The relationship between city size, decentralisation and economic growth

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Abstract

Purpose – This article examines the links between average city size, fiscal decentralisation, and national economic growth in 33 Organisation for Economic Co-operation and Development (OECD) countries.

Design/methodology/approach – The data in this paper comprise an unbalanced panel dataset which contains economic growth indicators, average city size, fiscal decentralisation indicators and control variables in 33 OECD member countries from 1975 to 2015 in five-year intervals. Fixed-effects (FE) estimators are used for the analysis.

Findings – This research finds i) countries with larger weighted average city sizes have higher economic growth, ii) countries with greater fiscal decentralisation have higher economic growth, but iii) countries with larger weighted average city sizes with greater decentralisation have lower rates of economic growth.

Originality/value – The research highlights the importance of agglomerations and decentralised governance and management for economic growth. While the findings are consistent with previous evidence that larger city sizes and fiscal decentralisation are separately associated with higher rates of economic growth, the authors find countries which have larger cities and greater fiscal decentralisation experience lower rates of economic growth highlighting a need for caution on decentralisation agendas in such cases. The implications of this suggest policymakers should proceed with caution on decentralisation agendas in countries with large cities.

Keywords City size, Fiscal decentralisation, Economic growth, OECD

Paper type Research paper

1. Introduction

From 1950 to 2018, the world's population increased four-fold with the rate of urbanisation growing at 30%, and for the first time in 2006, more people lived in urban areas than rural areas (United Nations, 2019). The United Nations (2019, p. 3) highlights that urbanisation is characterised by an "increasing share of economic activity and innovation becom [ing] concentrated in cities". This urbanisation–growth nexus has led to growing interest in the relationship between city size and economic growth (Al-Jebouri *et al.*, 2020; Alvarado *et al.*, 2020; Zheng and Walsh, 2019). Recent research suggests city size is positively associated with economic growth in high-income countries (Frick and Rodríguez-Pose, 2018; Gollin *et al.*, 2016). Related to this, the degree of decentralisation of government power to cities is also argued to be important for economic growth (Morgan, 2002). Closer proximity between citizens and institutions, provided by greater devolved powers to local government, is considered important for more efficient matching of services to citizens as well as leading to greater economic dividends and growth (Tiebout, 1956). Building on this literature our paper

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addresses three specific research questions; (i) whether average city size impacts national economic growth, (ii) whether decentralisation impacts national economic growth; and (iii) whether the impact of city size on economic growth is mitigated by the degree of decentralisation.

In addressing these research questions, the paper makes two distinct contributions to the existing literature. Firstly, there has been a global trend towards fiscal decentralisation over the past 30 years (Canavire-Bacarreza *et al.*, 2020). Fiscal decentralisation proponents contend that higher levels of economic growth and improved government efficiency result from greater proximity to businesses and citizens helping government decision-makers better comprehend the needs and demands of citizens (Oates, 1972; Tiebout, 1956; Giordano, 2000; Morgan, 2002; Rodríguez-Pose and Sandall, 2008; Canavire-Bacarreza *et al.*, 2020; Nantharath *et al.*, 2020; Li *et al.*, 2021). Academics, national governments and organisations appear convinced of the economic benefits of fiscal decentralisation (Rogríguez-Pose and Kroijer, 2009). Yet, the evidence that fiscal decentralisation stimulates economic growth continues to be controversial (Thanh and Canh, 2020). Rodríguez-Pose and Ezcurra (2011, p. 638) argue that "in the case of the OECD, while fiscal decentralization may still be an adequate way to preserve and promote regional identity and culture, the claim that it will also bring about some sort of economic dividend can be considered as questionable." While more recently Carniti *et al.* (2019, p. 786) has called for "a deep understanding of a system of multilevel government as an appropriate way to promote growth". This paper contributes to this literature by directly addressing these calls for a greater understanding of whether increased decision-making powers at local government level leads to higher national economic growth.

Secondly, existing literature relating to the impact of city size on economic growth indicates a positive relationship (Frick and Rodríguez-Pose, 2016, 2018; Gollin *et al.*, 2016). However, there is limited understanding around the exact mechanisms driving this relationship, with Frick and Rodríguez-Pose (2016, p. 315) calling for greater understanding in how "city size shapes economic growth at an aggregate level". We contribute to this discussion by examining whether the degree of fiscal decentralisation moderates the impact of city size on growth. Consideration of the potential moderating impact of decentralisation on the city size-economic growth relationship is critical for the management of cities (Rodríguez-Pose and Griffiths, 2021). This is particularly the case for larger cities, which may experience inefficiencies and have issues with capacity, infrastructure provision, and the matching of services due to diseconomies of scale (Frick and Rodríguez-Pose, 2018; Hoyt, 1999). Rodríguez-Pose and Griffiths (2021) argue that efficiencies may be more easily realised in smaller and medium sized cities which are better equipped to deal with resource allocation. Our analysis allows for further insights into whether decentralisation can play a role in shaping the city size-economic growth relationship.

The data in this paper comprise an unbalanced panel dataset which covers economic growth indicators, average city size and decentralisation in 33 OECD-member countries from 1975 to 2015 in five-year intervals. Localised revenue is used as a measure of decentralisation from the OECD fiscal decentralisation index, while average city size data are from the UN World Urbanisation Prospects database. The data for the control variables used in the study are derived from the Penn World Tables, World Bank and the University of Gothenburg. OECD countries have been chosen as the focus of analysis due to limitations in the availability of data on fiscal decentralisation outside of the OECD cohort. Given the panel nature of our data, a fixed-effects (FE) estimation method is employed to account for unobserved heterogeneity across countries. This choice of model is consistent with existing literature (Carniti *et al.*, 2019; Jin and Rider, 2020; Thanh and Canh, 2020; Van Rompuy, 2021; Zheng and Walsh, 2019) and accounts for country specific effects.

Our analysis has important implications for policy with both the Urban Agenda for the EU (European Commission, 2017) and the UN New Urban Agenda seeking to empower policy

makers and decision makers by "ensuring appropriate fiscal, political and administrative decentralization based on the principle of subsidiarity" (2017, p. 16). Our findings suggest that policymakers should proceed with particular caution on decentralisation agendas in countries with large cities. We develop the implications of this research in more detail in the conclusion section.

The remainder of this paper is structured as follows. Section 2 summarises existing literature and develops the hypotheses to be tested in the paper. Section 3 presents the data. Section 4 outlines the methods used to conduct the research. The results are discussed in Section 5. Section 6 includes limitations of the study and conclusion.

2. Literature review

2.1 The relationship between urban concentration and city size on growth

The relationship between urbanisation and economic growth has long been an area of interest in economics (Marshall, 1890; Lewis, 1954). In recent decades urban economics and New Economic Geography (NEG), two competing but related perspectives on the economics of urban areas, have contributed to a greater understanding of the dynamics, links, and drivers of urban development and economic growth (Duranton and Puga, 2004). The NEG perspective theorises how urban regions drive national economic growth and long-run productivity (Krugman, 1991; Fujita *et al.*, 1999). A key prediction of the NEG framework is that a higher number of larger agglomerations of firms increases productivity and economic growth (Fujita and Thisse, 2003; Martin and Ottaviano, 2001) as well as trade and competitiveness effects (Baldwin and Krugman, 2004; Van Rompuy, 2021). Commendatore *et al.* (2021) suggest that the local distribution and concentration of firms can determine and alter the degree of how firms overcome local competitiveness effects and their ability to trade. NEG falls into the classification of general location theory, studying the geographical distribution of economic agents in space and the dynamics of spatial price systems and trade patterns (Gaspar, 2020). NEG assumes three important features in underlying theoretical frameworks: (i) increasing returns and economies of scale, (ii) production factors, labour and capital are assumed to be mobile, and (iii) transport costs are integrated into models (Hassink and Gong, 2019).

Urban economics (UE) takes a different perspective. Urban economics focuses on the impact of city size on the productivity of workers (Duranton and Puga, 2004; Duranton, 2008). UE pays particular attention to the generation, accumulation, and diffusion of knowledge and skills in cities to identify what makes cities more productive (Duranton and Puga, 2004). The dynamics of local infrastructure, localised scale economies, matching of skills, suppliers, markets and labour are also explored to identify what makes cities more productive (Duranton and Puga, 2004). Al-Jebouri *et al.* (2020) emphasises that firms locate near pools of labour and that people choose to locate close to employment opportunities. This forms the basis of urban concentration and thus increased activity due to proximity to commercial activities and local demand, leading to increased economic growth. Like firm location and pools of labour, trade and access to markets via trade agreements, also determine where firms may locate (Commendatore *et al.*, 2021). Accetturo *et al.* (2019) suggest that medium sized cities have benefited in population growth at the expense of smaller sized cities. While larger cities tend to have the highest level of population growth due to larger availability of jobs and a wage premium paid by firms to attract employees. Transportation is a key area of local infrastructure that permits consumers, workers and firms to connect to other firms and gain market access along with facilitating trade, however transportation costs can be an inhibitor to growth if too high, thus shaping the distribution of economic growth (Combes *et al.*, 2022). In UE, the internal structures of cities is an important area of interest. The structures of cities over time have changed, often with people living in suburban areas, facilitated by public

transportation, resulting in a separation between workplace and residence, allowing for more space to concentrate economic activity and agglomeration spillovers in city areas such as London (Heblich *et al.*, 2020). Duranton and Puga (2020) highlight the benefits of density of cities, which lead to reductions in transportation times and costs, for both workers and firms, as well as increased economic activity, productivity and earnings. However, Hoyt (1999) and Frick and Rodríguez-Pose (2018) suggest that larger cities are more likely to suffer from waste and inefficiencies due to diseconomies of scale. These can make it harder to manage infrastructure and resources while smaller and middle-sized cities may be better equipped to manage their resources, infrastructure and suffer less from the same growth-enhancing constraints of larger cities (Rodríguez-Pose and Griffiths, 2021).

However, Hansen (1990) argues that a high degree of urban concentration may be more helpful in the early stages of economic development. This can lead to increased knowledge development and information spillovers. Eventually, as the region and economy develops, it can afford to spread resources to other regions, which can lead to a deconcentration effect in the initial highly urban concentrated region, which can lead to the development of secondary cities. Rodrıguez-Pose and Storper (2020) note that while the concentration of high-productivity workers in cities can further increase overall productivity, prices and living costs can increase, pushing lower-skilled workers out of cities into urban fringes. With Alvarado *et al.* (2020) suggesting that a more efficient use of resources is required for urban areas to develop further growth.

Frick and Rodríguez-Pose (2016) find countries grow faster if the urban population lives, on average, in larger cities. Empirical evidence suggests that urban concentration (share of national population living in cities) is positively correlated with economic growth, but differences can be found depending on the income of countries (Henderson, 2003) and their stage of development (Gollin *et al.*, 2016; Jedwab and Vollrath, 2015). Ganau and Rodrıguez-Pose (2022) also find a positive relationship with urban concentration and growth, but argue more focused labour market measures are required in high-income countries, while in lower-income countries, infrastructure is a key requirement in larger cities. Less often negative relationships between urban concentration and economic growth have been detected (Alvarado *et al.*, 2020).

This leads to our first hypothesis:

H1. Countries with larger average city sizes have higher national growth.

2.2 The impact of decentralisation on economic growth

Martinez-Vazquez and McNab (2003) define decentralisation as the devolution of decision-making powers to sub-national governments. They further note that there are two generations of fiscal decentralisation theories.

The first generation focuses on the benefits of economic efficiency and allocation of resources at subnational levels. The Oates Decentralisation Theorem (1972) suggests that proximity to local residents, individuals and institutions can have informational advantages, which when coupled with devolution of political and fiscal powers to the local level, can provide improved levels of efficiency, delivery of services and economic growth at the regional and national levels. Tiebout (1956) suggests that more decentralised powers lead to better matching of goods and services to the required population than a centralised governmental system. Morgan (2002) builds on these theories by stating that greater decentralisation and devolution of political powers leads to an economic dividend as well as reducing democratic deficits. The second generation focuses on devolution as a means to promote and preserve the development of markets (Martinez-Vazquez and McNab, 2003). Weingast (1995) and McKinnon (1997) suggest that appropriately structured intergovernmental systems create a system that encourages subnational governments to foster markets. This assumes that decentralisation may improve efficiency, resource allocation, and preserve the development of markets, which

drive economic growth. This argument has been contested by Prud'homme (1995) who asserts the success of decentralisation depends on a country's stage of development arguing that developing and transitional countries may lack the capacity and resources to respond to newly created incentives after devolution.

Kyriacou *et al.* (2017) supports the expectation that fiscal decentralisation will likely improve the quality of governance but also that the quality of governance will also improve the outcomes of fiscal decentralisation providing a self-reinforcing relationship. Rodríguez-Pose and Muštra (2022) suggest that decentralised local governments with high quality governance, in areas with surrounding governments of a similar calibre, encourages competitive learning processes, leading to policy innovations and efficient delivery of goods and services. Thanh and Canh (2020) note that while the growth effect from decentralisation is still controversial, their analysis supports the second-generation view of fiscal decentralisation which focuses on market preservation and development and governance structures. However, the form of market and governance structures can be critical in determining the success of fiscal decentralisation, as noted by Jin and Rider (2020) who find that in the cases of China and India, limited growth emerged from decentralisation, as both countries did not follow the norms of decentralisation. Canavire-Bacarreza *et al.* (2020) highlight that demands for fiscal decentralisation and autonomy can be attributed to localised heterogeneity and that this heterogeneity can determine the preferences for particular local and regional public service and public good provisions. Nantharath *et al.* (2020) suggests that inter-governmental transfers to local levels allows for greater levels of growth and less fiscal imbalances. Ganaie *et al.* (2018) support this by arguing that in the case of India, the structure of public institutions makes the centralisation of revenue more efficient in collecting taxes, while the decentralisation of expenditure is more efficient, implying that localised knowledge leads to more effective spending outcomes in local regions.

There is a lack of consensus in empirical studies on the effect of decentralisation on national growth. While Limi (2005) finds fiscal decentralisation has a positive relationship with economic growth, Carniti's (2019) found an inverted U-shaped relationship between fiscal decentralisation and growth in the OECD, where increasing decentralisation has a positive relationship with growth up to a certain point. Similarly, in a study on the impact of fiscal decentralisation of expenditure in 20 Italian regions, Di Liddo *et al.* (2018) also found an inverted U-shaped relationship. These are similar findings to Barro (1990), Thiessen (2003) and Rodríguez-Pose and Ezcurra (2011). Other studies of specific countries undertaking fiscal decentralisation, found positive relationships between decentralisation of revenue and growth, for instance in Thailand (Nantharath *et al.*, 2020), a long-term positive impact in India, with no impact in the short-term (Jin and Rider, 2020), and a positive impact in Vietnam (Thanh and Canh, 2020). However, Li *et al.* (2021) found a positive relationship in Pakistan with decentralisation of expenditure and growth, while a negative relationship is found in a study of Indian states undertaking fiscal decentralisation of revenue in a study by Ganaie *et al.* (2018). A negative relationship has also been identified between fiscal decentralisation and economic growth in various other studies (Rodríguez-Pose and Bwire, 2004; Rodríguez-Pose and Ezcurra, 2011). Locally imposed taxes can yield growth at the national level in the long term, however this can depend on the form of and extent of decentralisation (Rogríguez-Pose and Kroijer, 2009; Canavire-Bacarreza *et al.*, 2020). Rodríguez-Pose and Muštra (2022) find a positive relationship with growth, however the gains mainly accrue through indirect effects such as competition between neighbouring regions and increased efficiencies within local government. Whilst negative effects have been identified, on balance we expect a positive relationship between decentralisation and growth and thus our second hypothesis is:

H2. Countries with greater levels of decentralisation have higher national growth.

2.3 The relationship between city size, decentralisation and growth

Parkinson *et al.* (2015) call for decentralisation of power to cities and argue that cities that are decentralised with greater powers and resources perform better. This can be partly attributed to the inclusion of "place-based" urban and regional policies which consider local context and specificity (Barca *et al.*, 2012). Decentralised policymaking or "bottom-up" policies need to take localised forces that can influence innovation and development into account, while also being reconciled with "top-down" policies (Crescenzi and Rodrıguez-Pose, 2011). However, Hoyt (1999) finds that waste or inefficiency in local government is higher in larger cities. Frick and Rodríguez-Pose (2018) theorise that larger city sizes may lead to diseconomies of scale, making it harder to manage the provision of services and infrastructure. They contend that smaller and medium sized cities are better suited to deal with these localised resources. More recent research suggests this to be the case for intermediate or middle-sized cities, which undertake more territorially balanced place-sensitive strategies (Rodríguez-Pose and Griffiths, 2021). Duranton and Puga (2020), suggest that constraints begin to emerge when cities become more dense and expand outwards, placing increased pressure on its infrastructure, particularly transport. These constraints can lead to reduced potential economic activity, increased financial costs and a cost of time. This is consistent with Rodríguez-Pose and Griffiths (2021) argument that smaller and medium sized cities are better equipped to manage with the allocation of resources than larger cities, as larger cities may suffer from inefficiencies, diseconomies of scale, larger public investments to mitigate congestion costs, and more interventions to alleviate externalities, which raises the costs of economic activity.

Our third hypothesis examines if larger cities with greater decentralisation may also suffer from growth restricting effects:

H3. Countries with larger average city sizes and greater levels of decentralisation have lower national growth.

3. Data

3.1 Sample

This paper uses data from 33 countries from the Organisation for the Economic Co-operation and Development (OECD). The study period covered is 1975–2015 in five-year increments. This is due to the availability of data on city size, which are published by the World Urbanisation Prospects United Nations database every five years since 1975 (note 2020 data is not available at the time of this research). The data are unbalanced in nature as some countries are not included in the full period due to missing data. Table A1 presents the full list of countries included in this analysis as well as the periods covered for each country. Due to data availability, some former Soviet and Soviet satellite countries enter our analysis from 2000 others such as Israel enter our sample in 2000 due to lack of data on other variables. The sample size available for analysis excluding missing values is 208 observations.

3.2 Data for economic growth, city size and decentralisation

The outcome measure of interest in our analysis is the 5-year growth rate in Gross Domestic Product (GDP) per capita. The data are from the Penn World Tables (PWT) database. The GDP indicator is expenditure-side real GDP at chained PPP. National GDP is divided by the total population in each country to create GDP per capita. This is then used to calculate the growth rate of GDP per capita in five year increments from 1975 to 2015.

City size data are obtained from the World Urbanisation Prospects (WUP) United Nations Database. The data are available in five-year increments and this paper uses data on; (i) the

population in urban regions, (ii) the number of cities, and (iii) the percentage of the urban population in a country. The city size data are categorised based on the population of the cities. A list of these categories can be seen in Table A2.

As countries have different sized cities due to differing levels of populations and concentrations, a population weighted average city size variable, proposed by Frick and Rodríguez-Pose (2016), is employed using data from the WUP database. This weighted average city size measure differs from urban primacy and urban concentration, which do not fully account for the size related effects of cities (e.g. population of the cities).

The population weighted average city size is calculated by multiplying each city's population by its share of the urban population. For example, consider two countries, A and B. Each country has two cities, with different levels of urban concentration. In country A, there are two cities with a population of 500,000 each, and the urban concentration for the country is evenly split between the two cities. The population weighted average city size would be expressed as: 500,000*50%+500,000*50% = 500,000. This means the weighted average city size is half a million people. In country B, again where there are only two cities, one city has a population of one million people and the other has a population of 100,000 people. The population weighted average city size is 1,000,000*90%+100,000*10%, or 910,000 people. In these examples, A has a perfectly even spread between cities, whereas in B most urban inhabitants live in one city.

Decentralisation data come from the OECD Fiscal Decentralisation Database. This paper uses data on the decentralisation of governmental tax revenues at central, state, and local levels of government. Tax revenues are provided as a percentage of total general government tax revenue, which is categorised to each level of government. The data include consolidated tax revenue at the local level, provided in percentages. Many papers use fiscal decentralisation of expenditure (Rodríguez-Pose and Bwire, 2004; Baskaran and Feld, 2013; Rodríguez-Pose and Ezcurra, 2011; Carniti *et al.*, 2019). However, Akai and Sakata (2002) note that data for expenditure may include inter-governmental transfers which may not necessarily reflect the level of authority allocated to lower-level government. They also note that many studies use expenditure as an indicator of decentralisation and it is necessary to construct indicators of fiscal decentralisation that reflect revenue, as it is difficult to develop a single measure that appropriately measures decentralisation. The data for fiscal decentralisation of revenue and expenditure at local levels do not match in this paper as expenditure data are missing for a large part of the study period and so restricts the analysis [1]. However, the revenue and available expenditure data are highly correlated at 0.70. The high correlation and greater sample size for the revenue measure supports the use of revenue data as an indicator of fiscal decentralisation.

3.3 Other control variables

We include several control variables identified in the literature to affect national growth, including trade openness (Sachs *et al.*, 1995) estimates from the World Bank, capital stock (Solow, 1956), human capital and population (Becker *et al.*, 1999), which are derived from the Penn World Tables. Human capital is included as a control as it has been shown that a more educated work force enhances productivity and drives economic growth (Romer, 1986; Lucas, 1988). Legal and Property Rights data are obtained from the University of Gothenburg Quality of Government Institute (Siddiqui and Ahmed, 2013). A data definition table is included in Table A3. Table 1 presents the descriptive statistics for the variables used in our analysis.

Table 1.
Descriptive statistics

Variables	Observations	Mean	Std. dev.	Min	Max
Log of GDP per capita	208	0.1143288	0.1311225	−0.632823	0.4616699
Log of weighted average city size	208	7.598577	0.0055213	7.585789	7.60589
Fiscal decentralisation of revenue	208	9.767207	8.134987	0.0386977	34.89625
Log of Interaction of weighted average city size & fiscal decentralisation of revenue	208	74.21839	61.81928	0.2936506	265.417
Log of initial GDP	208	10.16272	0.4945232	8.952894	11.44497
Legal & property rights	208	7.114759	1.037545	3.524508	8.550271
Human capital	208	2.969587	0.4713361	1.469023	3.703131
Openness	208	69.89861	34.38578	15.51637	189.4217
Log of Capital Stock	208	11.9716	0.56086	10.01347	12.99687
Log of Population	208	2.293555	1.575604	−1.522939	5.733378

4. Methodology

This paper empirically tests the relationship between (i) weighted average city size (ii) fiscal decentralisation, and (iii) the interaction of weighted average city size and decentralisation on national growth. To empirically test these relationships, we estimate the final model presented in equation (1) below:

$$\Delta \ln GDP_{it} = \beta_0 + \beta_1 \ln CitySize_{it-1} + \beta_2 Decentralisation_{it-1} + \beta_3 \ln CitySize_{it-1} * Decentralisation_{it-1} + \beta_4 \ln GDP_{it-1} + \beta_5 X_{it-1} + \mu_i + \mu_t + \varepsilon_{it} \quad (1)$$

Where $\Delta \ln GDP_{it}$ is the first difference of the natural log of GDP per capita (i.e. the growth rate) of country i in period t, $\ln CitySize_{it-1}$ is the natural logarithm of weighted average size of cities in country i in period $t-1$, $Decentralisation_{it-1}$ is the fiscal decentralisation of local government revenue in country i in time period $t-1$, $CitySize_{it-1} * Decentralisation_{it-1}$ is the interaction term of the two key variables of interest in country i in time period $t-1$, and X_{it-1} is a set of control variables. The subscript i represents the country and t denotes time period which is in five-year increments. X_{it-1} contains the control variables included in our model (listed in Table A3). The βs are the coefficients of the model, μ_i indicates country-fixed effects, μ_t represents the time-fixed effects, and ε_{it} is the error term.

$\beta_1 CitySize_{it-1}$ is used to test H1 which states that countries with larger average city sizes have higher national growth. Based on the theories of Krugman (1991) and Duranton and Puga (2004) and research by Frick and Rodríguez-Pose (2016, 2018), we expect the sign of the coefficient to be positive which would provide support for H1. For H2, $\beta_2 Decentralisation_{it-1}$ tests whether countries with greater levels of decentralisation have higher national growth. Based on the theories of Tiebout (1956), Oates (1972, 1999), and Morgan (2002), and the research of Barro (1990), Limi (2005) and Carniti *et al.* (2019), we expect the sign of the coefficient to be positive. Finally, $\beta_3 CitySize_{it-1} * Decentralisation_{it-1}$ is used to test H3 which states that countries with larger average city sizes and greater levels of decentralisation have lower national growth. Based on the city size research of Frick and Rodríguez-Pose (2016, 2018) and fiscal decentralisation research of Di Liddo *et al.* (2018) and Carniti *et al.* (2019), we expect the sign of the coefficient to be negative.

The estimation method employed is a FE estimator. The FE method controls for the time-invariant effects within the model (Gujarati, 2015). FE allow for a specific individual effect to be correlated with the independent variables which has the advantage of testing the

relationship between predictor and outcome variables within a country (Reyna, 2007). The within group estimator allows for consistent estimates of the beta coefficients (Baum, 2006). It is termed 'within' as it estimates the variation within the unit. As such, this means any characteristic that does not vary over time cannot be included. The FE method is also helpful as it does not require a balanced panel. To undertake further robustness tests, an OLS model with country FE are included in Table A5. A Hausman test was also conducted and indicated that a random effects estimator should not be used. We also include a table of diagnostics tests in Table A4.

To reduce possible heteroscedasticity, several variables take a logarithmic form (Gujarati, 2015). The control variables include GDP per capita, institutional quality (Afonso, 2022), human capital (Romer, 1986; Lucas, 1988), openness (Sachs *et al.*, 1995), capital stock (Solow, 1956) and population (Becker *et al.*, 1999). GDP per capita, city size, city size/decentralisation, capital stock per capita and population are all in the form of a natural logarithm. The remaining control variables are either in percentage terms or indices. Robust standard errors are also used in all estimations.

To account for potential endogeneity we lag our independent variables by one time period (i.e. five years). This should reduce any potential problems of endogeneity as there is usually no correlation between the lagged values and the disturbance (Limi, 2005; Van Rompuy, 2021).

5. Results

Table 2 displays the results of the FE estimation of equation (1). Firstly, the coefficient on weighted average city size is positive and significant indicating that countries with larger average city sizes have higher levels of national growth. This suggests that as a country's weighted average city size increases, it also experiences faster growth rates of GDP per capita, providing support for our first hypothesis. This finding is consistent with Frick and Rodríguez-Pose (2016, 2018) and Al-Jebouri *et al.* (2020) suggesting that economies can benefit from larger urban agglomerations. Ganau and Rodríguez-Pose (2022) find a positive relationship with growth and urban concentration, with growth mainly driven by the core of the urban areas.

Secondly, the decentralisation of local tax revenue also has a positive and significant relationship with growth. This provides support for our second hypothesis which states that countries with greater levels of decentralisation have higher national growth. This finding is consistent with the theoretical arguments of Morgan (2002) and Oates' decentralisation theorem (1972). It is also consistent with the empirical results of Carniti *et al.* (2019) who find a positive relationship between decentralisation and growth (however they note that this relationship is not linear). Similarly, Canavire-Bacarreza *et al.* (2020), Thanh and Canh (2020), Nantharath *et al.* (2020) and Rodríguez-Pose and Muštra (2022) find a positive relationship between fiscal decentralisation and economic growth.

Thirdly, the interaction coefficient between average city size and fiscal decentralisation of revenue is negative and significant. This supports the third hypothesis that countries with larger average city sizes and greater levels of decentralisation have lower national growth. The findings may be due to larger cities being less efficient or harder to manage in a more decentralised system. Rodríguez-Pose and Griffiths (2021) argue that smaller and medium sized cities are better suited to deal with localised resources than larger cities, while Carniti *et al.* (2019) and Di Liddo *et al.* (2018) find an inverted-U relationship with fiscal decentralisation and growth. This is consistent with Hoyt (1999) who suggests that waste or inefficiency is higher in larger sized cities as there may be increased costs and taxes associated with city living.

Variables	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
Log of Weighted Average City Size	19.0682*		25.3442**	34.7857***
	(11.7655)		(11.3832)	(12.2016)
Fiscal Decentralisation of Revenue		0.0131***	0.0131***	4.4589*
		(0.0037)	(0.0037)	(2.5774)
Log of Weighted Average City Size*Fiscal Decentralisation of Revenue				−0.5851*
				(0.3392)
Log of Initial GDP per capita	−0.5366***	−0.6290***	−0.6290***	−0.6835***
	(0.1359)	(0.1284)	(0.1284)	(0.1193)
Legal & Property Rights	−0.0028	−0.0075	−0.0075	−0.0194
	(0.0394)	(0.0326)	(0.0326)	(0.0339)
Human Capital	0.0534	−0.0474	−0.0474	−0.0527
	(0.2248)	(0.2055)	(0.2055)	(0.2075)
Openness	−0.0006	−0.0005	−0.0005	−0.0010
	(0.0009)	(0.0008)	(0.0008)	(0.0009)
Log of Capital Stock	0.2075	0.2506	0.2506	0.2482
	(0.1722)	(0.1915)	(0.1915)	(0.1681)
Log of Population	−0.5010**	−0.4750*	−0.4750*	−0.4666**
	(0.2446)	(0.2421)	(0.2421)	(0.2239)
Year-Fixed Effects				
1980	−0.0918**	−0.0198	−0.0840**	−0.0961**
	(0.0377)	(0.0373)	(0.0331)	(0.0368)
1985	−0.1813***	−0.0360	−0.1643***	−0.1662***
	(0.0314)	(0.0591)	(0.0265)	(0.0298)
1990	−0.0695	0.1260	−0.0662*	−0.0717*
	(0.0429)	(0.0914)	(0.0366)	(0.0353)
1995	−0.1338***	0.1361	−0.1199***	−0.1281***
	(0.0362)	(0.1153)	(0.0341)	(0.0325)
2000	0.0139	0.3390**	0.0194	0.0110
	(0.0368)	(0.1465)	(0.0346)	(0.0339)
2005	−0.0131	0.3841**	0.0011	−0.0003
	(0.0253)	(0.1848)	(0.0256)	(0.0253)
2010	0.0054	0.4596**	0.0133	0.0116
	(0.0191)	(0.2089)	(0.0206)	(0.0201)
Constant	−140.7127	4.4063**	−187.8493**	−258.8893***
	(87.5002)	(2.0158)	(84.7171)	(91.1979)
Observations	208	208	208	208
R-squared	0.4311	0.4693	0.4693	0.4951
Number of countries	33	33	33	33

Note(s): Standard errors in parentheses
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$
Model 1 includes Weighted Average City Size and control variables
Model 2 includes Fiscal Decentralisation of Revenue and control variables
Model 3 includes Weighted Average City Size, Fiscal Decentralisation of Revenue and control variables
Model 4 includes all key variables and interaction of Interaction of Weighted Average City Size and Fiscal Decentralisation of Revenue and control variables

Table 2.
Fixed effects estimation of equation

6. Conclusion

This paper examines the links between city size, decentralisation, and national economic growth. We find that, when considered separately, decentralisation and average city size have a positive impact on national economic growth. However, we find the combination of higher average city size and rising decentralisation to be adversely related to national

economic growth suggesting the city size–national growth nexus is conditioned by the extent of national decentralisation.

A key contribution of this paper was to shed light on the controversy surrounding the assumed economic growth boon effect the increased fiscal decentralisation brings (Thanh and Canh, 2020). Rodríguez-Pose and Ezcurra (2011, p. 638) previously questioned the claim that fiscal decentralisation will bring some sort of economic dividend. Our results indicate that greater decision-making powers in relation to revenue at the local level positively influence growth. However, separately, Rodríguez-Pose and Griffiths (2021) also make the argument from a management and resource allocation perspective that small- and medium-sized cities would be better equipped to deal with resource allocation efficiencies than larger cities. We find support for this contention as the positive effect of city size on growth is moderated by decentralisation – countries with larger average city sizes and increased decentralisation have lower growth. In effect, larger cities may be conditioned by their size and will struggle with decentralising decision-making and resource allocation as the city grows.

The findings of this paper are important for policymakers. They provide insights into the impact of increasing urban concentration and the size of urban concentrations on national economic growth. They also further support the rationale for the devolution of fiscal autonomy to sub-national levels. However, there is also a cautionary tale presented as our findings indicate that fiscal decentralisation in larger cities results in lower economic growth. This points to scale issues for decentralisation, where the benefits of decentralisation depend on the average size of the cities. Larger cities with fiscal autonomy may suffer from the same problems that centralised nations do. This is particularly concerning as large parts of the world have embarked on a decentralisation agenda. The results provide a warning for policy agendas such as 'Urban Agenda for the EU' (European Commission, 2017) and the UN New Urban Agenda (UN, 2017), which are seeking to readdress urban development issues and how cities are planned and financed. The UN New Urban Agenda seeks to empower policymakers and decision-makers "ensuring appropriate fiscal, political and administrative decentralization based on the principle of subsidiarity" (2017, p. 16). Specifically, policymakers should proceed with caution on decentralisation agendas in countries with large cities. The implications of this negative decentralisation moderating impact should be considered by policymakers alongside potential impacts on spatial planning issues and frameworks, economic development, transport, environment, infrastructure, rural regeneration, geographical boundaries, local democracies and interdependencies of local institutions and regional policies.

As with all studies, this analysis is not without limitations. Due to limits on data availability the accuracy of some measurements and contextual factors may be reduced. For example, the lack of data for OECD fiscal decentralisation of tax expenditure greatly reduced the potential for robustness testing on the expenditure side. Despite these limitations, the research and results do add to the evidence base within the empirical literature, which adds further value and insight around the role of city size and decentralisation for growth. Finally, future research is needed to identify if the same issues of negative economic growth occur through the interaction of increasing average city size and decentralisation through other measures of decentralisation. Consideration could be given to measures of local government expenditure. Additionally, other measures beyond fiscal decentralisation could be considered including the level and size of political and administrative decentralisations.

Note

1. Due to the lower nature of countries and greater concentration of former Soviet countries, data is limited to about 120 observations over a shorter time frame for the tax expenditure measure of fiscal decentralisation

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(The Appendix follows overleaf)

Appendices

Country	Time period covered
Australia	1980–2015
Austria	1980–2015
Belgium	1975–2015
Canada	1980–2015
Chile	1995–2015
Colombia	No observations
Czech Republic	2000–2015
Denmark	1995–2015
Estonia	2000–2015
Finland	1980–2015
France	1980–2015
Germany	2000–2015
Greece	1980–2015
Hungary	2000–2015
Iceland	No observations
Ireland	1980–2015
Israel	2000–2015
Italy	1980–2015
Japan	1980–2015
Korea	1980–2015
Latvia	2000–2015
Luxembourg	No observations
Lithuania	2000–2015
Mexico	1995–2015
Netherlands	1980–2015
New Zealand	1995–2015
Norway	1980–2015
Poland	2000–2015
Portugal	1980–2015
Slovakia	2000–2015
Slovenia	No observations
Spain	1980–2015
Sweden	1995–2015
Switzerland	1995–2015
United Kingdom	1980–2015
Turkey	1985–2015
United States	1980–2015

Table A1.
List of countries and time periods covered

Size 1	Number of cities below 300,000
Size 2	Number of cities between 300,000 and 500,000
Size 3	Number of cities between 500,000 and 1 million
Size 4	Number of cities between 1 to 5 million
Size 5	Number of cities between 5 to 10 million
Size 6	Number of cities above 10 million

Table A2.
United Nations world urbanization prospects city size categories

Variable	Measure	Source
Log of Weighted average city size	Includes percentage of urban population living in cities, total urban population and number of agglomerations	UN World Urbanisation Prospects Database
Fiscal decentralisation of local revenue	% of revenue raised at subnational level of government	OECD Fiscal Decentralisation Database
Interaction of log of weighted average city size & fiscal decentralisation of revenue	Includes a combination of the above two measures	UN World Urbanisation Prospects Database/OECD Fiscal Decentralisation Database
Log of Initial GDP per capita	The GDP indicator is expenditure-side real GDP at chained PPP's using 2017 as a base year	Penn World Tables
Legal & Property Rights	Index ranging from 0–10	University of Gothenburg Quality of Government Institute
Human Capital	Based on the average years of schooling and the return to education.	Penn World Tables
Log of Capital Stock	This includes the value of structures (residential and non-residential), as well as machinery and equipment	Penn World Tables
Log of Population	The number of people in a country	Penn World Tables
Openness	The sum of exports and imports measured as a share of GDP	World Bank

Table A3.
Data definitions

Diagnostic test table – *R*-squared & *F*-test results						
	Model 1	Model 2	Model 3	Model 4	Model 5 (OLS)	Model 6 (Soviet Dummy)
Within	0.4311	0.4693	0.4693	0.4951		0.5201
Between	0.1988	0.1653	0.1653	0.1718		0.1050
Overall	0.0373	0.0352	0.0352	0.0377	0.5487	0.0273
F-test	$F(14,161) = 8.71$ Prob > $F = 0.0000$	$F(15,160) = 9.43$ Prob > $F = 0.0000$	$F(15,160) = 9.43$ Prob > $F = 0.0000$	$F(16,159) = 9.74$ Prob > $F = 0.0000$	$F(48, 159) = 4.03$ Prob > $F = 0.0000$	$F(16,141) = 9.55$ Prob > $F = 0.0000$

Table A4.
Diagnostic tests

Variables	(1) OLS	(2) FE
Log of Weighted Average City Size	34.7857***	34.0462***
	(10.8605)	(9.1093)
Fiscal Decentralisation of Revenue	4.4589**	4.1295**
	(1.8588)	(1.6186)
Log of Weighted Average City Size*Fiscal Decentralisation of Revenue	−0.5851**	−0.5417**
	(0.2445)	(0.2130)
1980	−0.0961*	−0.1005
	(0.0494)	(0.0994)
1985	−0.1662***	−0.1701*
	(0.0434)	(0.0870)
1990	−0.0717	−0.0783
	(0.0445)	(0.0772)
1995	−0.1281***	−0.1353**

(*continued*)

Table A5.
Robustness Tests

Variables	(1) OLS	(2) FE
	(0.0363)	(0.0621)
2000	0.0110	−0.0042
	(0.0317)	(0.0507)
2005	−0.0003	0.0017
	(0.0271)	(0.0392)
2010	0.0116	0.0016
	(0.0278)	(0.0303)
Log of GDP per capita	−0.6835***	−0.6964***
	(0.1151)	(0.0787)
Legal & Property Rights	−0.0194	−0.0187
	(0.0285)	(0.0249)
Human Capital	−0.0527	0.0226
	(0.1643)	(0.1360)
Openness	−0.0010	−0.0013
	(0.0010)	(0.0009)
Log of Capital Stock	0.2482*	0.2519**
	(0.1462)	(0.1037)
Log of Population	−0.4666***	−0.5630***
	(0.1787)	(0.1286)
Austria	−0.5079***	
	(0.1710)	
Belgium	−0.3383*	
	(0.1737)	
Canada	0.2286**	
	(0.1138)	
Chile	−0.5441**	
	(0.2373)	
Czech Republic	−0.1793	
	(0.2667)	
Denmark	−0.9011***	
	(0.2042)	
Estonia	0.6556**	
	(0.2958)	
Finland	−0.8683***	
	(0.2457)	
France	0.0391	
	(0.1774)	
Germany	−1.5759***	
	(0.5231)	
Greece	−0.6765**	
	(0.2757)	
Hungary	0.3826	
	(0.2594)	
Ireland	−0.5262***	
	(0.1715)	
Israel	−0.6833***	
	(0.1941)	
Italy	−0.8407**	
	(0.3361)	
Japan	−2.3080***	
	(0.7665)	
Korea, South	−0.7986***	
	(0.2499)	

Table A5. (*continued*)

Variables	(1) OLS	(2) FE
Latvia	0.0809	
	(0.2697)	
Lithuania	0.7584**	
	(0.3639)	
Mexico	−1.2714***	
	(0.4472)	
Netherlands	−1.4975**	
	(0.6430)	
New Zealand	−1.6635***	
	(0.4605)	
Norway	0.1942	
	(0.2984)	
Poland	−0.2327*	
	(0.1281)	
Portugal	−0.6904**	
	(0.3468)	
Slovakia	−0.7513**	
	(0.2983)	
Spain	−0.7679***	
	(0.2324)	
Sweden	−1.2162***	
	(0.3022)	
Switzerland	−1.4443***	
	(0.4092)	
Turkey	−0.6195**	
	(0.3127)	
United Kingdom	0.1815	
	(0.2520)	
United States	1.2989***	
	(0.4966)	
Constant	−258.3726***	−253.2528***
	(80.9553)	(68.4569)
Observations	208	184
R-squared	0.5487	0.5201

Note(s): Robust standard errors in parentheses
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$
Column (2) is estimated as a country FE model

Table A5.

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