



# Granular indicators of fiscal decentralisation from the REGOFI and MUNIFI databases

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## Abstract

Standard measures of fiscal decentralisation often group subnational levels together, concealing differences in regional and municipal public service provision, financial contributions and taxing power. We address this gap by constructing refined granular decentralisation indicators for 22 countries using novel OECD data on regions and municipalities between 2010 and 2021, focusing on actual subnational autonomy over budgetary items. We examine the comparative role of transfers, tax revenues and other own revenue sources in subnational governments' finance, considering the implications for vertical and horizontal imbalances. Our findings, which complement the existing evidence on fiscal decentralisation based on established data sources, reveal two models of decentralisation: one in which municipalities have significant revenue and expenditure powers, and another in which regions dominate. Notably, while some countries choose not to devolve powers to regions, all maintain at least some degree of fiscal and service provision autonomy at the municipal level. From a policy perspective, our research contributes to the fiscal decentralisation literature by highlighting the importance of distinguishing between regional and municipal governments in a country's multilevel fiscal structure concerning revenues, public service delivery, and responsibilities.

**Keywords** Expenditure decentralisation · Subnational tax revenues · Regional governments · Municipal governments

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## 1 Introduction

The rapid pace of fiscal decentralisation in recent decades has led to a significant shift in the role of subnational governments, with many countries transferring substantial fiscal responsibilities to regional and local authorities. Granting taxing powers and spending autonomy to subnational units can improve the efficiency, transparency and accountability of public service provision to citizens (Martínez-Vázquez et al., 2017; Mauri, 2024; Musgrave, 1959; Oates, 1972; Tiebout, 1956).

The question of how to measure fiscal decentralisation effectively remains unresolved in the empirical and applied economics literature. Existing approaches face some conceptual limitations and significant challenges related to data availability, standardisation, and consistency across countries and over time (Dougherty et al., 2019; Liu et al., 2012). One crucial point is that disaggregated data on revenues and expenditures at the individual level of subnational governments are rarely systematically and uniformly available, which limits cross-country comparability (Agrawal et al., 2022; Pietrovito et al., 2023).

Drawing upon the pioneering work of Stegarescu (2005) and, more recently, Yoshihiro (2024), we introduce refined empirical indicators of fiscal decentralisation for countries belonging to the Organisation for Economic Co-operation and Development (OECD), including a selection of European Union (EU) Member States, observed over the years 2010–2021. These indicators are derived from highly granular data in the new OECD's Regional Government Finance (REGOFI) and Municipal Government Finance (MUNIFI) databases (OECD, 2024). Note that in unitary countries, 'regional' refers to regions, but in federal countries, it may refer to states. Intermediate levels of government, such as counties or provinces (where they exist), are not included in the REGOFI and MUNIFI databases.<sup>1</sup>

Using regional and municipal data separately provides a higher level of detail than is usually found in existing empirical literature and official data sources. These new data can therefore supplement traditional fiscal decentralisation data that combine all subnational levels of government, thereby obscuring the unique contribution of each level to the decentralisation process. Moreover, the fiscal responsibilities and constraints, and political pressures faced by municipal and regional governments often differ within and between countries, due to diverse legal mandates, service provision and revenue-raising capacity (Berset et al., 2023). Accordingly, the true extent of fiscal decentralisation cannot be understood by relying solely on the available statistical data on central and non-central public revenues and expenditures.

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<sup>1</sup> Counties or provinces are included in the databases when they represent the highest subnational tier of government (i.e. they function as regions with general-purpose self-government). By contrast, in countries that have both a regional and a municipal tier, intermediate entities located between them are not covered. Inter-municipal collaborative bodies are also excluded. Although the datasets are limited to the period from 2010 to 2021, thereby excluding the years immediately following the 2008 financial crisis and only partially capturing the period of the Covid-19 pandemic, they nevertheless provide a decade-long window into important developments in subnational public finance.

A comprehensive and effective understanding of the fiscal decentralisation phenomenon requires granular data on the various levels of subnational government and the degree of autonomy held by non-central governments (Ebel & Yilmaz, 2003; Martínez-Vázquez & McNab, 2003; Mauri, 2024). Due to potential differences in their tax bases, spending allocations, and reliance on intergovernmental transfers, it is important to separate regional and local indicators. Aggregating them can mask offsetting movements and lead to ambiguous inferences about the extent and nature of decentralisation. Furthermore, such detailed subnational data allows us to demonstrate the differences in fiscal arrangements between countries (Agrawal et al., 2024) and fully understand the role of external revenue sources, such as transfers, compared to internally generated revenues, such as taxes and fees (Dougherty et al., 2024; Lago et al., 2024).<sup>2</sup>

Our results confirm the existing evidence of wide variations in the degree of fiscal decentralisation across countries, as well as widespread asymmetric decentralisation, whereby spending tasks tend to be more decentralised than revenue collection. We also find that the unitary versus federal structure of government is an important, yet imperfect, predictor of fiscal decentralisation arrangements.

A breakdown of decentralisation indicators based on regional and municipal data reveals different models of decentralisation across countries. Some countries, such as Mexico, Canada and Switzerland, mostly decentralise revenues at the regional level, while others, such as Colombia, Denmark and Sweden, mostly do so at the municipal level. Overall, our findings suggest that there are at least two distinct decentralisation models. Denmark and Sweden exemplify the ‘Scandinavian model’ (Knutsson et al., 2016), in which municipalities have significant powers. In contrast, regions play a more prominent role in other countries. Even the most centralised countries seem to prefer some degree of municipal decentralisation. We also provide new evidence on the comparative role of transfers versus own revenues in financing subnational governments. Notably, the subnational tiers of government in some countries, including the Netherlands and Türkiye, rely heavily on external resources, which can constitute over 70% of subnational revenues.

The remainder of the paper is structured as follows: Sect. 2 reviews the literature on measuring fiscal decentralisation, providing an overview of the current state of the art in terms of indicators. Section 3 describes the new REGOFI and MUNIFI databases and their regional and municipal budgetary items. Section 4 presents the methodology behind our refined decentralisation indicators, which are then discussed, analysed and compared with the main existing measures in Sect. 5. Section 6 concludes by highlighting some policy implications.

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<sup>2</sup>This type of analytical study would complement the evidence produced by qualitative approaches such as those of Dougherty and Montes (2023) and OECD (2021).

## 2 Measuring fiscal decentralisation: the state of the art

In the existing literature, fiscal decentralisation is typically measured as the proportion of subnational revenues (or taxes) and expenditures relative to those of the general government. This gives rise to indicators of revenue decentralisation (RD) and tax decentralisation (TD), as well as expenditure decentralisation (ED). Empirical analyses tend to rely on data from standard official sources, such as the International Monetary Fund (IMF) and the OECD (Bach et al., 2009; Blöchliger, 2015; Blöchliger et al., 2013; Blume & Voigt, 2011; Dougherty et al., 2019; Martínez-Vázquez & Timofeev, 2010; Sacchi & Salotti, 2014, 2016).<sup>3</sup>

Specifically, the IMF database contains fiscal indicators for over 70 countries from 1972 onwards. These are based on the Government Finance Statistics Yearbooks (Lledó et al., 2018). The OECD's Fiscal Decentralisation Database (FDD) contains data on member countries from 1965 until the most recently available year. The latter is based on three primary sources: the OECD National Accounts database, the OECD Revenue Statistics database, and unique data collected from individual countries via questionnaires.

According to these data, subnational government spending accounts for around 33% of general government expenditure on average in OECD countries. However, their share of subnational revenues averages at just 20% of general government revenues. Existing literature on asymmetric decentralisation suggests that this could have negative consequences for fiscal and economic performance (Guo et al., 2022; Mitra and Chymis, 2023; Nakatani, 2023).

A well-known limitation of this type of data is that it fails to capture the true extent of subnational government autonomy and accountability over expenditure and revenue decisions (Ebel & Yilmaz, 2003; Vo, 2008, 2010). Consequently, decentralisation indicators may overstate the influence of subnational governments by failing to reflect their actual control over fiscal matters.

For example, official statistics often categorise shared taxes as subnational tax revenues, even when subnational governments lack the authority to determine the tax base or rates. Tax-sharing mechanisms imply complex linkages between subnational and central government budgets, which can give rise to moral hazards, overlapping competencies and conflicts of interest (Liberati & Sacchi, 2013; Martínez-Vázquez et al., 2017). Therefore, it is difficult to argue, with general validity, that shared taxes are fully subnational in terms of real decision-making powers (Bahl & Cyan, 2011; Martínez-Vázquez, 2015; McLure, 1998; Oates, 2004). Conversely, from a policy standpoint, own tax revenues are a vital component of vertical budgetary structure, influencing both independence from the central government and horizontal fiscal competition (Keen & Kotsogiannis, 2002, 2004).

<sup>3</sup> On the other hand, more qualitative approaches have been developed and focus on fiscal autonomy and rely on information collected from regional and local governance experts (e.g., Hooghe et al., 2016; Ivanyna & Shah, 2014; Ladner et al., 2019, 2023; Marks et al., 2008). The main measures of subnational autonomy are the Regional Authority Index (RAI—Hooghe et al., 2016) and the Local Autonomy Index (LAI—Ladner et al., 2019, 2023). The downside is that it can be challenging to ensure the comparability of assessments across countries.

Refined decentralisation indicators that account for real subnational autonomy have been constructed. Building on a pioneering OECD (1999) study that categorised tax revenues from autonomous sources, shared taxes, and intergovernmental grants, Stegarescu (2005) developed seven expenditure, revenue, and tax decentralisation indicators, capturing the varying degrees of real autonomy of subnational governments. These indicators were applied to 23 OECD countries between 1965 and 2001. For example, three of the indicators distinguish between taxes over which subnational governments have full autonomy, shared tax revenues and taxes collected at the subnational level but decided entirely by the central government.

Recent updates on the tax revenue side are documented in Blöchliger and Nettley (2015), as well as in OECD (2009a, b). The OECD FDD now provides data on fiscal autonomy indicators, distinguishing between taxes over which sub-central governments have discretion over tax rates and reliefs, one or the other, or neither. On average, the data reveal that subcentral governments in federal countries have discretion over 60% of their tax revenues, whereas in unitary countries this applies to less than 13% of revenues (although subcentral governments do have decision-making powers regarding tax rates for 60% of their taxes).<sup>4</sup>

While this information is useful, it does not distinguish between different types of taxes, such as the value added tax (VAT), property taxes, or personal income taxes. The extent to which subnational governments control each type of tax varies. Property tax, for example, is usually collected and managed by municipalities under a tax base separation scheme (Liberati & Sacchi, 2013). However, while subnational governments in some countries (such as Germany) can set tax rates and determine eligibility for tax relief, in others (such as the UK), tax rates are set by the national government.

Another shortcoming of the data discussed so far is that all subnational levels are treated as a single entity. While both the IMF and OECD datasets contain standardised data across countries, neither provides the level of detail required to construct decentralisation indicators offering information on the various subnational levels of government (Martínez-Vázquez et al., 2017). This is because international public finance databases based on the System of National Accounts generally categorise governments into three main layers: the central government sector; the state government sector, applicable only to federal countries; and the local government sector. The latter includes regional, intermediate (e.g. provinces, districts and counties) and municipal governments.

Another complication is that countries may not apply the definition of local government consistently when reporting to the OECD Revenue Statistics database. In some cases, the data on local government in OECD Revenue Statistics correspond exactly to the aggregate of REGOFI and MUNIFI, suggesting that both regional and municipal tiers were reported under the local category. Additionally, the state government category appears only for federal countries in OECD Revenue Statistics,

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<sup>4</sup>The tax autonomy indicators are collected operationally from a survey of national administrations applying the OECD typology of tax autonomy. This indicates the degree to which subnational governments have autonomy over different revenue sources. The data is then taken from the OECD publication Revenue Statistics.

even though the OECD definition also encompasses regional governments in unitary states. This suggests that countries may interpret ‘local government’ differently, which potentially limits cross-country comparability. The REGOFI and MUNIFI databases improve clarity in this respect by applying a uniform classification that systematically distinguishes between regional and municipal governments, complementing the information available from established sources.

In the next Section, we explain how we use data from the OECD’s REGOFI and MUNIFI databases to construct refined, comprehensive, granular fiscal decentralisation indicators that overcome some of the aforementioned limitations, particularly on the revenue side.

### 3 The REGOFI and MUNIFI databases

The REGOFI and MUNIFI databases contain data on the regional and municipal public finances in OECD countries from 2010 to 2021. They provide information on government expenditure, revenue, and public debt, covering 550 regional governments and around 120,000 municipalities. The REGOFI database includes aggregated data for 25 countries and disaggregated data for 23 countries (not available for Türkiye and Greece), covering all regions belonging to the included countries. The MUNIFI database covers 37 countries in its aggregated version and 28 countries in its disaggregated version. For most of these 28 countries, all municipalities are included. A notable exception is Switzerland, where publicly available data only covers municipalities with more than 5,000 inhabitants, excluding over 1000 smaller municipalities. Other countries without full municipal coverage include the United States, Mexico, Italy and Hungary, where a small proportion of municipalities are missing. Despite these exceptions, the MUNIFI database offers a very broad coverage of municipal governments. Data are collected from national sources and harmonised across countries in collaboration with national statistical institutes and other key stakeholders to ensure high reliability and comparability (OECD, 2024).

While aggregated data suffice for some general decentralisation indicators, disaggregated information is equally important. Asymmetries in autonomy and fiscal capacity are not confined to countries with formal constitutional differences, such as Spain and Belgium. In practice, many countries exhibit significant regional and municipal variations in expenditure responsibilities and revenue capacity (Allain-Dupré et al., 2020). Disaggregated data are therefore essential for analysing these differences and assessing intra-country disparities that are obscured in aggregated figures.

Expenditure data is categorised as either current or capital spending. Regarding revenue, the databases include tax revenue categorised by type (income, property and consumption), as well as grants and subsidies, user charges and fees, income from asset management and social contributions. This comprehensive data structure enables us to develop more precise revenue decentralisation (RD) and tax decentralisation (TD) indicators that accurately reflect the autonomy of subnational governments. Examining disaggregated revenue streams and their sources enables us to better appreciate the extent to which subnational entities control their own financial

resources. This gives us a more nuanced understanding of fiscal decentralisation, especially since we can analyse regions and municipalities separately. Conversely, although the databases differentiate between current and capital expenditure, they lack the detail required to provide insights into the degree of subnational autonomy over these expenditures. This means that, while we can analyse expenditure distribution at various government levels, critical information on the decision-making power of subnational governments in allocating these funds is lacking. This is similar to the state of the art described in Sect. 2.

While these databases represent a significant step forward in the availability of granular subnational fiscal data, they are not without limitations. Firstly, they exclude intermediate levels of government, such as counties or provinces, which play a role in certain countries, including France and Italy. This means that the databases do not fully capture all subnational finances and are not fully comparable with other aggregated figures available in the national accounts or IMF and OECD datasets. Secondly, the data are not consolidated across subnational tiers, meaning that intergovernmental transfers between regions and municipalities, if any, are included. By contrast, the OECD's Revenue Statistics consolidate regional and local governments into a single subnational category. However, this obscures the role of each level, at least for unitary countries. The two approaches are therefore complementary. The Revenue Statistics provide a consolidated subnational total, while the REGOFI and MUNIFI data enable regions and municipalities to be analysed separately.

Finally, as the REGOFI and MUNIFI databases focus on individual regions and municipalities, they do not reflect any fiscal relationships between governments within the same tier, such as inter-municipal cooperation or shared service arrangements. Therefore, the databases are not suitable for calculating variables that encompass subnational governments as a whole. They are, however, best suited to analyses of the specific regional and municipal governments covered in the databases.

#### 4 The methodology behind the refined decentralisation indicators

Building on the seminal contribution of Stegarescu (2005) and subsequent scholars (Ebel & Yilmaz, 2003; Gemmill et al., 2013; Liberati & Sacchi, 2013), we develop refined fiscal decentralisation indicators adapted to the REGOFI and MUNIFI datasets and covering 22 countries (seven federal and 15 unitary).<sup>5</sup> We calculate three RD indicators and one ED indicator. Moreover, we build two novel composite indicators

<sup>5</sup>The countries for which both regional and local data are available over the period 2010 to 2021 are as follows, indicating whether they are federal (and quasi-federal) countries (F) or EU member states (EU): Denmark (EU), Sweden (EU), Australia (F), Japan, Colombia, Canada (F), Greece (EU), Mexico (F), Norway, Spain (EU, F), Switzerland (F), Belgium (EU, F), South Korea, the USA (F), the Czech Republic (EU), the Netherlands (EU), Poland (EU), Romania (EU), Türkiye, Italy (EU), Croatia (EU) and France (EU). This list reflects the intersection of the REGOFI and MUNIFI datasets. Several OECD/EU countries were excluded either because they lack a recognised regional tier of self-government (e.g. Estonia, Finland, Latvia, Lithuania, Slovenia, Iceland, Portugal, Ireland, Luxembourg, Malta) or because of data limitations, such as short or incomplete series or missing municipal coverage (e.g. Germany, Austria, New Zealand, Hungary, the United Kingdom, Chile).

by combining information from both sides of the budget and, thus, offering a more comprehensive understanding of fiscal decentralisation.

The decentralisation indicators are expressed as the ratio of subnational government budget items to general government budget items. The denominator of the RD indicators is an aggregate that defines the scope of the general government's revenue. This is defined as the sum of the internally generated revenues—namely, tax revenue, fees and other types of own revenue—excluding transfers from other entities (which may include other levels of government). Similarly, the denominator of the expenditure decentralisation indicator is an aggregate representing 'direct' general government expenditure—that is, expenditure not transferred to third parties. These general government aggregates exclude the double counting of intergovernmental transfers and deduct any other resources that are, by their nature, subject to a degree of third-party control that cannot be assessed a priori on a general basis. This provides a stricter and more consistent benchmark for assessing subnational government decentralisation.

Equation (1) defines the first RD indicator,  $RD\_Tot$ , which stands for 'total RD' and is the ratio of the subnational governments' total revenues to the general government's aggregate revenues. Note that the numerator includes all subnational revenues, regardless of the discretion that subnational governments may exercise over them.  $RD\_Tot$  provides a basis for comparison with the more detailed indicators presented in the rest of the paper.

$$RD\_Tot = \frac{SNG\ Total\ Rev}{GG\ Total\ Rev - Transfers\ (received)} = \frac{R1_{SNG}}{R1_{GG} - R12_{GG}} \quad (1)$$

$GG$  stands for general government, and  $SNG$  stands for subnational government, which in our case are the regional and municipal authorities. First, we provide indicators by combining regions and municipalities into a single measure, following the standard approach in the literature, where no distinction is made within the  $SNG$  aggregate. We then exploit the granularity of the REGOFI and MUNIFI databases by disentangling the  $SNG$  aggregate and replicating the calculations separately for regional and municipal governments. Total revenues (denoted  $R1$  according to the nomenclature used in REGOFI and MUNIFI) comprise the following components: tax revenues ( $R11$ ), transfers ( $R12$ ), other own-source non-tax revenues (e.g., user charges and fees,  $R13$ , and income from asset management,  $R14$ ) and other revenues ( $R15$ ).<sup>6</sup>

We then refine the numerator by focusing only on those revenue sources on which subnational governments potentially exercise a certain level of control, i.e. taxes, fees and asset income ( $R11 + R13 + R14$ ), and excluding sources of funding that are

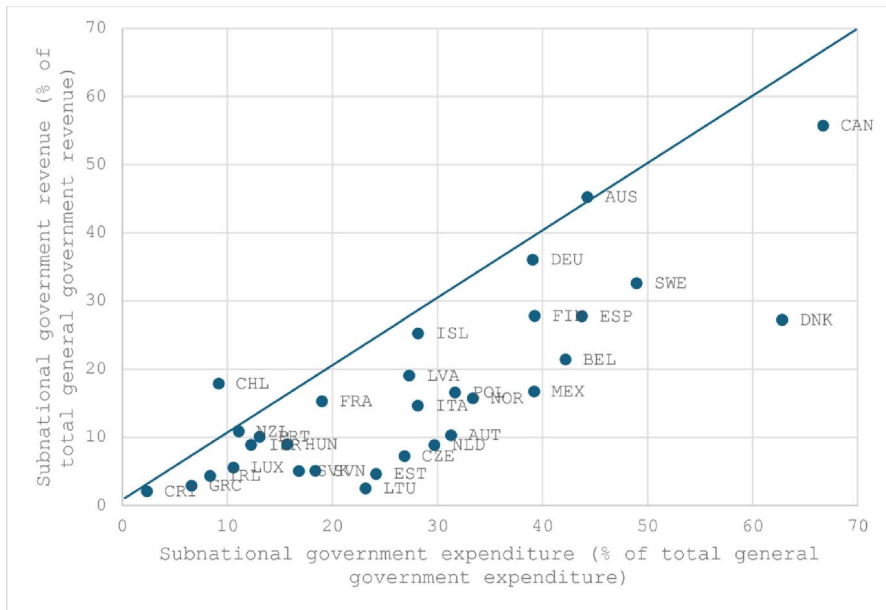
<sup>6</sup>The codes refer to those of the REGOFI and MUNIFI databases. They correspond to the following Eurostat nomenclature:  $R1$  corresponds to TR (total revenues);  $R11$  corresponds to D2 (taxes on production and imports) + D5 (taxes on income, profits and wealth);  $R12$  corresponds to D39 (other subsidies on production) + D7 (other current transfers including intergovernmental transfers) + D92\_99 (capital transfers);  $R13$  corresponds to P11\_P12\_P131 (market output, output for own final use and payments for non-market output);  $R14$  corresponds to D4 (property income);  $R15$  corresponds to D61 (social contributions) + any other remaining revenue.

typically controlled by third parties in terms of both entity and method of disbursement., i.e. transfers (*R12*). Equation (2) defines the indicator *RD\_NoTra* (RD without transfers), for which only subnational revenues from taxes and other own resources are used in the numerator (this is the indicator whose definition is closer to the one used on the vertical axis of Fig. 1). As for Eq. (1), we replicate the calculation of Eq. (2), by changing the governmental unit of analysis (regional plus municipal; only regional; only municipal).

$$RD\_NoTra = \frac{SNG\ Tax\ Rev + SNG\ Fees\ \&\ Charges\ \&\ Asset\ Income}{GG\ Total\ Rev - Transfers\ (received)} = \frac{R11_{SNG} + R13_{SNG} + R14_{SNG}}{R1_{GG} - R12_{GG}} \quad (2)$$

Note that *RD\_NoTra* does not include other revenues which are different from taxes or other own resources, and which are reported under the label *R15* in REGOFI and MUNIFI. *R15* includes mostly social contributions to social insurance schemes incurred by employers to secure entitlement to social benefits (‘Employers’ actual social contributions, revenue’). These revenues are not typically under the control of the subnational government, which is why we exclude them from the numerator in order to avoid biasing the indicator upwards.<sup>7</sup>

*RD\_NoTra* does not yet differentiate between taxes that subnational governments have discretionary power over and those that they do not. We therefore refine our measurement of revenue decentralisation further by defining another indicator in Eq. (3), *RD\_Own*, which considers only the tax revenues on which subnational gov-



**Fig. 1** Expenditure and revenue decentralisation in OECD countries (mean values, 2010–2021). (Source: Authors’ calculations on OECD Fiscal Decentralisation Database)

<sup>7</sup>Note that *R15* has little quantitative relevance in all countries of the sample apart from three non-EU countries in which this entry shows very high values, making them outliers in this respect.

ernments can exercise some discretionary power. This excludes tax revenues that are typically controlled at the national level and then ceded to the territorial levels through tax sharing and piggybacking mechanisms. Again, Eq. (3) is calculated for three different aggregations of the *SNG* units.

$$RD\_Own = \frac{(SNG\ Own\ Tax\ Rev) + SNG\ Fees\ \&\ Charges\ \&\ Asset\ Income}{GG\ Total\ Rev - Transfers\ (received)} \quad (3)$$

$$= \frac{(R112_{SNG} + R114_{SNG} + R115_{SNG}) + R13_{SNG} + R14_{SNG}}{R1_{GG} - R12_{GG}}$$

The taxes for which regional and/or local governments typically have some power to determine the tax rates and/or tax bases are identified based on the OECD's seminal classification of decision-making tax autonomy (OECD, 1999) and recent literature (Gemmell et al., 2013; Liberati & Sacchi, 2013; Martínez-Vázquez, 2008; Mauri, 2024). Practical examples are the immovable property tax assigned at the municipal level on a tax-separation scheme for almost all countries, and the income tax assigned at the regional level, allowing regions some power and discretion on rates and reliefs for many countries (e.g., Spain, Sweden, Switzerland, Italy).

Based on this, we assume that subnational governments have some discretionary power over the personal income tax (PIT), denoted *R112*, the property tax (PT), *R114*, and over many locally established taxes (e.g. environmental and gambling taxes), which are mostly reported as 'other tax revenue' under label *R115* in REGOFI and MUNIFI. Conversely, we treat *R111* (corporate income tax) and *R113* (value added tax) as taxes over which the central government retains generally full control, management and collection.<sup>8</sup> Therefore, *RD\_Own* only accounts for revenue decentralisation over resources that subnational governments have some discretionary power over.

The comparative analysis of the three revenue decentralisation indicators defined above, as presented in Sect. 5.3 and 5.4, allows us to understand the respective roles of transfers, own revenue and tax revenue in subnational government finance.

On the expenditure side, Eq. (4) computes the ratio between subnational expenditure (i.e. expenditure made by the government concerned, in its own areas and territorial scope of competence, and calculated as total subnational expenditure net of

<sup>8</sup>The codes refer to those of the REGOFI and MUNIFI databases. They correspond to the following Eurostat nomenclature: *R111* corresponds to D51B (taxes on the income or profits of corporations); *R112* corresponds to D51A (taxes on individual or household income); *R113* corresponds to D211 (value added type taxes); *R114* corresponds to D59A (current taxes on wealth); *R115* finally comprises any other remaining item in D2+D5. As Martínez-Vázquez and Bird (2011) have highlighted, the value added tax is usually managed by central governments worldwide, with only a few exceptions in federal countries where some degree of subnational involvement may occur. This centralisation allows for uniform tax policy and administration, which is crucial for maintaining economic efficiency and coherence across regions. While there is some variation internationally, corporate income tax is generally characterised by centralised policymaking and administration. This is supported by a significant body of literature on international tax competition, including the work of Leibrecht and Hochgatterer (2012), which often discusses how national governments set corporate tax policies to attract investment while managing economic stability.

transfers paid), and the general government expenditure aggregate.<sup>9</sup> We denote the indicator  $ED\_Dir$  (direct expenditure decentralisation).

$$ED\_Dir = \frac{SNG\ Total\ Exp - Transfers\ (paid)}{GG\ Total\ Exp - Transfers\ (paid)} = \frac{E1_{SNG} - (E116_{SNG} + E122_{SNG})}{E1_{GG} - (E116_{GG} + E122_{GG})} \quad (4)$$

Finally, we present a composite decentralisation indicator, which is constructed using jointly the revenue and expenditure ratios described above. Following Martínez-Vázquez and Timofeev (2010), we combine information on revenue and expenditure decentralisation to create a composite fiscal decentralisation indicator (CFD), which is positively related to both components.

$$CFD = RD / (1 - ED) \quad (5)$$

where expenditure decentralisation (ED) is measured by  $ED\_Dir$ , and at the numerator we either use  $RD\_NoTra$  or  $RD\_Own$  (then there are two versions of CFD:  $CFD\_NoTra$  and  $CFD\_Own$ ). The CFD indicator has the advantage of RD and ED measures reinforcing each other (for the same level of RD, CFD will be larger if the level of ED is higher, and vice versa).

In the next Section, we examine the REGOFI and MUNIFI databases by computing indicators (1) to (5). First, we present the results of combining regions and municipalities into a single measure, in line with the standard approach adopted in previous studies, which does not distinguish between subnational tiers. Secondly, we take advantage of the granularity of the databases by disentangling the subnational aggregate and replicating the calculations separately for regional and municipal governments. Finally, we also present a series of TD indicators in the [Appendix](#): the indicators (2) and (3) are calculated based on tax revenues only, excluding own revenues from user charges, fees, and asset income; these indicators are denoted  $TD\_NoTra$  and  $TD\_Own$ ; we also present the composite fiscal decentralisation indicators calculated using TD rather than RD, denoted  $CTD\_NoTra$  and  $CTD\_Own$ .

## 5 Results

### 5.1 A first look at regional and municipal government finance

Before turning to the refined fiscal decentralisation indicators, we briefly summarise the overall information on regional and local government revenue and expenditure contained in the REGOFI and MUNIFI databases. On average, regional government expenditure in the OECD and EU countries included in these databases accounted for 8.2% of GDP and 14.3% of total public expenditure in 2021.

<sup>9</sup>Expenditure transfers represent a small share of subnational government spending in most countries. The codes refer to those of the REGOFI and MUNIFI databases. They correspond to the following Eurostat nomenclature:  $E1$  corresponds to TE (total expenditure);  $E116$  corresponds to D3 (subsidies) + D7 (other current transfers including intergovernmental transfers);  $E122$  corresponds to D9 (capital transfers).

There are significant differences between federal (and quasi-federal) and unitary countries,<sup>10</sup> with regional governments in federal countries often having a larger share of GDP due to the greater autonomy and responsibilities of federal units. For example, regional expenditure in federal countries averaged 15.6% of GDP, compared with 4.1% in unitary countries. Local government expenditure is similarly important, accounting for 7.5% of GDP and 13% of total public expenditure, on average, in 2021. Although there are differences between countries, municipalities in the Nordic countries generally have the highest expenditure ratios.

A full comparison with the OECD FDD figures is not feasible as that database only contains data for 15 of the 22 countries in the REGOFI and MUNIFI databases. Nevertheless, non-central government expenditure in the 15 countries for which OECD FDD data exists averages at 18.6% of GDP, which is close to the sum of regional and municipal expenditure mentioned above ( $8.2\% + 7.5\% = 15.7\%$ ). The OECD FDD figure is larger than the combined REGOFI and MUNIFI figure because the latter does not contain data on intermediate subnational tiers of government. Despite this limitation, the data sources are broadly coherent and thus mutually reinforcing, and this convergence lends credibility to the overall picture of decentralisation patterns presented, providing a foundation for further analysis and policy insights.

On the revenue side, the regional governments derive their income from a combination of tax revenues, grants, and other sources such as user charges. According to REGOFI data, grants and transfers are the primary sources of regional government revenue (45.3%) in 2021, on average, for the 22 countries for which data were available. Tax revenue also accounts for a substantial portion of regional government revenue (32.3%).

MUNIFI data suggest that municipal governments show similar patterns in their revenue structures, with grants and subsidies accounting for 39.2% of total municipal revenue, followed by tax revenue at 36.9%. Interestingly, in countries like Iceland, tax revenue accounts for up to 80% of municipal government income, reflecting the fiscal autonomy granted to local governments in specific contexts. Conversely, in countries like Malta, Ireland and Türkiye, municipalities heavily depend on transfers from higher levels of government.

## 5.2 Measuring fiscal decentralisation according to standard official sources

Figure 1 presents a comparative analysis of fiscal decentralisation in the 34 countries for which data is available in the OECD FDD. The horizontal axis represents ED, and the vertical axis represents RD. ED is defined as total subnational expenditure divided by total general government expenditure. The same logic applies to RD (TD), which is defined as total subnational revenue (taxes) divided by total general government revenue (taxes), with all items consolidated across levels of government.<sup>11</sup>

<sup>10</sup> Quasi-federal countries are unitary states with regions that feature significant autonomy, akin to federated states, such as legislative powers via elected assemblies, though without full constitutional sovereignty sharing (e.g., Belgium, Spain). This contrasts with strictly federal countries (e.g., Canada, the USA) in which sovereignty is constitutionally divided (OECD, 2020).

<sup>11</sup> Total government expenditure (revenue) has been calculated as total expenditure (revenue) at the general government level plus total property expenditure (income) at the intergovernmental level (property

Figure 5 in Appendix is constructed according to the same logic, but with TD rather than RD. Note that the consolidated figures net out the transfers from central to non-central levels of government, leaving out of the picture an often essential element to gain a more detailed insight into fiscal decentralisation and subnational autonomy (de Mello, 2000; Eyraud & Lusinyan, 2013; Lago et al., 2024), and this is why in the next Sections we propose a comparative analysis that, especially on the revenue side, allow grasping the role of transfers (including intergovernmental ones) vis-à-vis tax revenues and other own revenue sources.

Figure 1 provides a visual representation of how individual countries balance their expenditure and revenue responsibilities and tasks at the subnational level, with each point corresponding to a country. ED within the sample varies widely, ranging from almost 70% to below 10%. Similarly, RD ranges from almost zero to around 55% (TD ranges from zero to 50%). In most cases, the ED value is larger than the RD one (i.e. most countries lie below the 45-degree line). This phenomenon has been labelled vertical fiscal imbalance or vertical fiscal gap in the literature (de Mello, 2000; Sharma, 2012; Eyraud & Lusinyan, 2013) and refers to an asymmetry between the amount of expenditure for which subnational governments are responsible and the revenue they can generate.<sup>12</sup>

The existence of such asymmetry requires permanent transfers from the centre to lower levels of government to finance subnational expenditure and bridge the gap. This contrasts with a widespread interpretation in the literature on fiscal federalism, according to which a decentralisation process would be optimal only if revenue-raising powers are devolved along with expenditure responsibilities (see Martínez-Vázquez et al., 2024; Rodríguez-Pose & Vidal-Bover, 2024), but at the same time, it highlights the important role of transfers in terms of equity, efficiency, and territorial cohesion (Dougherty et al., 2024; Lago et al., 2024).

This initial examination of fiscal decentralisation, based on OECD FDD data, establishes a foundation for baseline comparisons with the findings from the REGOFI and MUNIFI datasets, which are presented below.

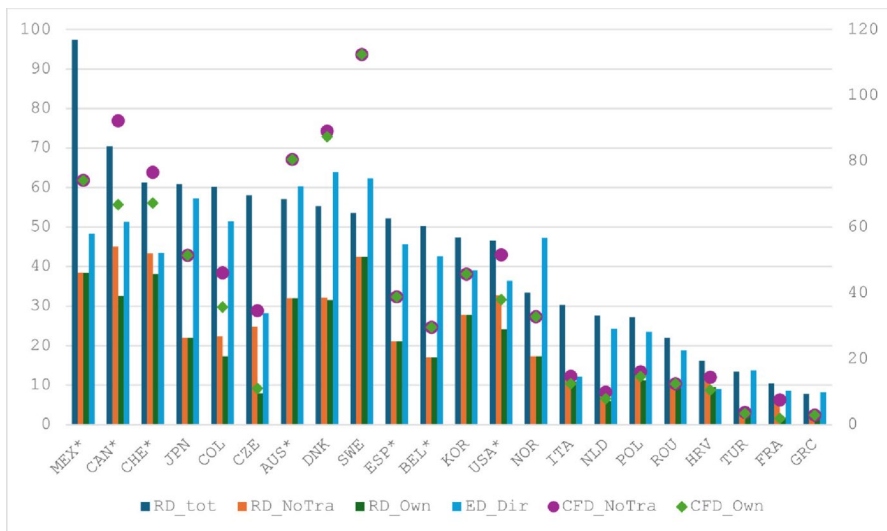
### 5.3 Refined indicators of decentralisation aggregating data for regions and municipalities

Figure 2 shows the RD and ED indicators defined in Sect. 4 (Eq. (1) to (4)), calculated as averages over the sample period (2010–2021) using aggregated regional and

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expenditure refers to spending related to the acquisition, maintenance, operation, and management of government-owned properties and assets). This addition is made because the latter represents payments by one level of government for a service provided by another level of government and avoids consolidation of property expenditure (income) at the level of general government. Social security funds are treated as part of central government.

<sup>12</sup>The gap between subnational expenditures and own revenues is one of the most common indicators used to measure the fiscal dependence of subnational governments on higher levels, that is the degree of vertical fiscal imbalance. This could also be interpreted as the degree of subnational “fiscal equivalence” (e.g., Bartolini et al., 2018) between taxing and spending powers, as the share of subnational own revenues in subnational expenditures. Low (high) fiscal equivalence should indicate a lower (higher) correspondence between subnational own revenues and expenditures, revealing the presence of vertical fiscal imbalances as local own revenues do not fully cover local spending.



**Fig. 2** Revenue and expenditure decentralisation indicators, aggregated regional and municipal data. The data represent average values for the period 2010–2021. The left vertical axis is used for the three RD indicators and the ED indicator, while the secondary (right) axis is used for the two composite indicators (in both cases, the numbers are percentages). Federal and quasi-federal countries are characterised by an asterisk (\*). (Source: Authors' calculations based on the OECD's aggregated regional and municipal data (REGOFI+MUNIFI))

municipal data from the REGOFI and MUNIFI datasets.<sup>13</sup> The countries are ordered by *RD\_Tot* value, from highest to lowest. Figure 2 also reports the values of *CFD\_NoTra* and *CFD\_Own* using the scale on the secondary vertical axis (Eq. (5)).<sup>14</sup> Table 2 in Appendix provides the descriptive statistics for all these indicators (including the CFD ratios), calculated using both joint and separate regional and municipal data.

Several stylised facts stand out. Firstly, all the indicators demonstrate significant variability across the sample countries. For example, the average value of *RD\_Tot* is 43.6%, yet the indicator ranges from 97.4% in Mexico to 7.8% in Greece, resulting in a coefficient of variation of 0.5 (this measure of dispersion is calculated as the standard deviation divided by the mean). Similarly, there is significant heterogeneity in *RD\_NoTra* and *RD\_Own*, with average values of 22.2% and 19.3%, respectively, but with high standard deviations and coefficients of variation. The high level of similarity between *RD\_NoTra* and *RD\_Own* suggests that refining the decentralisation measurement by excluding taxes over which subnational governments traditionally have limited control is only meaningful for some countries in the sample: the Czech Republic, Canada, the US, Switzerland, France, Croatia and Colombia.

<sup>13</sup>The indicators remained stable in each country throughout the observation period. Although reforms to fiscal decentralisation that affect tax autonomy are uncommon, we recognise that subnational tax autonomy may have changed in some countries following reforms and new institutional arrangements. Incorporating changes in tax autonomy over time, if any, could be beneficial for future research.

<sup>14</sup>Figure 6 in Appendix shows the equivalent picture using TD rather than RD.

Regarding expenditure, the average value of  $ED_{Dir}$  is 36.2%, which is higher than  $RD_{NoTra}$  and  $RD_{Own}$ , but lower than  $RD_{Tot}$ . Again, there is significant heterogeneity, with values ranging from 63.9% (Denmark) to 8.2% (Greece). Thus, in our sample, ED is more pronounced than RD when transfers are not included in the calculations, confirming existing evidence on asymmetric decentralisation (see also Fig. 1).

This evidence reveals the coexistence of a wide range of multilevel fiscal governance models. At one end of the spectrum are highly centralised countries such as Greece, France, Türkiye and Croatia. At the other end are highly decentralised countries such as Canada, Sweden, Colombia and Japan. This cross-country heterogeneity is consistent with the qualitative data shown in Fig. 1, in which the countries in the sample are ranked in a similar way to those in Fig. 2. However, our indicators only comprise the regional and municipal levels, and therefore, by construction, they do not fully align with those applied to standard OECD FDD data.

The difference between  $RD_{Tot}$  and  $RD_{NoTra}$  indicates the importance of transfers received by subnational governments for financing expenditure. On average, around half of subnational resources originate from transfers by other government levels or other subjects, though in certain countries, the magnitude of these transfers is more pronounced. As can be seen from the difference between the dark blue and orange bars in Fig. 2, this is particularly true of the Netherlands and Türkiye (where transfers constitute more than 70% of subnational revenues), as well as Mexico, Japan, Colombia, Belgium and Greece (where transfers constitute between 60% and 70% of subnational revenues).

The data reported in Fig. 2 confirm the importance of distinguishing between federal (and quasi-federal) and unitary countries (see also in the Appendix Tables 3 and 4, which contain the same information as Table 2, but for the federal and unitary subsamples, respectively). On average, most of the seven federal countries in the sample have higher values for each of the four decentralisation indicators than unitary countries. This suggests that a federal structure is associated with greater fiscal decentralisation in all its forms. These results emphasise the importance of distinguishing between federal and unitary systems when analysing fiscal decentralisation, since the governance structure appears to have a significant impact on the distribution of fiscal responsibilities and resources within a country.

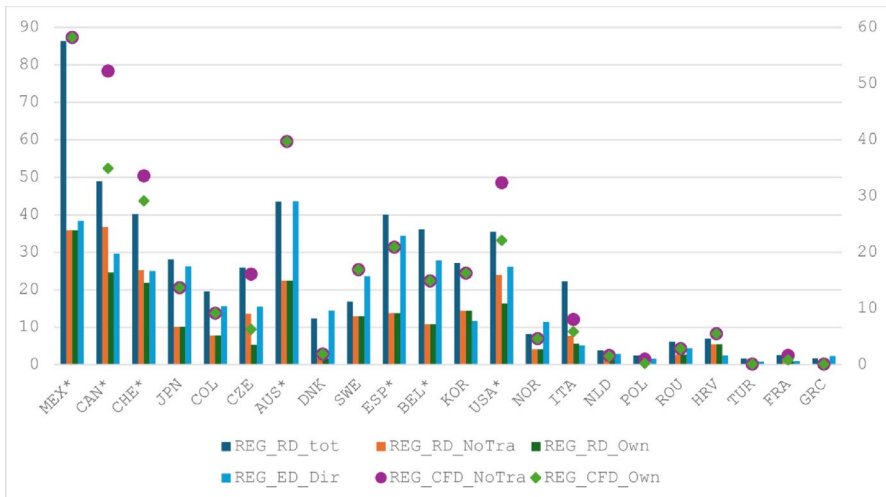
However, this is not true for all countries in the sample. The two composite indicators (CFD) suggest that two of the three countries with the highest values are unitary: Denmark and Sweden. In the latter, the value of both CFD indicators exceeds 100 due to the combination of high RD and ED. More generally, the countries' ranking changes slightly when considering CFD, with Australia, Denmark and Sweden performing better than when considering the simple RD indicators. Conversely, the Czech Republic's position worsens significantly when considering  $CFD_{Own}$ , since most of the country's decentralised revenues are outside the control of subnational entities.

## 5.4 Main results when separating regions and municipalities

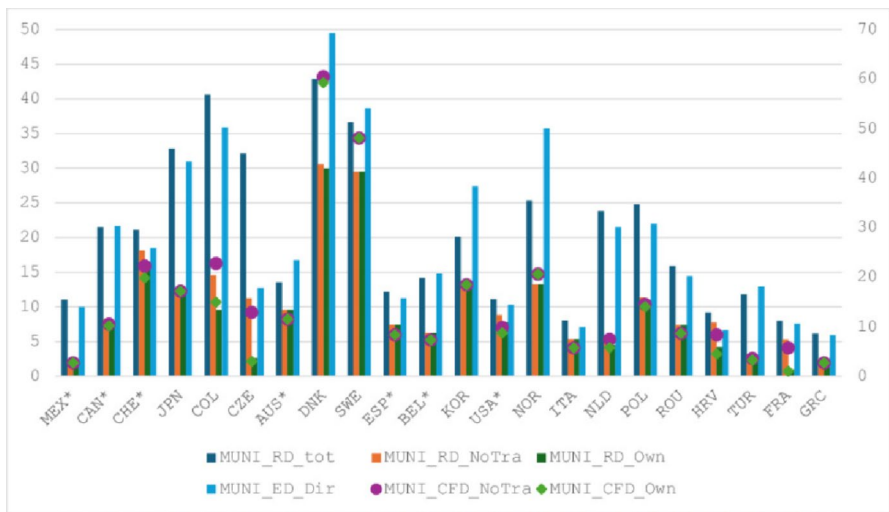
Figures 3 and 4 show the same decentralisation indicators as Fig. 2, but they are calculated using only regional and municipal data, respectively, essentially breaking down the information of Fig. 2 into two components. This is one of the main advantages offered by the new REGOFI and MUNIFI databases used here. To facilitate interpretation, the countries are ordered in the same way as in Fig. 2 (Figure 7 and 8 in Appendix provide the same information using TD indicators).

The breakdown highlights different models of decentralisation in terms of the sub-national actors with revenue-raising and spending responsibilities in each country. As can be seen by comparing the dark blue bars ( $RD_{Tot}$ ) in Figs. 3 and 4, some countries decentralise revenues mostly at the regional level, while municipal revenues dominate in others. In Mexico, Canada, Switzerland, Australia, Spain, Belgium, South Korea, the USA and Italy, more than 50% of subnational revenues are regional, whereas the opposite is true for the remaining 15 countries (as can be seen particularly clearly in the cases of Colombia, Denmark and Sweden, which have high  $RD$  values in Fig. 4). Croatia and the Czech Republic also form part of the first group when considering  $RD_{Own}$ , rather than  $RD_{Tot}$ .

In general, the average value of regional (municipal)  $RD_{Tot}$  is 23.4% (20.1%), but this data remains highly heterogeneous across countries. Also, the composite decentralisation indicators demonstrate significant variability across countries, comparable to that obtained when regional and municipal data are considered together (see Fig. 2); however, they remain low across the entire sample, with Denmark and Sweden being notable exceptions when municipal data are used for calculation. This



**Fig. 3** Revenue and expenditure decentralisation indicators, regional data only. The data represent average values for the period 2010–2021. The left vertical axis is used for the three  $RD$  indicators and the  $ED$  indicator, while the secondary (right) axis is used for the two composite indicators (in both cases, the numbers are percentages). Federal and quasi-federal countries are characterised by an asterisk (\*). (Source: Authors' calculations based on the OECD's REGOFI database)



**Fig. 4** Revenue and expenditure decentralisation indicators, municipal data only. The data represent average values for the period 2010–2021. The left vertical axis is used for the three RD indicators and the ED indicator, while the secondary (right) axis is used for the two composite indicators (in both cases, the numbers are percentages). Federal and quasi-federal countries are characterised by an asterisk (\*). (Source: Authors’ calculations based on the OECD’s MUNIFI database)

**Table 1** Pairwise correlations among the RD, ED, and CFD decentralisation indicators

	RD_tot	RD_NoTra	RD_Own	ED_Dir	CFD_NoTra	CFD_Own	REG_RD_tot	REG_RD_NoTra	REG_RD_Own	REG_ED_Dir	REG_CFD_NoTra	REG_CFD_Own	MUNI_RD_tot	MUNI_RD_NoTra	MUNI_RD_Own	MUNI_ED_Dir	MUNI_CFD_NoTra	MUNI_CFD_Own	
RD_tot	1																		
RD_NoTra	0.8296*	1																	
RD_Own	0.8028*	0.9380*	1																
ED_Dir	0.7949*	0.7705*	0.8331*	1															
CFD_NoTra	0.7832*	0.9446*	0.9456*	0.8668*	1														
CFD_Own	0.7399*	0.8756*	0.9366*	0.8909*	0.9729*	1													
REG_RD_tot	0.8978*	0.7079*	0.8568*	0.5256*	0.5833*	0.5491*	1												
REG_RD_NoTra	0.8000*	0.8260*	0.7271*	0.4820*	0.6720*	0.5799*	0.9116*	1											
REG_RD_Own	0.8221*	0.7960*	0.7892*	0.5516*	0.6825*	0.6508*	0.9476*	0.9576*	1										
REG_ED_Dir	0.8356*	0.7500*	0.7637*	0.7701*	0.7321*	0.7193*	0.8661*	0.7992*	0.8475*	1									
REG_CFD_NoTra	0.8000*	0.7918*	0.7224*	0.5064*	0.6669*	0.5939*	0.9309*	0.9883*	0.9711*	0.8350*	1								
REG_CFD_Own	0.8000*	0.7475*	0.7562*	0.5446*	0.6588*	0.6396*	0.9480*	0.9313*	0.9384*	0.8640*	0.9668*	1							
MUNI_RD_tot	0.3862	0.3689	0.3358	0.6213*	0.4854*	0.4535*	-0.1159	-0.0997	-0.1173	0.0741	-0.1294	-0.1507	1						
MUNI_RD_NoTra	0.392	0.3397*	0.2745*	0.5292*	0.6079*	0.6889*	-0.1058	-0.0322	-0.0186	0.1356	-0.0717	-0.0605	0.7903*	1					
MUNI_RD_Own	0.2386	0.3387*	0.3488*	0.6712*	0.6937*	0.7481*	-0.0993	-0.0047	0.0438	0.1914	-0.029	0.0044	0.6216*	0.9173*	1				
MUNI_ED_Dir	0.3113	0.3684	0.4509*	0.7044*	0.5386*	0.5741*	-0.1367	-0.1212	-0.0818	0.0896	-0.1385	-0.1111	0.8875*	0.8299*	0.8349*	1			
MUNI_CFD_NoTra	0.2671	0.4728*	0.5302*	0.6212*	0.6373*	0.6660*	-0.133	-0.0979	-0.0731	0.0952	-0.1231	-0.1054	0.7909*	0.7375*	0.9531*	0.8620*	1		
MUNI_CFD_Own	0.2583	0.4747*	0.5787*	0.6428*	0.6536*	0.7100*	-0.1041	-0.0779	-0.0324	0.1306	-0.0939	-0.0604	0.7188*	0.8332*	0.9814*	0.9581*	0.9820*	1	

Source: Authors’ calculations based on the OECD’s REGOFI and MUNIFI databases jointly for the first group of indicators; only on the OECD’s REGOFI database for the second group of indicators (*REG\_*); on the OECD’s MUNIFI database for the third group of indicators (*MUNI\_*). \* indicates 5% statistical significance

suggests the existence of at least two different decentralisation models: one in which municipalities have significant revenue and expenditure powers and responsibilities (the above-mentioned Scandinavian model—Knutsson et al., 2016), and one in which regions have the ‘lion’s share’ of these powers and responsibilities. Finally, countries with centralised revenue and expenditure models can opt out of devolving powers to regions; yet, they cannot avoid a certain degree of municipal decentralisation that appears to be almost indispensable.

The existence of different decentralisation models across countries, suggested by the visual inspection of the decentralisation indicators presented above, is confirmed by the correlation pattern among them as reported in Table 1 (Table 5 in Appendix

uses the *TD* indicators rather than the *RD* ones). Note that darker colours indicate higher correlations. Within each subnational level, all the decentralisation indicators are highly correlated among themselves, which is not entirely surprising, as it reveals consistency across the various measures of the decentralisation phenomenon.

More interestingly, while the regional indicators are always highly correlated with the aggregated ones, the situation at the municipal level is more nuanced. The lack of correlation between municipal decentralisation indicators and the *RD\_Tot* indicator, yet the correlation between the former and the more specific aggregated decentralisation indicators (*RD\_NoTra* and *RD\_Own*), suggests that subnational government autonomy is an important factor in the relationship between municipal and overall decentralisation. This implies that the simple total RD indicator, which does not account for the actual degree of autonomy over revenue sources, may not capture the nuances of decentralisation at the municipal level. In other words, a high level of total RD does not necessarily mean that municipal governments have a significant degree of autonomy or control over their finances.

Additionally, the regional decentralisation indicators and the municipal ones are not correlated. This suggests that countries are decentralising power and resources to regional and municipal tiers through various mechanisms, policies and institutional arrangements that do not follow a systematic pattern and do not appear to be complementary to or substitute for each other. This may reflect the fact that regional and municipal governments have different prerogatives, needs, and challenges to be addressed through various decentralisation initiatives following a different logic.

## 6 Concluding remarks

In this paper, we present refined and granular measures of fiscal decentralisation for 22 countries, based on the OECD's recently published REGOFI and MUNIFI databases. We build upon a well-established existing literature analysing the degree of actual subnational autonomy, and we comparatively examine the role of transfers, tax revenues and other own revenues in decentralised settings.

From an analytical perspective, we emphasise why it is important to have separate indicators for regional and local governments. The functions, tax bases and transfer arrangements of different tiers can differ substantially, so aggregating them into a single subnational measure can mask offsetting dynamics. Evidence arising from these refined indicators is intended to complement that obtainable from established sources of fiscal decentralisation data rather than replace it.

In addition to confirming existing evidence of huge variability in decentralisation across countries and asymmetric decentralisation, we present novel findings on different multilevel fiscal governance models that cannot be fully explained by federal versus unitary government structures alone. On average, fiscal decentralisation is higher in federal countries; however, there is significant heterogeneity, and a federal institutional architecture does not necessarily predict a high level of decentralisation.

We present new evidence on revenues that are completely under the control of subnational governments. These revenues account for a relatively small percentage of the total. Central governments often use transfers to ensure that subnational gov-

ernments have the necessary resources to finance their spending. However, this can result in a lack of taxing authority and local tax allocation (King, 1984; Liberati, 2011; McLure, 1998).

A separate analysis of regional versus municipal finance reveals significant variations in the roles of local and regional finance across different countries. These differences are a key source of heterogeneity that is often overlooked when analysing subnational governments collectively. When examining decentralisation models, we found that regional finance tends to be particularly limited in cases of low fiscal decentralisation rather than municipal finance. Interestingly, even in centralised economies, a certain minimum degree of municipal decentralisation is present. Countries are adopting diverse strategies to decentralise authority and resources to regional and local levels, often implementing distinct policies and frameworks tailored to their specific needs and priorities.

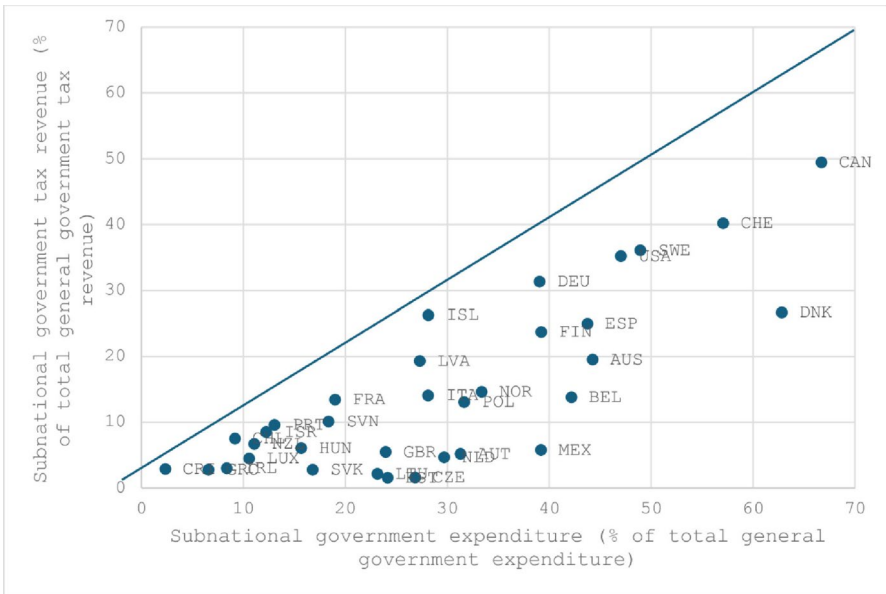
Our results suggest that a one-size-fits-all approach to measuring fiscal decentralisation is neither feasible nor effective. Given the existence of distinct decentralisation models, whether region- or municipality-dominant, and the critical role of intergovernmental transfers and arrangements in subnational public finance, tier-specific indicators reveal the decision-making authority and financial capacity of each government. This could enable policies to be tailored to their capabilities and needs when assessing reforms or designing intergovernmental grant formulas.

Finally, with the availability of data that distinguishes between municipal and regional levels, the research community is now better equipped to conduct more nuanced analyses—such as examining how negative fiscal shocks affect different levels of government, assessing the differentiated impact of national-level reforms on municipalities and regions, or comparing countries with diverse decentralisation systems while accounting for this subnational distinction. These new data can also provide useful tools to policy-makers who are increasingly engaging in policy initiatives at the level of cities, such as the European Urban Initiative recently launched in the EU (European Commission, 2025).

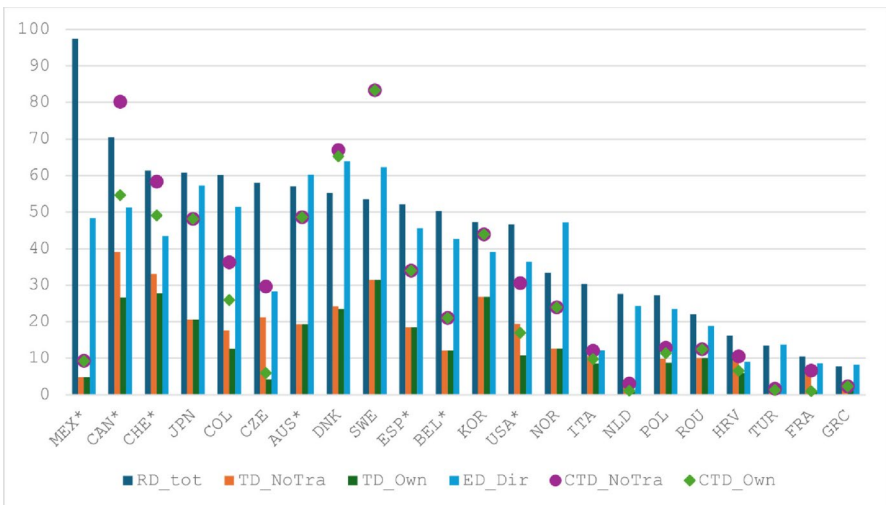
Future research could also examine how the composition of public expenditure varies depending on the subnational tier of government responsible for it. This could be explored in terms of both discretionary and non-discretionary spending and spending categories.

## Appendix

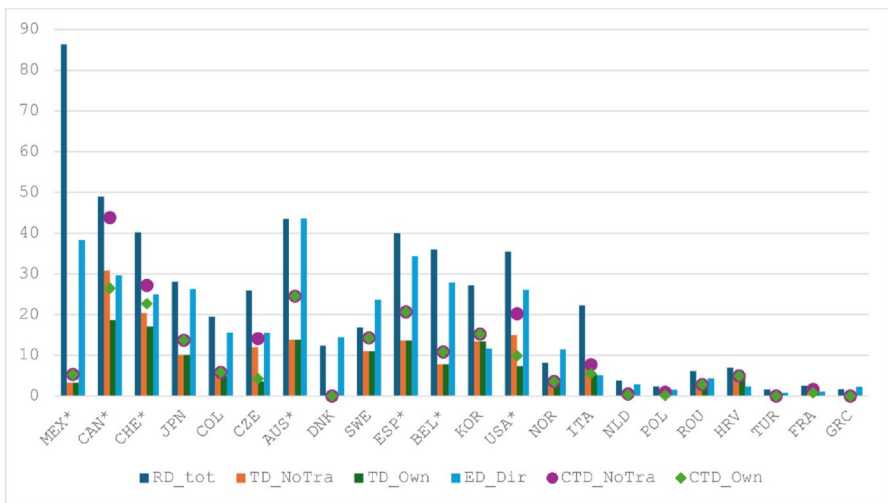
See Figs. 5, 6, 7 and 8; Tables 2, 3, 4 and 5.



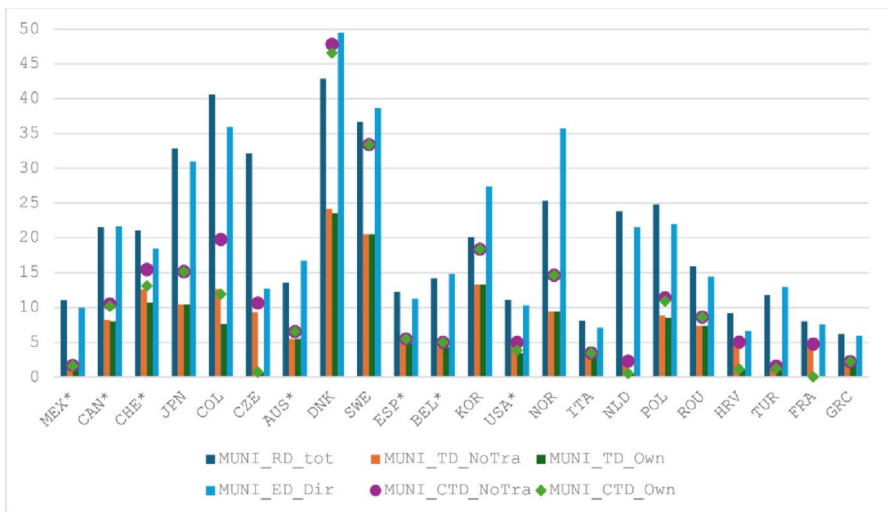
**Fig. 5** Expenditure and tax decentralisation in OECD countries (mean values, 2010–2021). (Source: Authors’ calculations using data from the OECD Fiscal Decentralisation Database)



**Fig. 6** Tax and expenditure decentralisation indicators, aggregated regional and municipal data. Source: Authors’ calculations based on the OECD’s aggregated regional and municipal data (REGOFI+MUNIFI). The data represent average values for the period 2010–2021. Federal and quasi-federal countries are characterised by an asterisk (\*)



**Fig. 7** Tax and expenditure decentralisation indicators, regional data only. Source: Authors’ calculations based on the OECD’s REGOFI database. The data represent average values for the period 2010–2021. Federal and quasi-federal countries are characterised by an asterisk (\*)



**Fig. 8** Tax and expenditure decentralisation indicators, municipal data only. Source: Authors’ calculations based on the OECD’s MUNIFI database. The data represent average values for the period 2010–2021. Federal and quasi-federal countries are characterised by an asterisk (\*)

**Table 2** Descriptive statistics of the indicators defined in Sect. 4, full sample

Variable	Mean	SD	CV	Max	Min
RD_tot	43.6	22.4	0.5	97.4	7.8
RD_NoTra	22.2	13.2	0.6	45	2.6
RD_Own	19.3	12.6	0.7	42.4	1.8
TD_NoTra	16	10.5	0.7	39.1	1.4
TD_Own	13.2	9.7	0.7	31.4	0.8
ED_Dir	36.2	18.8	0.5	63.9	8.2
CFD_NoTra	42.6	32.5	0.8	112.5	2.9
CFD_Own	38.1	31.7	0.8	112.5	1.9
CTD_NoTra	30.7	25	0.8	83.3	1.6
CTD_Own	26.1	23.7	0.9	83.3	1
REG_RD_tot	23.4	20.8	0.9	86.4	1.6
REG_RD_NoTra	11.5	11.1	1	36.8	0.1
REG_RD_Own	9.9	9.6	1	35.9	0.1
REG_TD_NoTra	8.1	7.8	1	30.8	0
REG_TD_Own	6.5	5.9	0.9	18.7	0
REG_ED_Dir	16.5	13.4	0.8	43.6	0.8
REG_CFD_NoTra	16	17.1	1.1	58.2	0.1
REG_CFD_Own	13.9	15.3	1.1	58.2	0.1
REG_CTD_NoTra	10.8	11.2	1	43.8	0
REG_CTD_Own	8.7	8.6	1	26.5	0
MUNI_RD_tot	20.1	11.1	0.6	42.9	6.2
MUNI_RD_NoTra	10.6	7.5	0.7	30.6	2.4
MUNI_RD_Own	9.4	7.7	0.8	29.9	0.9
MUNI_TD_NoTra	8	6	0.8	24.1	1.4
MUNI_TD_Own	6.7	6.3	0.9	23.5	0
MUNI_ED_Dir	19.6	12	0.6	49.5	5.9
MUNI_CFD_NoTra	15	14.2	0.9	60.5	2.7
MUNI_CFD_Own	13.4	14.4	1.1	59.3	1
MUNI_CTD_NoTra	11.3	11.2	1	47.8	1.6
MUNI_CTD_Own	9.8	11.4	1.2	46.6	0.1

Source: Authors' calculations based on the OECD's REGOFI and MUNIFI databases.

The full sample includes the following countries observed over the period 2010–2021 (see also footnote 5): Australia, Belgium, Canada, Colombia, Croatia, the Czech Republic, Denmark, France, Greece, Italy, Japan, Mexico, the Netherlands, Norway, Poland, Romania, South Korea, Spain, Sweden, Switzerland, Türkiye, and the USA

**Table 3** Descriptive statistics of the indicators defined in Sect. 4, seven federal and quasi-federal countries

Variable	Mean	SD	CV	Max	Min
RD_tot	62.2	17.4	0.3	97.4	46.6
RD_NoTra	32.8	10.6	0.3	45	17
RD_Own	29	8.4	0.3	38.3	17
TD_NoTra	20.9	11.7	0.6	39.1	4.8
TD_Own	17.1	8.5	0.5	27.7	4.7
ED_Dir	46.8	7.5	0.2	60.3	36.4
CFD_NoTra	63.4	23.5	0.4	92.3	29.6
CFD_Own	56.5	20.4	0.4	80.5	29.6
CTD_NoTra	40.3	24	0.6	80.1	9.2
CTD_Own	33.3	18	0.5	54.6	9.2
REG_RD_tot	47.2	17.9	0.4	86.4	35.5
REG_RD_NoTra	24.1	9.9	0.4	36.8	10.8
REG_RD_Own	20.8	8.3	0.4	35.9	10.8
REG_TD_NoTra	15	8.9	0.6	30.8	3.3
REG_TD_Own	11.7	5.6	0.5	18.7	3.3
REG_ED_Dir	32.1	6.9	0.2	43.6	25
REG_CFD_NoTra	36	15.6	0.4	58.2	14.9
REG_CFD_Own	31.4	14.6	0.5	58.2	14.9
REG_CTD_NoTra	21.8	12.4	0.6	43.8	5.3
REG_CTD_Own	17.2	8.4	0.5	26.5	5.3
MUNI_RD_tot	15	4.5	0.3	21.5	11
MUNI_RD_NoTra	8.7	4.8	0.5	18.1	2.4
MUNI_RD_Own	8.2	4.2	0.5	16.2	2.4
MUNI_TD_NoTra	5.9	3.5	0.6	12.6	1.5
MUNI_TD_Own	5.5	3	0.6	10.7	1.5
MUNI_ED_Dir	14.7	4.5	0.3	21.6	10
MUNI_CFD_NoTra	10.3	6	0.6	22.2	2.7
MUNI_CFD_Own	9.8	5.2	0.5	19.9	2.7
MUNI_CTD_NoTra	7.1	4.5	0.6	15.4	1.7
MUNI_CTD_Own	6.5	3.9	0.6	13.1	1.6

Source: Authors' calculations based on the OECD's REGOFI and MUNIFI databases. The seven federal and quasi-federal countries observed over the period 2010–2021 are as follows (see also footnote 5): Australia, Belgium, Canada, Mexico, Spain, Switzerland, and the USA

**Table 4** Descriptive statistics of the indicators defined in Sect. 4, 15 unitary countries

Variable	Mean	SD	CV	Max	Min
RD_tot	34.9	19.3	0.6	60.9	7.8
RD_NoTra	17.2	11.3	0.7	42.4	2.6
RD_Own	14.8	11.8	0.8	42.4	1.8
TD_NoTra	13.7	9.4	0.7	31.4	1.4
TD_Own	11.3	9.9	0.9	31.4	0.8
ED_Dir	31.2	20.5	0.7	63.9	8.2
CFD_NoTra	32.9	32.2	1	112.5	2.9
CFD_Own	29.5	32.9	1.1	112.5	1.9
CTD_NoTra	26.2	25	1	83.3	1.6
CTD_Own	22.8	25.8	1.1	83.3	1
REG_RD_tot	12.3	10	0.8	28.1	1.6
REG_RD_NoTra	5.6	5.1	0.9	14.4	0.1
REG_RD_Own	4.8	4.7	1	14.4	0.1
REG_TD_NoTra	4.8	4.8	1	13.5	0
REG_TD_Own	4	4.4	1.1	13.5	0
REG_ED_Dir	9.3	8.4	0.9	26.3	0.8
REG_CFD_NoTra	6.6	6.3	0.9	16.9	0.1
REG_CFD_Own	5.7	5.8	1	16.9	0.1
REG_CTD_NoTra	5.7	5.9	1	15.2	0
REG_CTD_Own	4.8	5.4	1.1	15.2	0
MUNI_RD_tot	22.5	12.5	0.6	42.9	6.2
MUNI_RD_NoTra	11.5	8.4	0.7	30.6	2.5
MUNI_RD_Own	9.9	9	0.9	29.9	0.9
MUNI_TD_NoTra	8.9	6.7	0.8	24.1	1.4
MUNI_TD_Own	7.3	7.3	1	23.5	0
MUNI_ED_Dir	21.9	13.8	0.6	49.5	5.9
MUNI_CFD_NoTra	17.1	16.5	1	60.5	2.7
MUNI_CFD_Own	15.1	17	1.1	59.3	1
MUNI_CTD_NoTra	13.3	12.9	1	47.8	1.6
MUNI_CTD_Own	11.3	13.4	1.2	46.6	0.1

Source: Authors' calculations based on the OECD's REGOFI and MUNIFI databases. The 15 unitary countries observed over the period 2010–2021 are as follows (see also footnote 5): Colombia, Croatia, the Czech Republic, Denmark, France, Greece, Italy, Japan, the Netherlands, Norway, Poland, Romania, South Korea, Sweden, and Türkiye

**Table 5** Pairwise correlations among the TD, ED, and CTD decentralisation indicators

	TD_tot	TD_NoTra	TD_Own	ED_Dir	CTD_NoTra	CTD_Own	REG_RD_tot	REG_NoTra	REG_TD_NoTra	REG_ED_Dir	REG_CTD_NoTra	REG_CTD_Own	MUNI_RD_tot	MUNI_NoTra	MUNI_TD_NoTra	MUNI_ED_Dir	MUNI_CTD_NoTra	MUNI_CTD_Own	
TD_tot	1																		
TD_NoTra	0.5733*	1																	
TD_Own	0.5236*	0.9000*	1																
ED_Dir	0.7949*	0.6652*	0.7563*	1															
CTD_NoTra	0.5877*	0.9435*	0.9259*	0.7967*	1														
CTD_Own	0.5272*	0.8046*	0.8646*	0.8092*	0.8548*	1													
REG_RD_tot	0.8214*	0.3569	0.3163	0.5255*	0.3172	0.2602	1												
REG_TD_NoTra	0.5315*	0.8288*	0.6531*	0.4286*	0.6839*	0.5263*	0.5565*	1											
REG_TD_Own	0.5359*	0.7988*	0.7818*	0.5325*	0.7055*	0.6547*	0.5639*	0.9172*	1										
REG_ED_Dir	0.8506*	0.5097*	0.5256*	0.7701*	0.5511*	0.5390*	0.8604*	0.6107*	0.6838*	1									
REG_CTD_NoTra	0.5506*	0.7970*	0.6449*	0.4692*	0.6836*	0.5403*	0.5910*	0.9882*	0.9212*	0.6821*	1								
REG_CTD_Own	0.5548*	0.7524*	0.7444*	0.5693*	0.6901*	0.6467*	0.6005*	0.9862*	0.9839*	0.7599*	0.9274*	1							
MUNI_RD_tot	0.3662	0.4897*	0.4655*	0.6213*	0.5536*	0.5609*	-0.1159	0.0298	0.0247	0.0741	0.0636	-0.0057	1						
MUNI_TD_NoTra	0.3112	0.5773*	0.3296*	0.2160*	0.7657*	0.7893*	-0.1001	0.1463	0.2053	0.0976	0.1092	0.1161	0.3228*	1					
MUNI_TD_Own	0.3044	0.6392*	0.6020*	0.6674*	0.7666*	0.8531*	-0.0426	0.1452	0.2462	0.168	0.1387	0.2243	0.6955*	0.9145*	1				
MUNI_ED_Dir	0.3113	0.4714*	0.5960*	0.7044*	0.6306*	0.6941*	-0.1367	-0.0182	0.0704	0.0886	-0.0264	0.0433	0.8973*	0.8510*	0.8561*	1			
MUNI_CTD_NoTra	0.2856	0.5761*	0.6576*	0.6154*	0.7113**	0.7565*	-0.1256	0.0266	0.0868	0.0717	0.0025	0.0477	0.8144*	0.7785*	0.9140*	0.8809*	1		
MUNI_CTD_Own	0.2742	0.5581*	0.7149*	0.6431*	0.7167**	0.8066*	-0.0892	0.0339	0.1329	0.117	0.0222	0.101	0.7230*	0.9373*	0.8803*	0.8739*	0.9705*	1	

Source: Authors' calculations based on the OECD's REGOFI and MUNIFI databases jointly for the first group of indicators; only on the OECD's REGOFI database for the second group of indicators (REG\_); on the OECD's MUNIFI database for the third group of indicators (MUNI\_). \* indicates 5% statistical significance

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**Data availability** All the data used in the analysis can be provided upon request.

## Declarations

**Disclaimer** The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the OECD and European Commission.

**Competing interests** The authors declare no competing interests.

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