1 Introduction

Fiscal federalism has been an important field of inquiry in the public economics literature since Oates's (1972) founding contribution. Understanding the properties and predicting the consequences of alternative arrangements of intergovernmental fiscal relationships in multi-tiered public sector structures on matters such as economic/growth, allocation of resources, political agency relationships, and social welfare is still a hot topic of academic research. Moreover, the sovereign debt crisis of the past decade and the enduring economic downturn have brought the analysis of multi-level fiscal governance to the forefront of academic discourse.

Indeed, federal and unitary countries alike typically share multi-level public finance structures where subcentral government units have an independent role in taxation and public service provision. According to the OECD/UCLG's (2016) investigation of the organizational and financial structure of 101 federal (17) and unitary (84) countries worldwide, comprising more than 500,000 subnational governments and representing almost 6 billion inhabitants, subnational governments account for around one quarter of total government spending or 9% of GDP. In fact, remarkable differences exist between federal and unitary countries. In the former, the share of subnational spending (almost 50% of total public expenditures and 18% of GDP) is more than twice as high as in unitary countries.

The bulk of subnational spending is on education, social protection, public transportation, housing, and community amenities, though the diversity in the assignment of responsibilities across levels of government is enormous. Subnational governments tend to play an important role in public investment, particularly in federal countries, and as public employers, with staff expenditure being their top budget item. Subnational own tax revenues account for about one-fourth of total public revenues and 8% of GDP and are about twice as high in federal as in unitary countries.

Intergovernmental grants play a crucial role in equalization and redistribution. The respective importance of own revenue sources versus transferred ones from other levels of government varies significantly both across countries and over time, as does the degree of regulation, capping, and of various forms of limitations that higher levels of government impose onto lower ones (Revelli, 2016b). The overall combination of those aspects of the fiscal federalism structure of a country determines in the end the degree of financial autonomy of governmental units at each of the existing tiers. In addition, equalization grants that fully or partially compensate local tax base differences (a common feature of federal and unitary countries) tend to influence the own taxation

incentives of decentralized policy makers by lowering their marginal cost of raising funds, thus also playing a role in allocative efficiency (Bucovetsky and Smart, 2006; Buettner, 2006; Smart, 2007).

Indeed, the characteristics of multi-tiered fiscal arrangements change over time in response to the evolution of the underlying economic, political, and social structures. In particular, the past decades have seen a trend toward greater decentralization around the globe (Allain-Dupré, 2018). Even though this "silent revolution" (Ivanyna and Shah, 2014) has occurred in almost all regions of the world, the process started earlier in the Western countries, notably in Europe (1960s and 1970s), than in the rest of the world (in Asia and Latin America during the 1990s). In fact, the decentralization revolution seems to have come to a stop in the advanced economies in the most recent years, with a number of unitary countries experiencing a trend of recentralization. Tables 1 and 2 report two basic indicators of public expenditure and revenue decentralization across a number of federal and unitary OECD countries in 1996, in what can be considered the peak of the great decentralization wave, in 2006, right before the beginning of the crisis, and in 2016, almost a decade after the start of the economic recession.

Tables 1 and 2 show that the role of subcentral units is considerable, and even larger than central ones in a number of cases, thus rightly deserving the great deal of attention that they have attracted in the past decades, both theoretically and empirically. However, while subcentral authorities maintain an important function both as revenue-raising bodies and as providers of public services around the developed world, there is no sign of a continuing process of decentralization either on the spending or on the revenue side.

By comparing Tables 1 and 2, it clearly emerges that the share of subcentral governments' expenditures remains consistently larger than the corresponding share of revenues. This constitutes a "vertical fiscal gap" – that is, an excess of local expenditure needs over revenue-raising capacity usually due to a tax assignment that is biased toward the central levels of government as collectors of taxes and that justifies most of the existing top-down intergovernmental transfers. Table 3 reports the subcentral vertical fiscal gap for the years 1996, 2006, and 2016. Overall, the vertical fiscal gap is about 5% to 6% of GDP and shows a large variance between countries, ranging from close to zero to almost 20% of GDP.

Moreover, there is no clear evidence of the vertical fiscal gap being absorbed during those 20 years. This suggests that the search for own revenue sources that can best be attributed to decentralized government units remains at the top of the research agenda in fiscal federalism. At the same time, grants from higher to lower levels of government are likely to

Table 1 Expenditure decentralization (% total government expenditure)

Country		1996	2006	2016
Federal				
Austria	Central	68.24	69.61	68.46
	State-local	31.76	30.39	31.54
Belgium	Central	66.76	61.60	55.13
	State-local	33.24	38.40	44.87
Canada	Central	39.86	33.95	31.85
	State-local	60.14	66.05	68.15
Germany	Central	62.56	62.08	59.91
	State-local	37.44	37.92	40.09
Switzerland	Central	45.63	44.49	42.58
	State-local	54.37	55.51	57.42
United States	Central	52.44	49.91	51.64
	State-local	47.56	50.09	48.36
Unitary				
Czech Republic	Central	65.90	70.52	74.27
	Regional-local	34.10	29.48	25.73
Denmark	Central	46.28	37.09	36.56
	Regional-local	53.72	62.91	63.44
Estonia	Central	74.39	72.65	76.96
	Regional-local	25.61	27.35	23.04
Finland	Central	68.21	61.26	60.69
	Regional-local	31.79	38.74	39.31
France	Central	82.39	80.07	80.60
	Regional-local	17.61	19.93	19.40
Greece	Central	93.20	92.67	92.92
	Regional-local	6.80	7.33	7.08
Hungary	Central	76.16	75.57	87.29
	Regional-local	23.84	24.43	12.71
Ireland	Central	68.24	81.09	92.43
	Regional-local	31.76	18.91	7.57
Israel	Central	87.17	89.01	87.47
	Regional-local	12.83	10.99	12.53
Italy	Central	75.47	69.02	72.52
	Regional-local	24.53	30.98	27.48
Latvia	Central	77.56	72.74	74.59
	Regional-local	22.45	27.26	25.41
Netherland	Central	66.89	67.02	68.62
	Regional-local	33.11	32.98	31.38

Table 1 (cont.)

Country		1996	2006	2016
Norway	Central	64.32	70.10	66.99
	Regional-local	35.68	29.90	33.01
Portugal	Central	87.31	85.73	87.60
	Regional-local	12.69	14.27	12.40
Slovak Republic	Central	89.04	83.31	84.24
	Regional-local	10.96	16.69	15.76
Slovenia	Central	82.88	80.80	81.95
	Regional-local	17.12	19.20	18.05
Spain	Central	65.54	51.01	56.59
	Regional-local	34.46	48.99	43.41
Sweden	Central	62.03	55.37	49.88
	Regional-local	37.97	44.63	50.12
United Kingdom	Central	73.28	71.31	75.89
	Regional-local	26.72	28.69	24.11

Note: Own calculations are based on OECD data.

keep on playing a major role in multi-tiered fiscal structures in the future too, thus justifying the continued interest of empirical public economists in their design and distributional impact, and in the analysis of their effects on local taxation and spending decisions.

In fact, having lagged behind the theoretical literature for decades, empirical research on fiscal federalism issues has been catching up by acquiring a central and independent role in policy advice, formation, and evaluation. This phenomenon is due, on the one hand, to the increasing availability of massive data sets on central and noncentral budgetary items from unitary states and federations; on the other hand, there has been in recent years a parallel development of sharp econometric methods. The latter rely on a clear definition of research questions and smart strategies for identification of key causal effects, thus promising to address the key issues in empirical fiscal federalism research far more successfully and convincingly.

Future research will need to thoroughly examine recent empirical work in this vein and explore the most critical issues in order to expand the frontier of econometric analysis in fiscal federalism, to which this Element is devoted. Given that the volume of empirical contributions in this area is enormous, we will focus on the most recent approaches and contributions.

This Element is structured into two parts. The first part (sections 2–4) covers the classic core endeavors and focuses on three areas of research that have attracted a great deal of scholarly attention in the past decades and can be

Table 2 Revenue decentralization (% total government revenue)

Country		1996	2006	2016
Federal				
Austria	Central	86.42	90.09	89.97
	State-local	13.58	9.91	10.03
Belgium	Central	85.77	82.32	76.42
	State-local	14.23	17.68	23.58
Canada	Central	45.85	45.34	43.62
	State-local	54.15	54.66	56.38
Germany	Central	66.13	64.83	63.18
	State-local	33.87	35.17	36.82
Switzerland	Central	51.22	51.48	51.27
	State-local	48.78	48.52	48.73
United States	Central	58.13	56.55	57.60
	State-local	41.87	43.45	42.40
Unitary				
Czech Republic	Central	82.97	81.94	81.79
	Regional-local	17.03	18.06	18.21
Denmark	Central	68.29	68.44	72.19
	Regional-local	31.71	31.56	27.81
Estonia	Central	96.16	95.60	95.95
	Regional-local	3.85	4.40	4.05
Finland	Central	73.86	74.51	71.74
	Regional-local	26.14	25.49	28.26
France	Central	86.06	84.83	83.99
	Regional-local	13.94	15.17	16.01
Greece	Central	97.34	97.42	97.03
	Regional-local	2.66	2.58	2.97
Hungary	Central	89.03	85.51	92.79
	Regional-local	10.97	14.49	7.21
Ireland	Central	90.38	91.86	95.41
	Regional-local	9.62	8.14	4.59
Israel	Central	92.10	91.78	91.09
	Regional-local	7.90	8.22	8.91
Italy	Central	88.36	81.04	82.67
	Regional-local	11.64	18.96	17.33
Latvia	Central	76.81	81.05	81.83
	Regional-local	23.19	18.95	18.17
Netherland	Central	88.38	89.68	91.22
	Regional-local	11.62	10.32	8.78

Table 2 (cont.)

Country		1996	2006	2016
Norway	Central	80.21	86.84	83.32
	Regional-local	19.79	13.16	16.68
Portugal	Central	90.68	89.69	89.70
	Regional-local	9.32	10.31	10.30
Slovak Republic	Central	94.02	95.04	94.85
	Regional-local	5.98	4.96	5.15
Slovenia	Central	88.81	89.46	88.04
	Regional-local	11.19	10.54	11.96
Spain	Central	82.73	74.20	72.19
	Regional-local	17.27	25.80	27.81
Sweden	Central	67.17	65.77	66.74
	Regional-local	32.83	34.23	33.26
United Kingdom	Central	91.83	90.67	91.45
	Regional-local	8.17	9.33	8.55

Note: Own calculations are based on OECD data.

viewed as the founding pillars of fiscal federalism. In particular, we will first investigate the impact of unconditional grants on recipient governments' spending and fiscal effort, focusing on the anomalous response to grants known as the "flypaper effect." Beyond this, we will turn to the key issue of fiscal externalities due to the mobility of the tax base and the resulting tax competition among same-tier authorities (horizontal fiscal competition). Finally, we will tackle the issue of fiscal externalities among taxing authorities at different levels (vertical fiscal competition) in a multi-tiered government system. This is a relatively (and undeservedly) understudied topic, considering its theoretical importance and its implications for revenue assignment across tiers of government.

The second part of this Element (sections 5–8) covers recent challenges and new frontiers and will turn to the survey of some novel areas of empirical investigation in fiscal federalism and, in particular, the link between decentralization and political accountability. Within this area of research, we will review four main strands. We will first explore how the existence of decentralized governments (and of large panels of data) allowed researchers to shed light on the effect of particular institutional features and advance the understanding of political institutions independently of decentralization, focusing on the link between term limits and political selection and accountability. We will then turn to the effect of voters' information, media penetration, and social capital on accountability and policy choices. Third, we will explore how localities may be

Table 3 Subcentral fiscal gap

Country	1996	2006	2016
Federal			
Austria	−10,73	−10,58	−11,08
Belgium	−10,59	−10,03	−11,93
Canada	−4,46	−3,51	−5,50
Germany	−2,95	−1,84	−1,14
Switzerland	−2,94	−1,82	−2,82
United States	−3,32	−3,70	−4,35
Mean	*−5,83*	*−5,25*	*−6,14*
Unitary			
Czech Republic	−7,65	−5,12	−2,83
Denmark	−13,55	−14,05	−19,21
Estonia	−8,57	−7,58	−7,73
Finland	−4,27	−5,42	−6,66
France	−2,54	−2,86	−2,46
Greece	−2,13	−2,31	−2,04
Hungary	−7,05	−6,46	−2,70
Ireland	−8,68	−3,43	−0,84
Israel	−2,84	−1,40	−1,64
Italy	−7,47	−6,42	−5,46
Latvia	0,17	−3,09	−2,70
Netherlands	−10,30	−9,76	−9,79
Norway	−6,39	−4,46	−7,63
Portugal	−1,90	−2,24	−1,16
Slovak Republic	−3,22	−4,73	−4,52
Slovenia	−2,73	−3,96	−2,97
Spain	−8,32	−8,34	−7,86
Sweden	−4,23	−4,56	−7,96
United Kingdom	−7,23	−8,20	−6,74
Mean	*−5,73*	*−5,49*	*−5,42*

Note: Subcentral fiscal gap = (Subcentral revenues – Subcentral expenditures) as a percentage of GDP; own calculations are based on OECD data.

subject to soft budget constraints and discuss the difficulties in detecting and measuring the effect of local governments expecting to be bailed out by central government in case of financial troubles. Fourth, the last theme in this Element is possibly the central question in the studies of decentralization and fiscal federalism: what evidence there is on the effects of decentralization per se on

local government efficiency and public good provision. We will review articles developing cross-country analyses and trying to detect whether political and fiscal decentralization are related in a causal fashion to better (or worse) government outcomes, such as the pervasiveness of corruption.

Finally, the empirical fiscal federalism literature has grown so much in the past decades that reasons of space have forced us to select a limited number of key topics out of a larger number of related important debates of which we provide, where possible, references to up-to-date reviews.

2 The Flypaper Effect

As documented in the introductory section, in virtually all multi-level structures of government, a vertical fiscal gap arises from the widely recognized advantages of assigning the power to tax at the higher tiers and attributing important tasks in the provision of public services to the lower tiers. Indeed, the gap between where tax revenues are collected and where public expenditures are made means that most decentralized authorities throughout fiscal federations will be unable to fund their outlays with their own revenue sources, requiring upper levels of government to intervene to fill the local revenue-expenditure gap with top-down transfers. Intergovernmental grants take many forms and serve different purposes, from unconditional transfers applying to broad categories of spending and leaving beneficiaries with an ample degree of discretion on their use, to grants that are conditional on grantees' programs having clearly defined objectives and satisfying specified conditions (Boadway, 2015).

Here we focus on the popular area of empirical research in fiscal federalism concerning the analysis of the impact of grants from upper-level authorities on lower-level recipient authorities' own expenditures on public services.[1] This line of research amounts to a veritable mountain of thousands of scholarly contributions (more than 3,500 according to Inman's 2009 decade-old count), frequently offering empirical evidence that appears to violate the axioms of microeconomic theory by showing differential responses of local spending to "external" versus "internal" revenue sources (Hines and Thaler, 1995).

To see why this is the case, consider an extremely simple fiscal decentralization arrangement in a two-tiered structure of government, where the expenditures of lower-tier authorities are funded by lump-sum grants from the upper level of government and by nondistortionary revenue sources. Let the welfare W_n of lower-tier jurisdiction $n(n = 1, \ldots \ , N)$ be expressed as a separable,

[1] Gamkhar and Shah (2007) and Sorens (2016) offer deep reviews of the research on the impact of vertical fiscal gaps and equalization grants on local economic performance, rent seeking, and moral hazard in fiscal policy making.

concave function of consumption of pure Samuelsonian public goods and private consumption goods:

$$W_n = v(Z_n) + \rho_n u(c_n) = \ln(Z_n) + \rho_n \ln[i_n(1-\tau_n)], \quad (1)$$

where Z_n stands for total expenditure on local public goods, i_n is the median income in the community, and ρ_n is a positive parameter reflecting the median voter's preferences for private consumption versus consumption of local public goods in locality n. It is assumed that the local authority can raise its own revenues by taxing the community's income at the proportional tax rate τ_n. Assume further that each local authority must abide by a balanced budget rule:

$$Z_n = G_n + \tau_n I_n = G_n + \tau_n \int i_x f(x) d(x), \quad (2)$$

where G_n represents the total lump-sum unconditional grants from the upper tier of the government, I_n is the total taxable income of the community, and $f(x)$ is the density of the income distribution.

Maximization of the welfare function (1) subject to the budget constraint (2) leads jurisdiction n to select the optimal tax rate-spending vector $[\tau_n^*, Z_n^*]$ as a function of the assumed exogenous variables G_n and I_n:

$$\tau_n^* = [1/(1+\rho_n)] \times [1-\rho_n(G_n/I_n)], \quad (3)$$

$$Z_n^* = [1/(1+\rho_n)] \times (G_n + I_n). \quad (4)$$

Equation (4) generates the standard result that exogenous perturbations in G_n or I_n should be predicted to have an identical effect on Z_n^*:

$$\partial Z_n^*/\partial G_n = \partial Z_n^*/\partial I_n = 1/(1+\rho_n). \quad (5)$$

When this does not happen – and in particular if a change in grants, in practice, turns out to provoke a larger reaction in local public spending than a change in "own" resources – a "flypaper effect" is said to exist. This section will focus on the most recent empirical investigations of the phenomenon of the excess sensitivity of local government expenditures to changes in grants relative to what conventional microeconomic theory would predict. For the sake of order, we can group these into four major categories, and we will restrict our attention to the most recent pieces of research in each category for reasons of space.[2]

The first category includes the contributions that portray the origin of the flypaper effect as an *econometric issue* related to a variety of specification and

[2] Hines and Thaler (1995), Gamkhar and Shah (2007), and Inman (2009) provide excellent reviews of the earlier contributions.

estimation errors that applied researchers would have kept on making for decades. The second explanation points instead to an oversimplification of the theoretical model of local decision-making – in particular, the properties of the mechanism of local revenue generation – as the cause of the "wrong" prediction of an identical impact on expenditures of transferred and own revenue sources. Clearly, the "econometric failure" argument is turned on its head here: it is not the faulty empirical approach that returns incorrect or biased coefficients, but it is the theoretical prediction of the perfect fungibility of funding sources that is "wrong" and does not find support in empirical research. As such, this approach is generally compatible with the standard neoclassical framework, as long as it still relies on the basic assumptions of agents' rationality, stable preferences, and clearing of all markets. Rather, it can be seen as a refinement of the theory that is obtained by introducing more realistic assumptions on the underlying local fiscal institutions and by allowing local governments to rely on distortionary sources of revenue. The third explanation is based on the recognition that recipient governments are subject to several constraints on their own revenue sources or spending decisions (tax and expenditure limitations) that are formally established by upper levels of government. In such a constrained environment, grant changes might be the only way to modify their levels of expenditures and get closer to their desired public-private consumption mix. Finally, the fourth explanation is qualitatively different from the previous ones, in that it explains the fact that money "sticks where it hits," with an explicit failure of some of the key assumptions of the neoclassical model of rational decision-making. In what follows, we will discuss the evidence that has emerged from those four lines of research, in turn.

2.1 Econometric Issues

The anomalously high response of local public expenditures to changes in grants relative to changes in local private resources might be due to econometric problems. In turn, these can have two distinct origins. The first is an issue of the specification of the local public expenditure equation, related to the characteristics of the grant variable that is included among the explanatory variables. The second econometric problem is more subtle and difficult to solve, even though it is, again, a specification issue, in the sense that it arises from the fact that the magnitude of a grant that flows to a locality may depend on local characteristics (observable or unobservable) that also have an independent impact on expenditure levels. First, any omitted variable that has a direct effect both on local expenditures and on grants – say, adverse climatic conditions, extreme events like flooding or earthquakes, or unobserved preferences for local