £6.02)}{3}\right) * 25{,}000}{25{,}000 \Big/ (25{,}000 + 20{,}000 + 15{,}000)} = \frac{-93.333}{0.41666} \cong -222$$

$$SM_{B1} = \frac{0.001(£5.74 - £5.693) * 20{,}000}{20{,}000 \Big/ 60{,}000} = \frac{+9.4}{0.333} \cong +28$$

$$SM_{C1} = \frac{0.001(£6.02 - £5.693) * 15{,}000}{15{,}000 \Big/ 60{,}000} = \frac{+49.05}{0.25} \cong +194$$

Expenditure. The State needs to finance the £10m it has planned for devolved functions from its tax base. As no region opts for any tax autonomy, the State will levy a single, nationwide tax rate (τ_{s1}) on the taxpayers in all three regions, viz:

$$\tau_{s1} = \frac{£10\text{m}}{(75{,}000 * £1500) + (30{,}000 * £1200) + (15{,}000 * £1000)} = \frac{£10\text{m}}{£163.5\text{m}} \cong 6.11\%$$

The State raises £6.88m (69%), £2.20m (22%) and £0.92m (9%) in taxes from Regions A, B and C, respectively. As the average tax rate is the same in all regions, we assume that no taxpayers will have an incentive to relocate.

Tax Autonomy Now, we consider the effects of a region opting for a degree of tax autonomy. For illustration, we assume that Region A decides to raise 50% ($\gamma_A = 0.5$) of its allocated share of the spending on devolved functions (the £5.32m from Eq.(10)), namely £2.66m. Accordingly, its subnational government has to levy a 'local' tax (τ_{A1}) at the following rate on its taxpayers:

$$\tau_{A1} = \frac{£2.66\text{m}}{(75{,}000 * £1500)} = 2.37\%$$

The State now has a smaller tax target given Region A's decision, namely (£10m-£2.66m) = £7.34m, but also has a smaller tax base, given that the region's taxpayers will already have been levied by their devolved administration. Accordingly, its revised nationwide tax rate will be:

$$\tau_{s1} = \frac{\text{£7.34m}}{\left(\text{£163.5m} - \left(50\% * (75{,}000 * \text{£1,500})\right)\right)} \cong 6.84\%$$

The State's tax takes from the regions are now £3.85m, £2.46m and £1.03m. The taxpayers of Region A, however, will now face a different average tax rate ($\bar{\tau}_{A1}$) than their counterparts in B and C:

$$\bar{\tau}_{A1} = \frac{\text{£2.66m} + \text{£3.85m}}{(75{,}000 * \text{£1500})} \cong 5.79\%$$

- which is 1.05% lower than the rate faced elsewhere. We assume that some of Regions' B and C taxpayers will consider migrating to A, given its lower average tax rates. Our proposed response is similar to that of non-taxpayers moving to regions with higher per-capita spending, namely.

$$TM_{jt} = \frac{0.01(\bar{\tau}_1 - \bar{\tau}_{A1})N_{jt}}{N_{jt} \Big/ \sum_{i=A}^{C} N_{it}}$$

- where $\bar{\tau}_1$ is the (unweighted) average tax rate faced by all taxpayers in the State, and

N_{it} is the number of taxpayers in Region *i* at time *t.*

The model predicts that the following tax-migration flow will occur during period one:

$$TM_{A1} = \frac{0.01\left(\frac{5.79\% + 6.84\% + 6.84\%}{3} - 5.79\%\right) * 75{,}000}{75{,}000 \Big/ (75{,}000 + 30{,}000 + 15{,}000)} = \frac{+0.525}{0.625} \cong +8$$

$$TM_{B1} = \frac{0.01(6.49\% - 6.84\%) * 30{,}000}{30{,}000 \Big/ (75{,}000 + 30{,}000 + 15{,}000)} = \frac{-0.105}{0.625} \cong -4$$

$$TM_{C1} = \frac{0.01(6.49\% - 6.84\%) * 15{,}000}{15{,}000 \Big/ (75{,}000 + 30{,}000 + 15{,}000)} = \frac{-0.053}{0.625} \cong -4$$

Overall, the model would therefore predict a *net* movement of 214 people out of Region A, with 24 ending up in B and 190 in C by the start of period 2.

Responsibility Element Eqs.(1) and (5) include a responsibility component designed to reward above-average 'performance' in one, or more needs-based factors. As already mentioned, these would be direct measures of the regional governments' performances, like jobs created,

hospital waiting times, school class sizes, etc, but here we limit ourselves to the share of taxpayers in the population.

With this model, we equate the responsibility parameter, ω_{ij}, to be equivalent to the percentage tax autonomy opted for by Region *i* for the whole of epoch *j*. Thus, any region that does not take on any responsibility for raising its own tax cannot increase its responsibility coefficient above 1. Even then, it must also achieve a greater than State-average performance in its performance metrics. Given the starting demographics (*Table One*), the assumed population growth rates and inter-regional migrations, the State and Region A have the following period two demographics (*Table Two*):

Table Two Period Two Demographics		
	Region A	State
Total Population	100,181	180,471
Taxpayers (fraction of population)	75,303 (0.7517)	120,331 (0.6668)

Region C could have got a responsibility bonus in period two, as its weighted mean performance was greater than the State average but as it elected not to take on any tax responsibility (ω_{2i}=0), it will not. Region B's performance was below the State-average, so the Indicator Function sets its bonus to zero. Only Region A, whose performance was slightly above average and who opted for 50% tax autonomy gets a bonus, based on a responsibility multiplier of (from Eq.(9)):

$$1+ 50\%*(0.7517 - 0.6668) = 1.0425$$

giving it a responsibility bonus of:

$$£5.483m * (1.0425-1) \cong £233,000$$

4.2. Simulation: two scenarios

Having explained how our model works, we present some results from a simulation, spanning 40 periods over eight, five-year epochs. Starting with the period one demographics (*Table One*) and feasible population and spending/price growth indices, the State- and regional tax rates, expenditure shares, and demographics (including inter-regional migration) are modelled. [24] Having established the Base Case, where no region opts for any tax autonomy, we compute the effects on the key measures from, first the largest, most prosperous region (A), opting for

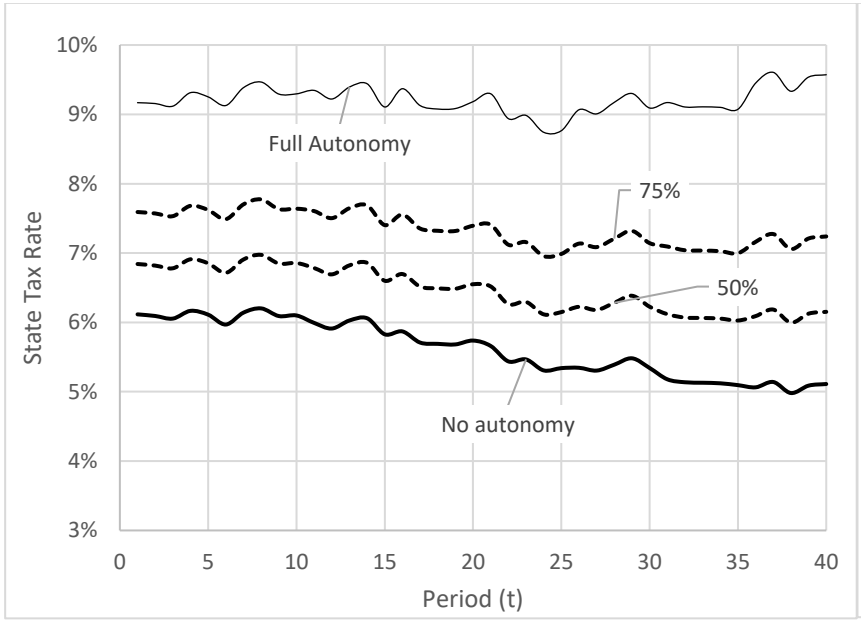
[24] At this stage of the model's development, we assume that all State and regional tax targets will be met exactly. Further developments will relax this assumption and explore alternative mechanisms for financing shortfalls and utilising any surpluses.

varying degrees of tax autonomy while the other two do not then, secondly where the smallest, least-prosperous region (C) opts for tax autonomy, while A and B do not.

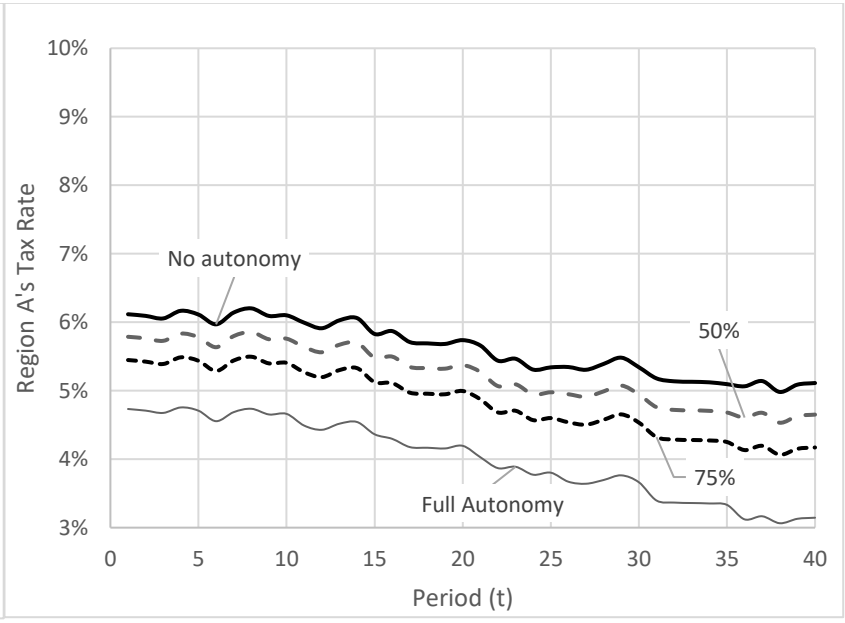
Firstly, Region A: *Figure Two* models the State's and Region A's average tax rates for the cases of No autonomy, 50% autonomy, 75% autonomy and, Full autonomy, *for the entire 40 years*. Given the spending and population inflators and inter-regional migration patterns the model uses, the State's population increases by 8% over the 40 years (though Region A's declines by 10%), the number of taxpayers by 13% (A = +9.5%) and the tax base by 255% in value, while spending on all devolved functions increases only by 197%. It is inevitable, therefore, that tax rates will tend to fall over time, but are not an inevitable outcome from regional tax autonomy.

What is immediately noticeable from *Figure Two* is when Region A opts for any tax autonomy, it lowers its average tax rate, causing the State's to increase. It can also be seen that the greater the degree of autonomy, the greater the gap between A's and the State's average tax rates. This is shown in *Figure 3* which shows an index of the State's and region's tax rates (100 = No autonomy).

Figure Two Region A Tax autonomy: State's and Region A's average tax rates

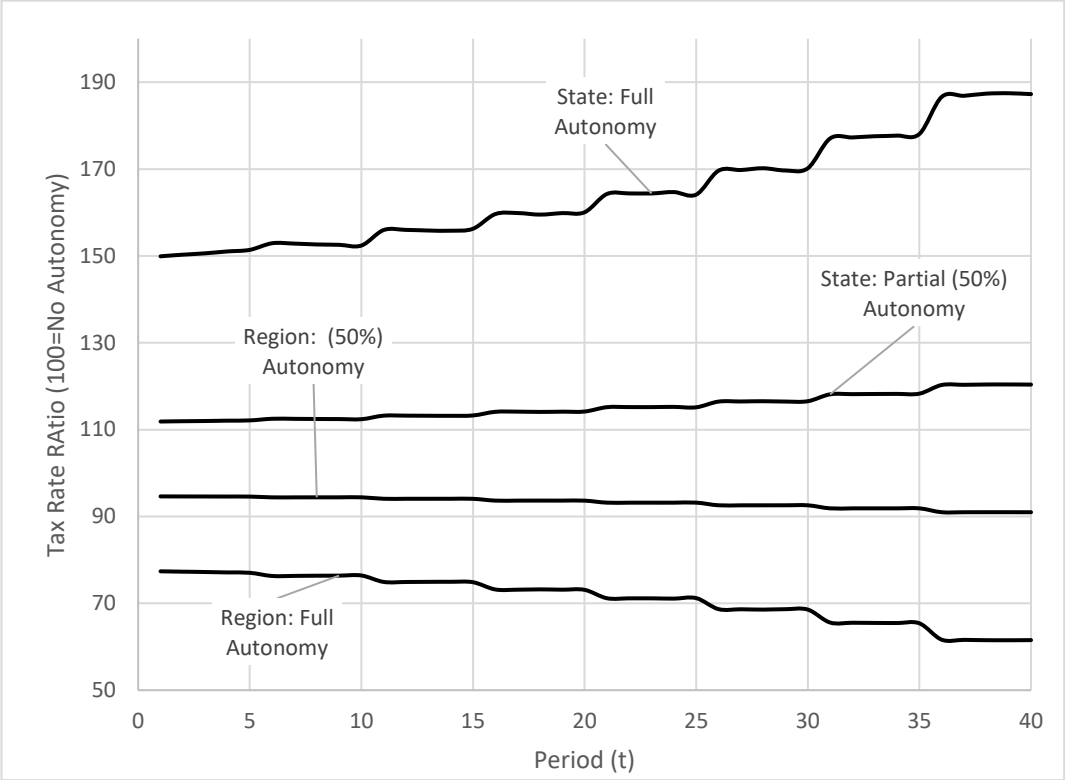


State



Region

Figure Three. Indices of the State's and Region A's Tax Rates



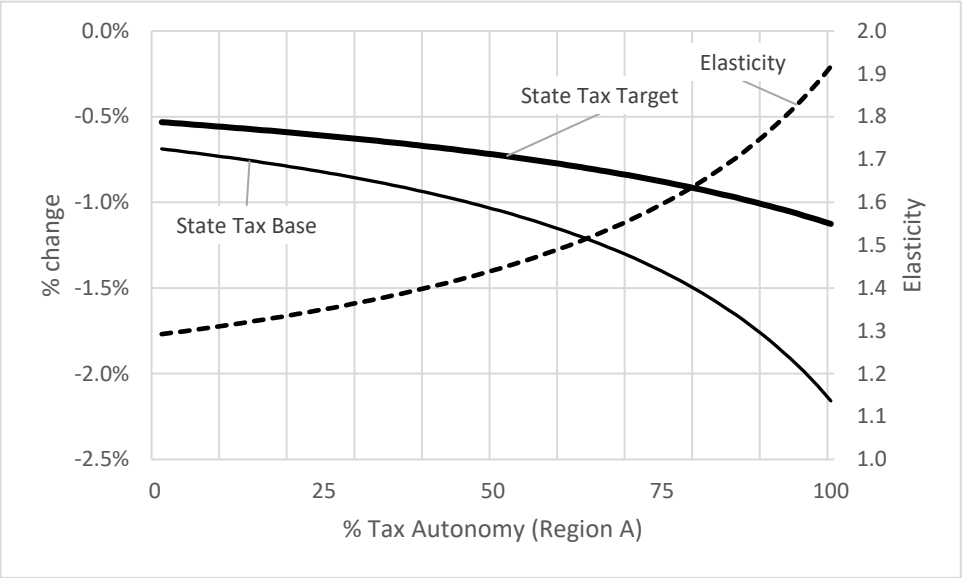
Also noticeable in *Figure Two* is the non-linearity in the increase of the State's tax rate as Region A opts for increasing tax autonomy, particularly the acceleration between 75% and 100%. Its tax rate will be 3-5% lower with full autonomy than would have been the case with no autonomy, while it would only be 1% lower with 50% autonomy. The State is losing valuable tax base at a faster rate than it is losing tax target, given that it is its largest and most affluent region that is progressively withdrawing its tax base. This is illustrated in *Figure Four*, that shows the percentage reductions in the State's tax base as Region A opts for one more percentage point of autonomy. While both decline as the degree of autonomy increases, the tax base declines more quickly from the outset and at a progressively faster rate than the tax target. This can be seen also in the measure of 'tax elasticity', ε_t, where:

$$\varepsilon_t = {}^{\%\Delta Tax\ Base}/_{\%\Delta Tax\ Target}$$

ε_t = 1 indicates that the tax base is changing in line with the tax target (i.e. the burden on the taxpayers remains the same); ε_t < 1 indicates that tax base is changing more slowly than the tax target (the burden is lessening), and; ε_t > 1 indicates that tax base is changing more quickly than the tax target (the burden is increasing). Here, the elasticity ranges between 1.3 and 1.9

indicating that the rate of increase in the tax burden on Region B's and C's taxpayers is, itself, increasing at the degree of autonomy approaches 100%.

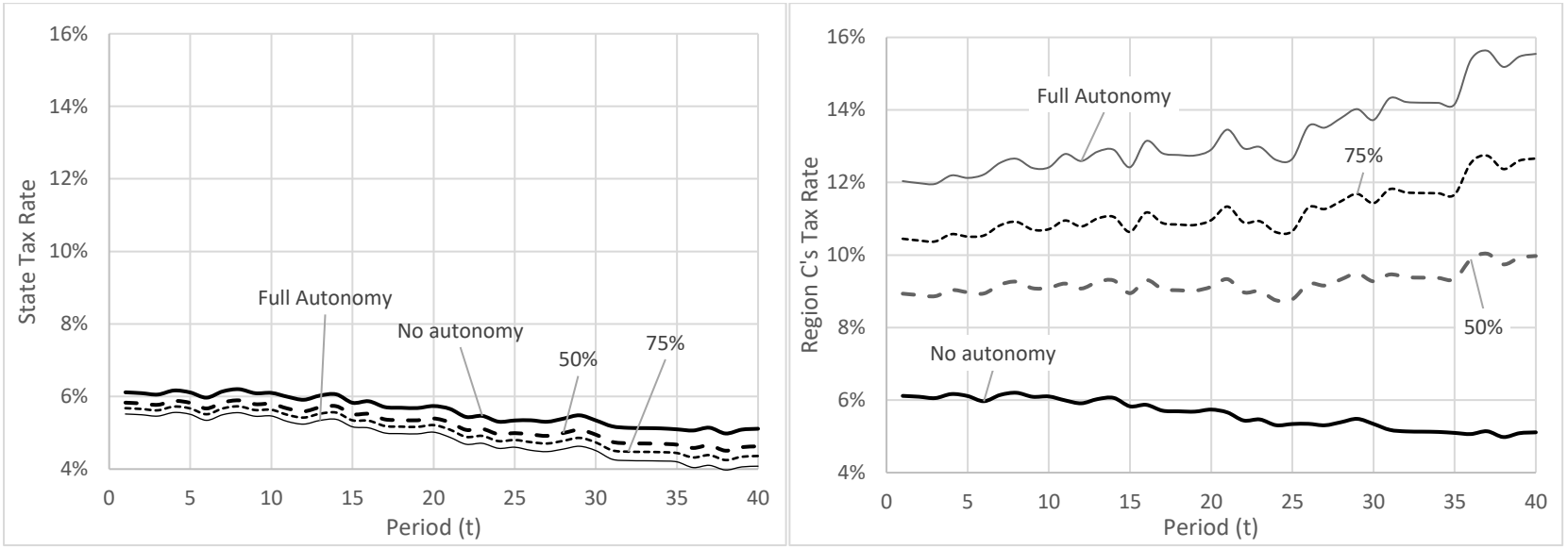
Figure Four. Percentage changes in State's Tax Base and Target and elasticities (Region A Autonomy)



We now investigate differences in response when a small and poor region opts for tax autonomy. In this second scenario, Region C opts for some autonomy, while Regions A and B do not. *Figure Five* plots the State's and region's average tax rates over the 40 periods. Again, the downward drift (by construction) of the tax rates can be seen, as can the increasing gap between the State- and regional tax rates as the degree of autonomy increases.

As Region C opts for autonomy, its taxpayers will face a higher tax rate, increasing in the degree of autonomy, while the average tax rates in the other two regions decline. There will be some migration response from the relatively scarce taxpayers in C moving to the rest of the State, repelled by its relatively high tax rate: this will further weaken C's tax base and strengthen those of A and B.

Figure Five Region C Tax autonomy: State's and Region C's average tax rates



State Region

As well as the contrasting relationship between tax rates and degree of autonomy, there is also a difference in the relative impact on tax rates in the regions and the State, depending on which region opts for autonomy. If Region A selects full autonomy, its average tax rate falls by around 1%, while rates rise in the rest of the State by around 3%. Region C's tax rate rises by around 6% if it opts for full autonomy, while rates fall in the rest of the State's taxpayers by less than 1%. Region C has a much smaller, and less-affluent tax base than A and would suffer proportionately more from any outward migration of taxpayers, making it harder for those taxpayers left to fund the ever-increasing local tax target.

Figure Six charts the decline in the State's tax base and target, along with the elasticities as Region C increases its degree of tax autonomy. The base declines more slowly than the target across the range ($\varepsilon_t < 1$) with the elasticity falling as the degree of autonomy approaches 100%, resulting in thez reduction in the State's average tax rate (*Figure Five*).

Figure Six. Percentage changes in State's Tax Base and Target and elasticities (Region C Autonomy)

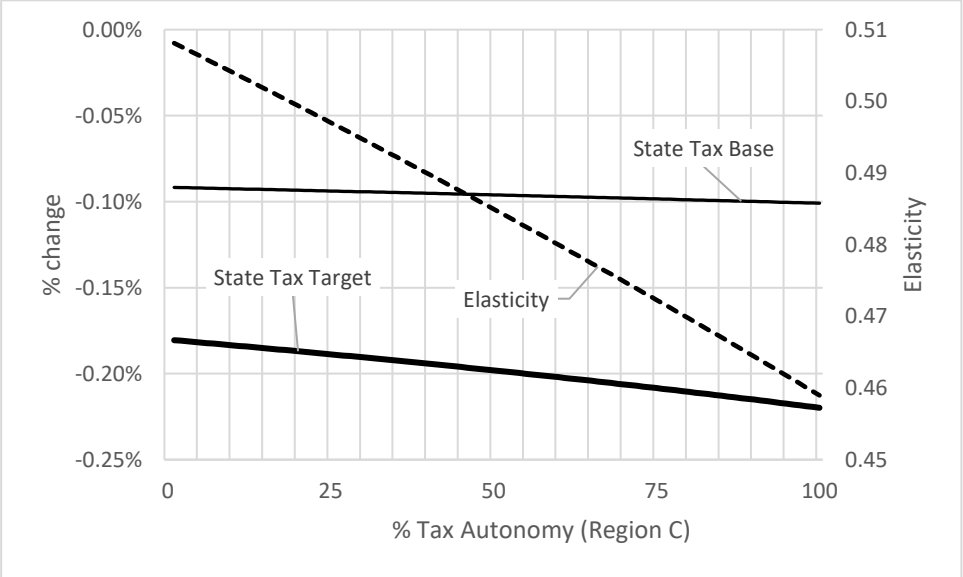
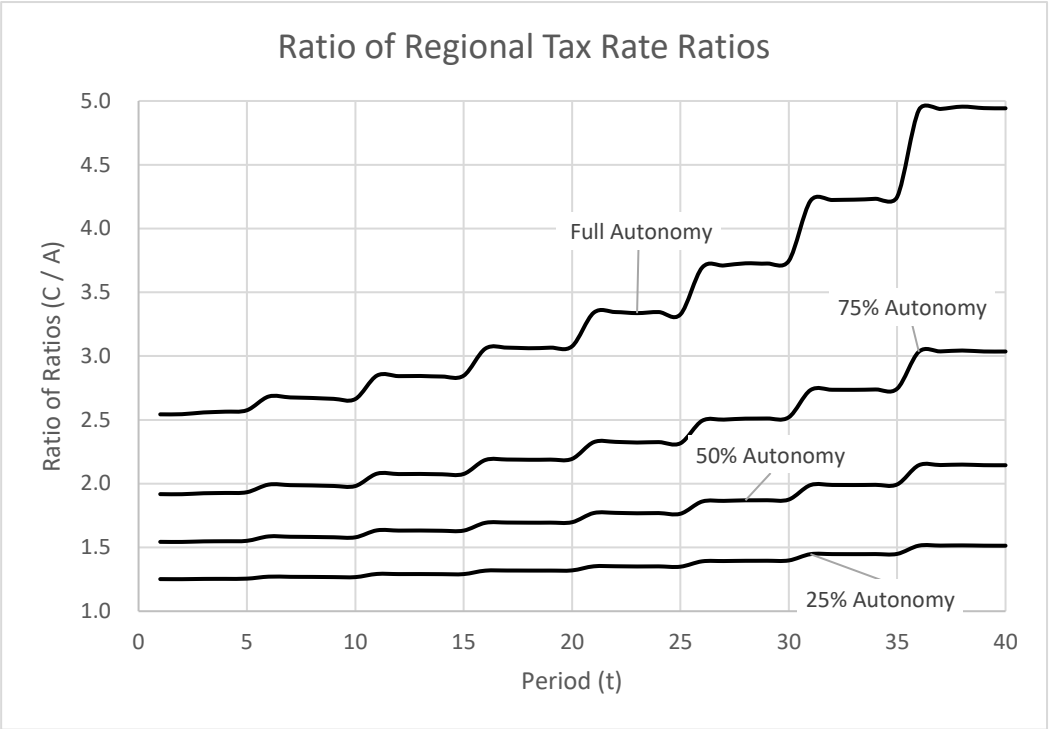


Figure Seven illustrates the ratio of the region-to-state tax rate indices over the simulation period. In period one, with full autonomy Region A's tax rate would be 77% of the rate with no autonomy, while C's rate would need to almost double. This implies a ratio of 2.54 between the rates in the two regions. It shrinks to only 1.25 with 25% autonomy.

Figure Seven Ratios of Region C's to Region A's Tax Rates Indices



The above analysis demonstrates that relatively affluent regions, that may also have the largest number of taxpayers in their territory, have an incentive to push for the highest possible degree of tax autonomy. This would increase the government's popularity with the taxpaying section of its electorate and would also strengthen its tax base by attracting taxpayers from other regions. If this could also be allied to higher levels of public spending per capita, this would also endear politicians to non-taxpayers, while also attracting non-taxpayers from other regions. It is a matter for the State, and the other, less-fortunate regions to consider whether this is an acceptable trend.

Smaller, less affluent, regions, would be less inclined to opt for tax autonomy, as this would make them unpopular with its tax-paying electorate and would lead to some outward migration and, perhaps, losing power in the next relevant election. There may be some scope in the poorer region to opt for more autonomy and to mitigate the effect of higher tax rates by using the Responsibility Bonus though this would be a risky strategy since the benefits of the responsibility bonus cannot be guaranteed.

This simulation illustrates our proposed Framework in operation. While it makes many assumptions that will be relaxed in subsequent developments, it encapsulates the basic intentions and functioning of the Framework in a mythical, though typical State, with

asymmetries in the size and affluence of its constituent regions. The main point illustrated is that, in terms of tax rates alone, regions that are more affluent than the State's average have much greater incentives to pursue autonomy than its poorest regions, while the latter have an incentive to retain the affluent region within the State. Conversely, affluent regions may have an incentive to encourage the poorer regions to opt for autonomy, or even to secede, though there are many other considerations beyond the tax rate, alone. Although we do not directly incorporate it here, the Responsibility Component would have to be applied judiciously in the poorer regions, to the extent that it would never be worse off from any degree of autonomy.

It is also clear that the effect on average tax rates as the degree of tax autonomy increases is not linear and that this may help to set an upper limit to the amount allowed. Also key is the absolute size of the populations of taxpayers and non-taxpayers in a region: the smaller the numbers, the more responsive the tax rate to changes in, for example, the degree of autonomy.

5. Concluding remarks

We suggest that the complexity, lack of transparency and independence of existing arrangements for distributing funds to subnational governments undermine both their sustainability and effectiveness. We propose that a new mechanism, which makes explicit the "compensation" and "responsibility" elements of their funding, should be established. This mechanism would permit subnational governments to determine the extent of responsibility and autonomy (and the level of risk) that they wished to take on, relative to a guaranteed amount of compensation for regional needs.

Applied to the UK setting, this would mean the devolved government in Scotland, Wales and Northern Ireland would potentially gain or lose relative to the English regions in the long run, depending on their decisions. As a result, our framework would necessarily involve the establishment of processes to identify relative need across different parts of the UK, and to establish a transition mechanism to adjust toward the implied distribution of funding support. It would also be required to monitor spillover effects from idiosyncratic fiscal decisions. This would ideally require an institutional base: our proposal is to establish a Responsibility and Compensation all Commission (RCC). It could be expected to be scrutinised by each Parliament.

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References

Andersson, L., 2008. Fiscal flows and financial markets: To what extent do they provide risk sharing within Sweden? Regional Studies 42, 1003–1011.

Arachi, G., Ferrario, C., Zanardi, A., 2010. Regional redistribution and risk sharing in Italy: the role of different tiers of government. Regional Studies 44, 55–69.

Baskaran, T., 2012. Soft budget constraints and strategic interactions in subnational borrowing: Evidence from the German States, 1975–2005. Journal of Urban Economics 71, 114–127.

Blöchliger H & King DN (2007) Less than you thought: the fiscal autonomy of sub-central governments. OECD Economic Studies, 2006 (2), pp. 155-188.

Boadway, R.W., Shah, A., 2007. Intergovernmental fiscal transfers: principles and practices., World Bank Publications.

Boadway, R., Shah, A., 2009. Fiscal federalism: principles and practice of multi-order governance. Cambridge University Press.

Boadway, R., Tremblay, J.F., 2012. Reassessment of the Tiebout model, Journal of Public Economics 96, 1063–1078.

Cohen, G.A., 1989. On the currency of egalitarian justice. Ethics 99, 906–944.

Fleurbaey, M., 2008, 'Fairness, Responsibility, and Welfare', OUP

Foremny, D., 2014. Sub-national deficits in European countries: The impact of fiscal rules and tax autonomy. European Journal of Political Economy 34, 86–110.

Jin, H., Qian, Y. and Weingast, B.R., 2005. Regional decentralization and fiscal incentives: Federalism, Chinese style. Journal of Public Economics 89, 1719–1742.

Keen, M.J. and Kotsogiannis, C., 2002. Does federalism lead to excessively high taxes? The American Economic Review 92, 363–370.

Lockwood, B., 2006. The political economy of decentralization, in: Handbook of multi-level finance. Ahmad, E. and Brosio, G, Chapter 2.

Oates, W., 1972. Fiscal federalism. Harcourt Brace Jovanovich (N.Y.).

Oates, W.E., 1999. An essay on fiscal federalism. Journal of Economic Literature 37, 1120–1149.

Oates, W.E., 2005. Toward a second-generation theory of fiscal federalism. International tax and public finance 12, 349–373.

Rodden, J., Eskeland, G.S. and Litvack, J.I., 2003. Fiscal decentralization and the challenge of hard budget constraints. MIT press.

Roemer, J.E., 1998. Why the poor do not expropriate the rich: an old argument in new garb. Journal of Public Economics 70, 399–424.

Sas, W., 2017. Can fiscal equalisation mitigate tax competition? ad valorem and residence-based taxation in a federation. International Tax and Public Finance 24, 817–853.

Weingast, B.R., 1995. The Economic Role of Political Institutions: Market-Preserving Federalism and Economic Development. Journal of Law, Economics and Organization 11, 1–31.

Weingast, B.R., 2009. Second generation fiscal federalism: The implications of fiscal incentives. Journal of Urban Economics 65, 279–293.

Wilson, J.D., 1986. A theory of inter-regional tax competition. Journal of Urban Economics 19, 296–315.

Wilson, J.D. and Wildasin, D.E., 2004. Capital tax competition: bane or boon?, Journal of Public Economics 88, 1065–1091.