Decentralisation at a Crossroads: How Fiscal and Administrative Autonomy Shape Regional Socio-Economic Efficiency

Abstract:

A cross-sectional and longitudinal analysis of social and economic effects of regional administrative and fiscal decentralisation is carried out. Spain regions from 2008 to 2021 are analysed by means of Data Envelopment Analysis as well as bootstrapped Tobit regressions and panel data. The study contributes to ongoing debates in regional science by introducing a horizontal approach to decentralisation—comparing institutional variation across regions at the same administrative level—thus complementing the traditionally vertical analyses between levels of government. Results show that both administrative and fiscally decentralised regions have better socio-economic performance, except for three years when considering social efficiency of administrative decentralisation by means of cross-sectional analysis. This article contributes to the field of federalisation theory in the following three ways: 1) when recessions start, administrative decentralisation reduces social efficiency which justify centralisation to deal with crises; 2) the design of decentralisation is the key factor to be considered; 3) it is necessary to avoid the overlapping of regional public administration. The results offer theoretical support for second-generation fiscal federalism theories, which stress the importance of institutional design, governance quality and incentive alignment. For policy makers, the findings suggest that decentralisation *per se* is not sufficient: well-calibrated fiscal rules and institutional clarity are essential to enhance efficiency. Internationally, our evidence highlights lessons for federal and asymmetrically decentralised systems, particularly regarding the risk of inefficiencies stemming from overlapping competences.

Keywords: Socio-economic Efficiency; Administrative Decentralization; Fiscal Decentralization; Public Administration; Regional Governments; Spain.

1. INTRODUCTION

Scientific community is interested in public decentralisation due to its noteworthy socio-economic effects. General government final consumption expenditure was 16.15% of worldwide GDP in 2022 (World Bank, 2022). There is a debate among scholars whether decentralisation has positive impacts on different socio-economic indicators: GDP growth and economic development (Hung & Thanh, 2022; Kim & Bae, 2019; Hasanli, 2017; Rodríguez-Pose & Ezcurra, 2010; Treisman, 2006), efficiency, (Martínez, at al., 2022; Bucci, at al., 2023; Ubago Martínez, at al., 2017; Rodriguez-Pose & Ezcurra, 2010; Balaguer-Coll. 2009), income distribution and human development (Hung & Thanh, 2022), public policies and citizen satisfaction (Lindaman & Thurmaier, 2002), among others.

Decentralisation involves distributing the making decision competence and allows the implementation of policies by central, regional or local administrations. There is a wide diversity of political systems, some highly centralised, such as Portugal and Finland, and others highly decentralised, such as Spain and Germany (Schakel et al., 2018). In some centralised systems, the central administration assumes all the power to manage revenues, allocate expenditure and determine the regulatory content of public policies. This power is shared with regional and local administrations in decentralised systems. In some cases, local administrations manage and decide the bulk of these issues. Public decentralisation can be threefold: administrative, fiscal and political. The scope of this article does not include political decentralisation.

Administrative decentralisation refers to the existence of different administrations (central, regional and local) and it is justified by its presumed positive impact on social and economic efficiency[1]. Theoretically, when political institutions and administrations are close to citizens,

[1] Efficiency term will be used in this article under the Data Envelopment Analysis framework.

there is an improvement in the quality of public policies in terms of increased social spending (Bilan et al., 2019; Chygryn et al., 2018) and economic growth (Kim & Bae, 2019). In other words, smaller and decentralised administrations will be more efficient both socially and economically. Nonetheless, Rodríguez-Pose & Ezcurra (2010) and Balaguer-Coll et al. (2009), among other authors, affirm that there is no evidence of administrative decentralisation and favourable effects.

Another important issue is whether fiscal decentralisation has a significant socio-economic effect. Fiscal decentralisation has to do with the ability of regional and local governments and administrations to collect taxes directly from the population without relying on transfers from the central administration. In theory, decentralisation improves the quality of information and the motivation of regional governments and administrations and, consequently, increases the quality of social policies (Lindaman & Thurmaier, 2002) and the quantity of public spending, favouring growth and economic development (Bucci et al., 2023). Fiscal decentralised regions are more closely linked to their territory and population. When they have greater revenue-raising capacity, they tend to allocate resources better. They have a more decisive social orientation and a greater inclination to attend to the needs of their communities. Nonetheless, some authors show that there is no clear relationship between socio-economic development and fiscal decentralisation (Hung & Thanh, 2022; Hasanli, 2017).

The Spanish case is unique. The Spanish Constitution of 1978 established a strongly decentralised system in favour of regions (NUTS-II)[2] and, to a much lesser extent, in favour of local administrations. In practice, this is a federal system and one of the most decentralised in the world. Nevertheless, the decentralisation process was not free of tensions, which had to do

[2] The term "NUTS" is an acronym that stands for *Nomenclature des Unités Territoriales Statistiques* (Nomenclature of Territorial Units for Statistics). This level divides the country (NUTS-I) into smaller units, such as regions (NUTS-II) which in Spain are a total of 19: 17 Autonomous Communities and 2 Autonomous Cities (Ceuta and Melilla, both located in the north of Africa).

with the asymmetric decentralisation of Spain, given that not all regions had and have the same responsibilities, spending levels and fiscal competences. Therefore, some Spain regions are administratively decentralised, whereas some others are centralised. Likewise, Spain has fiscally centralised and decentralised regions.

In view of the debate among scholars, this paper aims to confirm or refute the relationship between administrative and fiscal decentralisation and economic and social efficiency in the Spanish case. The measure of decentralisation to be analysed in this study is two-fold: 1) the comparison between single-province and multi-province regions (being the former administratively decentralised and the latter centralised[3]); and 2) the comparison between regions made up of fiscally decentralised provinces and fiscally centralised regions. For this purpose, a Data Envelopment Analysis (thereinafter, DEA) is carried out (first stage of the analysis) as well as bootstrap Tobit regressions (second stage) and panel data (third stage).

Scientific literature is mainly focused on studying local decentralisation and comparing different OECD countries according to the level of decentralisation of their institutions (Halkos & Tzeremes, 2010). In short, it deals with the analysis of administrative and fiscal decentralisation among the different levels of state organisation: central, regional and local. In other words, vertical comparisons. Nonetheless, to the best of our knowledge, there is no horizontal comparative studies between administrations at the same level (for instance, between different municipalities or regions). The aim of this paper is to analyse the economic and social impact of decentralisation, comparing regions according to administrative decentralisation (large multi-provincial regions and small single-provincial regions) and fiscal autonomy. This horizontal approach, using cross-sectional and longitudinal methodologies, is innovative and

[3] Single-province regions can be considered administrative decentralised because the regions are smaller and, therefore, closer to the territory and their citizens. Conversely, multi-province regions can be considered administrative centralised because their size is larger and they are not closer to their communities.

allows us to measure the effects of administrative and fiscal decentralisation between administrations at the same level.

The results of this article show that administratively decentralised single-province regions in Spain are more efficient than the administratively centralised multi-province ones, both socially and economically. Likewise, regions that are made up of fiscally decentralised provinces (the Basque Country[4] [NUTS-II] and Navarre [NUTS-II and NUTS-III, given that it is a single-province region]) are significantly more economic and social efficient.

Even if regional science has long explored how territorial governance influences economic outcomes, the efficiency implications of sub-national political choices remain under-investigated. Foundational work on fiscal decentralisation in China (Zhao & Zhang, 1999) and on county antipoverty campaign in the United States (Lobao et al., 2012) demonstrates that governance context matters, but comparative evidence for a mature, decentralised European country is still limited. Recent research on R&D convergence across Spanish regions (Delgado et al., 2024) confirms that regional policy can accelerate convergence processes, yet it leaves open whether such policies also foster efficiency. Although the methodology is innovative, the main contribution to the field (obtained by the horizontal perspective) is that the design of regional public administrations is the key factor to be taken into account when decentralising, particularly in order to avoid the overlapping of regional public administrations. Furthermore, the article contributes to federalisation theory by demonstrating that when recessions start, social performance decreases, which justifies centralisation for crisis management. In doing so, the study extends decentralisation debates to the Spanish context and contributes fresh empirical evidence to efficiency outcomes, thereby advancing discussions in regional science.

[4] The Basque Country region is not *per se* fiscally decentralised, but all its provinces are fiscally decentralised: Álava (NUTS-III), Guipúzkoa (NUTS-III) and Vizcaya (NUTS-III).

This paper is organised as follows. The literature review and the hypotheses are stated in Section 2. The input/output variables of the models, the sample and the methodologies are described in Section 3. The results of the empirical research are shown in section 4. Section 5 discusses the results and their implications. Section 6 ends with conclusions and future research recommendations.

2. LITERATURE REVIEW AND RESEARCH HYPOTHESES

Federalism, a governance structure that distributes power between central and regional governments, has significant economic implications, especially in terms of economic development. The economic influence of federalism has been a central theme in the academic debate. First, Tiebout (1956) argues that fiscal federalism promotes the efficient provision of public goods through competition among local governments. On the other hand, Oates (1972) develops the decentralisation theorem, which suggests that the level of welfare of a community is usually higher if the levels of public consumption are provided by each jurisdiction independently, and not by a central government assigning the same level to all jurisdictions. Building on these theories, Rodden (2004) examines the impact of fiscal federalism on government spending, while Bolton and Roland (1997) assess its effect on economic growth. Their research highlights that the economic outcomes of federalism are conditioned by aspects such as fiscal decentralisation and intergovernmental transfers. According to Alesina and Spolaore (1997), it can favour integration by enabling the implementation of diverse policies and regional development. However, if coordination among governments fails, it can also hinder trade and investment. Research on federalism and economic integration faces several challenges, such as the heterogeneity of federal systems across nations and the impact of globalisation. Oates (2005) sets out a “second-generation” theory of fiscal federalism that incorporates heterogeneous local preferences, information asymmetries between levels of

government and incentive-compatibility constraints, emphasising that the efficiency of decentralisation depends not only on the allocation of revenue and spending powers, but also on the quality of governance and the credibility of inter-governmental contracts.

There is an abundance of literature on DEA applied to public administration (Emrouznejad & Yang, 2018). This literature analyses and quantifies the efficiency of administrations (Buleca & Mura, 2014), and also studies its impact on the provision of public services (Tapia et al., 2019), in the promotion of small and medium-sized enterprises (Aristovnik & Obadic, 2015), in the implementation of management by objectives in public administrations (He & Wang, 2006), in the efficiency of public cultural services or in the assessment of efficiency in the public health and education system (Buljan et al., 2019), among others. Multiple studies use DEA to analyse and evaluate efficiencies in countries such as China (Zhu et al., 2006), Poland (Figiel et al., 2018), Czech Republic (Lindner & Kubát, 2016), Portugal (Rego et al., 2010), Slovakia (Fandel et al., 2018), Brazil (Moreira da Silva et al., 2019), Russia (Leshukov et al., 2016) and Spain (del Barrio et al., 2009).

Despite the fact that some significant relationship can be established between administrative decentralisation and social development (Bilan et al., 2019; Chygryn et al., 2018), much of the academic work fails to show a clear relationship between administrative decentralisation and economic growth. Kim & Bae (2019) report that regional decentralisation improves the efficiency of resource allocation in the public sector and thus contributes to economic growth. Conversely, Rodríguez-Pose & Ezcurra (2010) confirm that there is no significant impact of administrative decentralisation on economic growth. Balaguer-Coll et al. (2009) conclude that there is no clear answer to the question of whether greater decentralisation, or greater centralisation, is "good" or "bad" in terms of economic efficiency.

Theoretically, administrative decentralisation is expected to lead to efficient performance of local public services and rapid economic development. Indeed, decentralisation draws decision

making and resource allocation close to the population. Therefore, the access to information about the needs and preferences of the citizenry is faster and more accurate. Additionally, decentralisation promotes competition among administrations (competitive federalism) as well as cooperation among them (cooperative federalism), elements that improve the efficiency of public policies (Tiebout, 1956; Oates, 1972). Alongside these well-documented benefits, descentralisation can also entail significant costs, such as the increase in regional inequalities (Kyriacou et al., 2015; 2016; López-Villuendas & del Campo, 2022) [e.g. in R&D expenditure (Delgado et al., 2024), household income (Sacchi & Salotti, 2014)], the development of opportunistic fiscal policies (López-Laborda et al., 2021), coordination failures and administrative duplication (Zhao & Zhang, 1999; Treisman, 2006).

All in all, the first aim of this article is to examine whether there is evidence that administrative decentralisation has positive socio-economic effects in Spain regions. To address it, we have used the hypothetical-deductive method in conjunction with statistical hypothesis testing. To begin with, the synthetic analytical approach was used to identify the components of the problem before they were transferred to an input/output system. Therefore, the hypotheses dealing with administrative decentralisation state that decentralised single-province regions perform socio-economically better than centralised multi-province regions:

- (H_1) "Administratively decentralised regions are more socially efficient than centralised ones".
- (H_2) "Administratively decentralised regions are more economically efficient than centralised ones".

Scientific literature abounds concerning the socio-economic effects of fiscal decentralisation of regions and municipalities. The literature review suggests, though, that the relationship between fiscal decentralisation and economic growth is ambiguous. Bucci et al. (2023) analyse the fiscal decentralisation and the efficiency of municipalities, with positive results. In the same line,

there is also evidence of a positive relationship between fiscal decentralisation and the technical efficiency of tax collection (Martínez et al., 2022), as well as between fiscal decentralisation and the Human Development Index (Lindaman & Thurmaier, 2002). Conversely, Ubago Martínez et al. (2017) establish a statistically significant negative relationship between the fiscal decentralisation of public spending and technical efficiency. Otsuka et al. (2014) applies a cost-frontier approach to Japanese prefectures and concludes that that larger central transfers systematically reduce regional cost-efficiency, highlighting the disciplining role of fiscal rules in decentralised systems. Hung & Thanh (2022) observe a clear relationship between fiscal decentralisation and economic growth and human development, even though this relationship is contradictory: positive in the first case and negative in the second one. Nonetheless, Hasanli (2017) considers that the evidence for such a relationship is not conclusive. Likewise, Treisman (2006) states that there is no clear theoretical basis on which to expect that decentralising revenues will generally improve economic performance.

Theoretically, fiscal decentralisation is expected to lead to efficient performance of local public services and rapid economic development, because fiscally decentralised regions have greater capacities to raise revenue and a decisive social orientation. Therefore, the hypotheses dealing with fiscal decentralisation state that regions that are made up of fiscally decentralised provinces perform better in terms of social and economic efficiency.

- (H_3) "Regions that are made up of fiscally decentralised provinces are more socially efficient than fiscally centralised ones".
- (H_4) "Regions that are made up of fiscally decentralised provinces are more economically efficient than fiscally centralised ones".

Importantly, the contribution to the field of our paper is to provide a horizontal analysis that studies administrations at the same level, comparing different regions, given that each of them has different degrees of administrative and fiscal decentralisation, either because of their size

or because of their specific institutional model. They cannot be treated as a homogeneous whole, as happens when administrations are compared by classifying them as central, regional and local. This methodological approach is relevant because the design of institutions to improve their efficiency must consider not only how expenditures, revenues and competencies are distributed among the different levels of the state, but also how the institutions and administrations of each of the levels of the state, in our case the regional institutions and administrations, must be designed.

3. METHODOLOGY

The four hypotheses of Section 2 are tested using DEA, as well as both Tobit regressions (cross-sectional analysis) and panel data (longitudinal analysis).

DEA is a non-parametric statistical technique and it was first put forth by Charnes et al. (1978) and improved by Banker et al. (1984) and Banker (1984). In public administration literature, DEA has gained popularity in recent years. It has been used to determine the relative efficiency of various nations, regions and local governments, measuring both the efficiency of the public sector in its decision-making and the economic efficiency of European regions or OECD countries (Halkos & Tzeremes, 2010). This approach works particularly well when the efficiency of an organizsation is calculated based on their inputs and outputs. Its non-parametric nature prevents the imposition of a predefined functional form. The production frontier is calculated by linear programming techniques and is computed using the enveloping functions of the input-output combinations given by the data from several Decision-Making Units (thereinafter, DMUs).

In comparison to other DMUs, the most efficient have a value of 100; thus, there is still room for efficiency improvement in DMUs with lower values. The range of values is 0 to 100. This procedure can be used to establish a frontier with a maximum relative efficiency. The DMUs

that are most efficient in relation to the selection under consideration can be found since, as was already mentioned, this technique yields relative efficiency rather than absolute efficiency (San-Jose et al., 2020). The potentiality of the outcomes is increased because it is possible to set the efficiency criterion for the complete group of units rather than simply a subset of them by using the entire population.

In this article, the DMUs are the regions in Spain, taking as a reference the regional classification used in the European Union (EU) to divide the territories of the member states into different hierarchical levels for statistical purposes (NUTS). Regions are considered NUTS-II, which include both the 17 Autonomous Communities (Andalusia, Aragon, Asturias, Balearic Islands, Basque Country, Canary Islands, Cantabria, Castile and León, Castile-La Mancha, Catalonia, Extremadura, Galicia, La Rioja, Madrid, Murcia, Navarre, and Valencian Community) and the 2 Autonomous Cities located in the north of Africa, namely Ceuta and Melilla. Figure 1 illustrates the territorial organisation of Spain, displaying the decentralisation framework that encompasses both the regional level and the provincial level, defined as NUTS-III within the European statistical system.

Figure 1. Spain regions (NUTS-II) and provinces (NUTS-III)

Source: *Instituto Geográfico Nacional*.

Therefore, our data set consists of 19 Spain regions from 2008 to 2021 (as shown in Table 1).

Table 1. Study data sheet: sample composition and design

Sample	Population
Data	2008-2021
Autonomous Communities	17
Autonomous Cities	2
DMUs	Spain regions
Observations	3,192
Method	Data Envelopment Analysis
Statistics	Bootstrap Tobit Regression and Panel Data
Software	Frontier Analyst 4.5.0; Stata 17.0

Choosing and measuring the inputs and outputs, on which the DEA is based, is essential to ensure that the findings are precise, solid and meaningful (Morita & Avkiran, 2009).

Although the social efficiency (SE) and the economic efficiency (EE) models were developed separately, the same inputs for both models were used, based on the existing literature, as shown in table 2. On the one hand, the Public Revenue (PR) is a fundamental part of public administrations in achieving social benefit (Helland & Sørensen, 2015; Revelli & Tovmo, 2007). On the other hand, Capital Gross Investment (CGI) is one of the most relevant inputs to calculate efficiency and productivity in research on economic growth and regional convergence (Lábaj et al., 2014; Mas et al., 2000).

Table 2. Inputs and outputs used in the DEA models for Social Efficiency (SE) and Economic Efficiency (EE)

	INPUTS	**OUTPUTS**
Social Efficiency (SE)	Public Revenue (PR) Capital Gross Investment (CGI)	Human Development Index (HDI) S80/20 Inequality (I) Multidimensional Quality of Life Indicator (MQLI)
Economic Efficiency (EE)	Public Revenue (PR) Capital Gross Investment (CGI)	Companies per inhabitant (C) Employment Rate (ER) Gross Domestic Product per capita (GDP)

Concerning the outputs of the social efficiency (SE) model, the first one is the Human Development Index (HDI) which considers factors that influence people's well-being and quality of life, such as health and education (Bougnol et al., 2010; Tofallis, 2013). The second output is the S80/20 Indicator (I) which assesses economic inequality within a society. This indicator compares the proportion of income or wealth received by the richest households (the 20% of the population with the highest income, known as S80) with the proportion received by the poorest households (the 20% of the population with the lowest income, known as S20), showing the possible disparities that exist among regions (Benedetti & Crescenzi, 2023; Dauderstädt & Keltek, 2017). The third output is the Multidimensional Quality of Life Indicator (MQLI) that was developed by the Spanish National Statistics Institute (*Instituto Nacional de Estadística*), motivated by the Stiglitz-Sen-Fitoussi report (Stiglitz et al., 2008).

As far as the outputs of the economic efficiency (EE) model are concerned, the first one is the number of companies per inhabitant (C). This is a key indicator in the study of economic efficiency which assesses the economic dynamism and competitiveness, as well as the capacity to generate employment, innovation and economic diversification, which are essential aspects for improving regional economic efficiency (Drew et al., 2015; Tsolas, 2022). The second output is the employment rate (ER), which quantifies the level of economic activity and the allocation of resources to achieve economic development (Furlan & Mariano, 2022; González et al., 2011). Finally, the third output is the regional Gross Domestic Product (GDP) per capita at market prices which is the most used indicators in DEA economic efficiency models and the benchmark in regional convergence analysis (Despotis et al., 2010; Nitkiewicz et al., 2014).

Concerning the data sources, the regional public revenue was extracted from the Ministry of Finance and Public Administration. The source of the number of companies was the Ministry of Industry, Trade and Tourism. In the case of the regional HDI, the data was taken from the Institute for Management Research of the Radboud University, through its Global Data Lab. The BBVA Foundation together with the *Instituto Valenciano de Investigaciones Económicas* provide the data on Capital Gross Investment. The employment rate, GDP per capita at market prices, the S80/20 Inequality index or the Multidimensional Indicator of Quality of Life, were extracted from official sources, namely the National Statistics Institute of Spain. Therefore, we have used a variety of sources that enhances the quality of the data set.

Following the DEA convention that the number of DMUs per year (19) must be greater than three times the number of outputs plus inputs (Raab & Lichty, 2002), the first stage of the analysis is to calculate efficiencies by means of DEA using the Varying Returns BCC mode and attempting to maximise outputs as follows:

$$Max\ \varphi(k = 1\ \rightarrow\ n) = \frac{u_1 * y_{11} + u_2 * y_{21} + \cdots + u_s * y_{s1}}{v_1 * x_{11} + v_2 * y_{21} + \cdots + v_m * x_{m1}} \quad (1)$$

where φ is the efficiency rating; k is the number of DMUs; u_r is the weight or coefficient of output o; y_{ok} is the amount of output o used by k unit; o is the number of outputs from 1 to s; v_i is the coefficient or weight of input i; x_{ik} is the amount of input i used by k unit; and i is the number of inputs from 1 to m.

The Social Efficiency (maximising the outputs) is shown as follows for each DMU from 1 to n:

$$Max\ \varphi_{SE}(k = 1\ \rightarrow\ n) = \frac{u_1 * HDI_{11} - u_2 * I_{21} + u_3 * MQLI_{31}}{v_1 * PR_{11} + v_2 * CGI_{21}} \quad (2)$$

The Economic Efficiency (maximising the outputs) is shown as follows for each DMU from 1 to n:

$$Max\ \varphi_{EE}(k = 1\ \rightarrow\ n) = \frac{u_1 * C_{11} + u_2 * ER_{21} + u_3 * GDP_{31}}{v_1 * PR_{11} + v_2 * CGI_{21}} \quad (3)$$

Using a cross-sectional bootstrap (C=2000) Tobit censured regression for each year is the second stage of the analysis (Cheng et al., 2022). Stata 17.0 was used to perform both Tobit regressions and panel data (the third stage). Population Density (PD) was introduced as a control variable (Gorman & Ruggiero, 2008; Nyhan & Martin, 1999). Equation (4) provides a summary of the model used:

$$DEA_i = \beta_0 + \beta_1 \cdot AD_i + \beta_2 \cdot FD_i + \beta_3 \cdot PD_{it} + \varepsilon_i \quad (4)$$

where DEA represents the social and economic efficiency; AD is a dummy variable which takes value 1 for administratively single-province decentralised regions and 0 for the administratively multi-province centralised ones; FD is a dummy variable which takes value 1 for regions that are made up of fiscally decentralised provinces and 0 for the rest; PD is the Population Density of time t used as a control variable; and ε_{it} is the residual term.

The third stage is to estimate the regions' efficiencies as truncated dependent variables by means of random-effects panel data Tobit model. Panel data adjust for time-invariant factors

and individual-unobserved heterogeneity, as well as determine if the association consolidated during the time period under consideration (Torres-Pruñonosa et al., 2024; Hsiao, 2003). Therefore, panel data can be applied to evaluate the adjustment process of regions, as well as to shed light on the intertemporal relationship between having a single province and, having fiscal autonomy as far as social and economic efficiency (Baltagi, 2013). To address potential endogeneity between decentralisation and regional efficiency, we applied a control function approach by instrumenting administrative decentralisation (AD) with the distance from the Parliament of Spain—a variable widely recognised as capturing territorial demands for autonomy, since more distant regions have historically exhibited stronger pressures for decentralisation (Campante & Do, 2014)—and fiscal decentralisation (FD) with the presence of independentist parties in regional governments, as their participation consistently reflects systematic demands for greater fiscal autonomy (Hooghe & Marks, 2013), incorporating the resulting residuals into the panel models. Models with (C=2,000) and without bootstrapping have been created. Bootstrapping is used to deal with possible inherent dependency of DEA results and skewed outcomes (Simar & Wilson, 2007). The panel data model is shown in Equation 5:

$$DEA_{it} = \beta_0 + \beta_1 \cdot AD_i + \beta_2 \cdot FD_i + \beta_3 \cdot PD_{it} + \beta_4 \cdot NM_{it} + \beta_5 \cdot PO_{it} + \eta_i + \varepsilon_i \quad (5)$$

where *DEA* represents the social and economic efficiency; *AD* is a dummy variable which takes value 1 for administratively single-province decentralised regions and 0 the for administratively multi-province centralised ones; *FD* is a dummy variable which takes value 1 for regions that are made up of fiscally decentralised provinces and 0 for the rest; *PD* is the Population Density of time *t* used as a control variable; *NM* is the Net Migration of time *t* used as a control variable; *PO* is the Partisan Orientation of the party leading the regional government of time *t* used as a control variable; η_i represents the unobservable firm-specific fixed effects of region "i"; and ε_{it} is the residual term.

4. RESULTS

Table 3 shows the descriptive statistics for the input and output variables used in the DEA analysis.

Table 3. Descriptive statistics for DEA input and output variables

	Public Revenue (PR)	**Capital Gross Investment (CGI)**	**Human Development Index (HDI)**	**S80/20 Inequality (I)**	**Multidimensional Quality of Life Indicator (MQLI)**	**Companies per inhabitant (C)**	**Employment Rate (ER)**	**Gross Domestic Product per capita (GDP)**
Mean	12,415,369,934.42	12,017,052.63	0.8943	6.2579	101.9692	0.0672	49.2667	24,720.26
Standard deviation	12,057,611,603.49	14,208,659.61	0.0249	2.1950	2.1331	0.0085	4.0262	4,749.15
Minimum	302,176,278.03	250,106.00	0.8530	4.8000	98.0377	0.0449	40.9750	18,817.00
Maximum	42,322,990,970.37	54,678,849.00	0.9400	14.1000	105.8736	0.0836	56.0625	35,380.00

Table 4 shows the correlation coefficient of the inputs and outputs in the DEA. All correlation coefficients for DEA inputs and outputs are below .9., according to Farzipoor Saen et al. (2005).

Table 4. Correlation matrix for DEA input and output variables

Variables	PR	CGI	HDI	I	MQLI	C	ER	GDP
PR	1.0000							
CGI	.8784 (.0000)	1.0000						
HDI	.2607 (.0000)	.3127 (.0000)	1.0000					
I	-.1289 (.0357)	-.1234 (.0444)	-.4245 (.0000)	1.0000				
MQLI	-.1367 (.0257)	-.0852 (.1659)	.6356 (.0000)	-.4311 (.0000)	1.0000			
C	.3685 (.0000)	.4968 (.0000)	.5423 (.0000)	-.4395 (.0000)	.4739 (.0000)	1.0000		
ER	.1372 (.0253)	.3421 (.0000)	.5222 (.0000)	-.2873 (.0000)	.5948 (.0000)	.7646 (.0000)	1.0000	
GDP	.2004 (.0010)	.3835 (.0000)	.8066 (.0000)	-.2967 (.0000)	.6322 (.0000)	.6592 (.0000)	.8186 (.0000)	1.000 0

According to Farzipoor Saen et al. (2005) all correlation coefficients for DEA inputs and outputs are below.9.

Table 5 shows that in all cases, the residuals were statistically insignificant indicating no evidence of endogeneity. Therefore, we treat decentralisation variables as exogenous in our main analysis, reinforcing the internal validity of the estimated effects.

Table 5. Endogeneity Testing via Control Function Approach (2008-2021)

Endogenous Variable	Instrument Used	Dependent Variable	Residual Coefficient	Standard error
Administratively Decentralised (AD)	Distance from the Parliament of Spain	Social Efficiency (SE)	3.4023	9.1983
		Economic Efficiency (EE)	9.9513	11.43763
Fiscally Decentralised (FD)	Independentist Party in Regional Government	Social Efficiency (SE)	-0.0732	0.5924
		Economic Efficiency (EE)	0.5585	1.6761

*** Significant at 1%. ** Significant at 5%. *Significant at 10%.

Table 6 shows the cross-sectional results of the bootstrap Tobit regression analyses (second stage) carried out using the efficiency scores obtained by means of DEA.

Table 6. Bootstrap Tobit regression analyses on DEA scores (2008-2021)

Years/dependent variables	Social efficiency β; t value[p]	Economic efficiency β; t value[p]
Wald Chi_{2008}	16.71***	12.11***
Administratively Decentralised (AD)	1.7853** (.8685)	6.7933** (3.1640)
Fiscally Decentralised (FD)	3.0045*** (.9347)	8.9366** (3.5979)
Population Density (PD)	.0005 (.0014)	.0013 (.0067)
Constant	96.0195*** (.6006)	87.4309*** (2.2990)
Wald Chi_{2009}	13.45***	12.60***
Administratively Decentralised (AD)	1.2956 (1.0005)	6.3860* (3.5306)
Fiscally Decentralised (FD)	2.9760*** (.9199)	9.4993*** (3.4855)
Population Density (PD)	.0005 (.0022)	.0014 (.0057)
Constant	96.2918*** (.7587)	87.0482*** (2.3584)
Wald Chi_{2010}	7.95**	12.52***
Administratively Decentralised (AD)	2.0822 (1.3032)	7.0027** (3.3578)
Fiscally Decentralised (FD)	2.5715** (1.1621)	9.6595*** (3.6711)
Population Density (PD)	.0003 (.0018)	.0014 (.0066)
Constant	96.3367*** (.7590)	86.5934*** (2.3256)
Wald Chi_{2011}	14.64***	12.76***
Administratively Decentralised (AD)	2.4786*** (.7847)	6.3968* (3.2944)
Fiscally Decentralised (FD)	2.4830** (1.1635)	9.2738*** (3.3204)
Population Density (PD)	.0002 (.0013)	.0013 (.0069)
Constant	96.2323*** (.6076)	87.2916*** (2.2857)
Wald Chi_{2012}	13.86***	11.00**
Administratively Decentralised (AD)	1.9448* (1.0607)	6.9028* (3.6069)
Fiscally Decentralised (FD)	2.8812** (1.1952)	9.8801*** (3.7046)
Population Density (PD)	.0004 (.0017)	-.0013 (.0055)
Constant	96.0782*** (.6311)	86.4252*** (2.6632)
Wald Chi_{2013}	15.40***	11.71***
Administratively Decentralised (AD)	1.9656** (.9546)	6.9304* (4.0804)
Fiscally Decentralised (FD)	2.8953*** (1.0443)	10.7834*** (3.7908)
Population Density (PD)	.0004 (.0014)	.0015 (.0070)
Constant	96.0548*** (.5964)	85.4839*** (2.8168)
Wald Chi_{2014}	12.84***	13.02***
Administratively Decentralised (AD)	1.8657* (.9850)	7.2361** (3.6314)
Fiscally Decentralised (FD)	2.7549*** (1.0095)	10.5189*** (3.6961)
Population Density (PD)	.0004 (.0014)	.0014 (.0076)
Constant	96.2494*** (.6088)	85.6135*** (2.6647)
Wald Chi_{2015}	15.04***	13.05***
Administratively Decentralised (AD)	2.0159** (.8944)	8.5852** (3.8218)
Fiscally Decentralised (FD)	2.7927*** (1.0116)	10.1785** (4.1814)
Population Density (PD)	.0003 (.0013)	.0012 (.0064)

Constant	96.1378*** (.5592)	85.3161*** (2.5477)
Wald Chi$_{2016}$	15.87***	12.56***
Administratively Decentralised (AD)	1.8072* (.8886)	7.6202** (3.8481)
Fiscally Decentralised (FD)	3.0173*** (.9262)	10.9535*** (3.9651)
Population Density (PD)	.0004 (.0013)	.0014 (.0067)
Constant	96.0062*** (.6244)	84.9811*** (2.6820)
Wald Chi$_{2017}$	13.65***	12.84***
Administratively Decentralised (AD)	2.0141** (.9513)	7.7503** (3.6632)
Fiscally Decentralised (FD)	2.9108*** (1.0760)	10.2436*** (3.8933)
Population Density (PD)	.0004 (.0013)	.0013 (.0070)
Constant	96.0170*** (.6298)	85.6528*** (2.5309)
Wald Chi$_{2018}$	10.65***	14.33***
Administratively Decentralised (AD)	7.8203** (3.1101)	7.8203** (3.1101)
Fiscally Decentralised (FD)	9.4389** (3.8134)	9.4389** (3.8134)
Population Density (PD)	.0011 (.0055)	.0011 (.0055)
Constant	86.4519*** (2.1533)	86.4519*** (2.1533)
Wald Chi$_{2019}$	12.87***	14.62***
Administratively Decentralised (AD)	1.4405* (.8703)	7.4095*** (2.6971)
Fiscally Decentralised (FD)	2.2692*** (.8240)	8.6232** (3.3609)
Population Density (PD)	.0003 (.0011)	.0010 (.0048)
Constant	96.9571*** (.5271)	87.4952*** (1.8990)
Wald Chi$_{2020}$	6.65*	11.84***
Administratively Decentralised (AD)	1.3459 (.9455)	6.0570** (2.3547)
Fiscally Decentralised (FD)	2.0262** (.9183)	6.9282* (2.9205)
Population Density (PD)	.0002 (.0018)	.0008 (.0038)
Constant	97.2563*** (.7868)	89.9031*** (1.9717)
Wald Chi$_{2021}$	10.15**	9.74**
Administratively Decentralised (AD)	1.5700* (.8920)	6.7724** (2.7692)
Fiscally Decentralised (FD)	2.3355** (.9359)	6.5625** (3.2416)
Population Density (PD)	.0003 (.0018)	.0006 (.0027)
Constant	96.8265** (.6325)	89.9387*** (1.9840)

Standard errors in parentheses. *** Significant at 1%. ** Significant at 5%. *Significant at 10%.

The results show that administratively decentralised single-province regions have a higher significant social and economic efficiency, except socially for 2009, 2010 and 2020. Regions made up of fiscally decentralised provinces have during all years significant higher social and economic efficiency.

Regarding the third stage of the analysis, Table 7 shows the longitudinal results of panel data Tobit regressions.

Table 7. Random-effects panel data Tobit on DEA scores (2008-2021)

Dependent Variable	Model 1 SE	Model 2 Bootstrap SE	Model 3 EE	Model 4 Bootstrap EE
Administratively Decentralised (AD)	1.8388**	1.8388**	7.5459***	7.5459**
	(.7285)	(.8740)	(2.7776)	(3.2268)
Fiscally Decentralised (FD)	2.5852**	2.5852***	9.0939**	9.0939**
	(1.1190)	(.9850)	(4.3004)	(3.7652)
Population Density (PD)	.0003	.0003	.0008	.0008
	(.0002)	(.0025)	(.0007)	(.0048)
Net Migration (NM)	.0137	.0137	.0281	.0281
	(.0137)	(.0102)	(.0386)	(.0317)
Party Orientation (PO)	.0182	.0182	.0127	.0127
	(.0253)	(.0350)	(.0711)	(.0783)
Constant	96.3001***	96.3001***	86.8292***	86.8292***
	(.5083)	(.6474)	(1.9119)	(2.2911)
Sigma_u	1.4745***	1.4745***	5.6941***	5.6941***
	(.2441)	(.2553)	(.9395)	(.8634)
Sigma_e	.7042***	.7042***	1.9752***	1.9752***
	(.3032)	(.1292)	(.0889)	(.2516)
Rho	.8143***	.8143***	.8926***	.8926***
Observations	266	266	266	266

Standard errors in parentheses. *** Significant at 1%. ** Significant at 5%. *Significant at 10%.

"Rho" coefficients are significant, indicating that panel data estimation differs from the pooled estimation. Both being administratively decentralised single-province regions and having fiscal autonomy have a positive and significant social and economic impact.

All in all, the results show that, given the hypotheses:

- (H_1) “Administratively decentralised regions are more socially efficient than centralised ones”. The cross-sectional analysis confirms this hypothesis in most years. Nevertheless, the null hypothesis is upheld for 2009, 2010 and 2020 given that there are no significant differences, concluding that administratively decentralised single-province regions have been during these years as socially efficient as administrative centralised multiple-province regions. Nonetheless, panel data confirms that this significant difference is upheld over time.
- (H_2) “Administratively decentralised regions are more economically efficient than centralised ones”. Both cross-sectional and panel data confirm this hypothesis.

- (H_3) “Regions that are made up of fiscally decentralised provinces are more socially efficient than fiscally centralised ones”. Both cross-sectional and panel data confirm this hypothesis.
- (H_4) “Regions that are made up of fiscally decentralised provinces are more economically efficient than fiscally centralised ones”. Both cross-sectional and panel data confirm this hypothesis.

5. DISCUSSION

The debate on socio-economic impact of administrative decentralisation is relevant and admits multiple approaches and interpretations. The conclusions of this debate are diverse: some scholars affirm that there is no significant impact (Treisman, 2006; Balaguer-Coll et al., 2009), some authors conclude that there is a significant positive effect (Martínez et al., 2022; Kim & Bae, 2019) and some others state that it is significantly negative (Ubago Martínez et al., 2017; Hung & Thanh (2022).

Our article shows evidence that administratively decentralised single-province regions in Spain have higher significant social impact, in comparison with administrative centralised multi-province regions. This could be explained because the former have greater proximity of political decisions to the specific demands of the populations in the territory, in comparison with the latter. The information needed to make good decisions is better managed by decentralised public administration. Nonetheless, when an economic recession begins (2009, and 2010, when a recession started in Spain; and 2020 with the inception of COVID-19 pandemic), administrative decentralisation does not have a significant impact on social efficiency, since centralised and quick decisions are more effective in times of uncertainty, with a greater need for coordination. In conclusion, public administrations should be as decentralised

as possible, with the exception of the inception of crises when a centralised making-decision government is necessary.

Our findings show that there is a positive and higher efficiency of administratively decentralised regions. Therefore, in the case of Spain, single-province (instead of regional) decentralisation would be a better economic and social option, rather than multi-province regions. In other words, regions should be dissolved and their competencies should be given to provinces, which are closer to the citizenry. Nonetheless, due to political reasons, this is not a possibility in some historical regions, such as Catalonia, the Basque Country and Galicia. Consequently, a balanced solution would be to use the same organisational structure that was used in Spain in the 1930s, where only these three regions were established along with multiple provinces. Therefore, although Spain was decentralised once Franco died, the design of the centralisation was a key factor that was ignored and that led to socio-economic inefficiency, given that new regions were created in order to give the same level of decentralisation to all territories (what is popularly known in Spain as "*café para todos*[5]", which refers to reproduce the same model of the historical three regions to the rest of Spain). This is an important implication not only for Spain but for the rest of countries, given that the key issue is not to be decentralised administratively but the decentralisation design.

Concerning to fiscal decentralisation, the three Basque provinces and Navarre are territories which enjoy fiscal autonomy (López-Laborda et al., 2021). They collect all taxes, except tariffs and VAT, and contribute to the financing of the general not assumed charges of the State[6]. The

[5] This idiom is referred to a Spanish custom that has to do with what a large group orders in a restaurant. Instead of ordering what each individual prefers, coffee is the only option for everyone. Likewise, there was only one option in the design of democratic Spain: all regions (with the exception of Navarre and the Basque Country, which were decentralised since the 19th century) must have the same level of decentralisation.

[6] Through an amount called "*cupo*" or "*aportación*".

rest of the regions are financed according to the common system: the central state allocates what is determined for them[7].

Fiscal decentralisation strengthens the accountability of regional administrations in the management and allocation of resources. Regions that collect their own taxes are accountable for their citizens' money in the preparation and execution of their budgets. They cannot blame the central government for lacking revenues and have less incentive to squander resources or prepare expansionary budgets. Therefore, performance of these administrations is better and this has positive effects on the economy and social policies. In this sense, there are authors who claim that there is such a positive relationship (Bucci et al., 2023; Lindaman, & Thurmaier, 2002), whereas others conclude the opposite (Ubago Martínez et al., 2017; Treisman, 2006). The debate is therefore still open. Nonetheless, using robust cross-sectional and longitudinal analyses, our results confirms that fiscal decentralisation has positive socio-economically effects in Spain.

Nonetheless, costs associated with decentralisation must be considered. First, the potential development of inequalities between regions with significantly different levels of public spending and investment (López-Villuendas & del Campo, 2022; Delgado et al., 2024) can lead to household income inequality within a country (Sacchi & Salotti, 2014) and be a source of tension and conflict (Zhao & Zhang, 1999), justifying the reduction of fiscal transfers from central to regional governments (Otsuka et al., 2014). Second, economic agents may behave opportunistically in decentralised systems, either by benefiting from tax competition between regions or by their greater influence on regional administrations and public offices (López-Laborda et al., 2021). Third, coordination failures may arise when responsibilities between central and regional governments are not clearly defined or effectively managed. These failures can manifest in two primary ways: a) when a particular policy domain is neglected because

[7] A financing system similar to that of the Basque provinces and Navarre is currently being negotiated for Catalonia. For the time being, the scope of this agreement is yet to be determined.

each level of government assumes it is under the other's jurisdiction; and b) when overlapping competences lead to intergovernmental disputes, with both the central and regional administrations claiming authority over the same matter. Such institutional ambiguity can hinder the efficient provision of public services and delay critical policy responses. These issues become particularly salient during crises—such as public health emergencies or natural disasters—when rapid, coordinated action is essential. The lack of clarity and coordination not only compromises policy effectiveness but may also erode public trust in government institutions. Fourth, administrative duplication is another relevant cost of decentralisation, often arising when different levels of government independently undertake the same functions or deliver similar services. This leads to parallel structures, redundant procedures, and excessive bureaucracy, which increase administrative costs, reduce the overall efficiency of public management, and represent a significant waste of public resources. For citizens and firms, this duplication complicates access to public services and generates confusion regarding which authority is responsible. In this sense, a negative consequence of poor decentralisation is the presence of multiple overlapping administrations. When collection and spending decisions are made by regional administrations far removed from the citizens, the quality and quantity of these decisions can be defective. Therefore, *ad hoc* improvised administrations of lower rank are often designed to deal with this eventuality. A tangle of administrations appears between the regions and the municipalities which increase bureaucratic expenditure and hinder the socio-economic regional development. In the case of Spain, in addition to the central, regional and local administrations, there are many administrations embedded between the latter two: provinces, "*diputaciones*", "*vegueries*" (proposed in Catalonia, but not finally implemented), "*cabildos*" (Canary Islands), "*consejos insulares*" (Balearic Islands), "*consejos comarcales*", "*mancomunidades municipales*", among others. One of the reasons for this abundance of administrations is that the multi-province regions are very extensive and have few links to cities

and towns (unlike the provinces that were created in 1833 and that are still in force). The division of regional administrations into provinces would most probably contribute to simplify the territorial organisation of the state, making all these interposed administrations unnecessary, which would improve their socio-economic efficiency.

The consistency of our findings reinforces the validity of our conclusions and suggests that the advantages observed in administratively and fiscally decentralised regions may be applicable to a variety of international political and economic contexts. We acknowledge the discrepancy among academia (Ubago Martínez et al., 2017; Buleca & Mura, 2014; Tapia et al., 2019), but our results support what is found in the literature regarding administrative and fiscal decentralisation and positive socio-economic effects. Our study contributes to this discussion by providing additional evidence on how regional decentralisation affects the two studied dimensions.

6. CONCLUSIONS

A DEA along with Tobit regressions and panel data were carried out to analyse administrative and fiscal decentralisation in Spain, being the results significant in both economic and social efficiency in favour of administrative single-province regions and regions made up of fiscally decentralised provinces.

The results suggest that decentralised structure may play an important role in improving both economic and social efficiency. These findings are in line with previous studies that evaluated the economic efficiency of administrations (Buleca & Mura, 2014) and their social impact (Tapia et al., 2019). Administratively decentralised regions are smaller. Their simpler administrative structure combined with their proximity to citizens generates a positive synergy that contributes to greater economic efficiency, in terms of higher local economic growth, and higher social efficiency, in terms of equity and development. Likewise, fiscal decentralisation

has a positive impact on regional socio-economic efficiency, given that regions have fiscal independence and responsibilities that allow them to achieve greater levels of autonomy to design and implement public policies. In conclusion, despite the literature ambiguity, our results suggest that both decentralisations are socio-economically efficient.

Additionally, this paper contributes to federalisation theory, and more specifically to the field of socio-economic impact of decentralisation, in three ways. First, administrative centralisation of decision-making would be justified in periods of economic recession, as shown by the cross-sectional analysis, to contribute to social efficiency, where urgent decisions and control of macroeconomic variables may be necessary. This is a complex issue, not yet sufficiently explored, which needs to be further investigated. Nonetheless, policymakers should not hesitate to centralise decision-making when circumstances demand it—such as during economic recessions, natural disasters, environmental crises, or public health emergencies—since centralisation can offer a more efficient response suited to the exceptional nature of such events. Emphasising that these recentralisations are strictly temporary and reversible once the triggering conditions subside may help encourage their adoption, even by national governments whose political orientation is generally opposed to centralisation. Second, the design of decentralisation is the key factor to be considered, although it was ignored in Spain. Policy makers should take into account not only whether regions should be decentralised but also how decentralisation will be implemented between regions and municipalities, in other words, how they are designed. Third, poor decentralisation design creates an expensive overlapping of regional public administrations. Therefore, Spain is a bad example not to be followed by other countries because there are multitude of intermediate public administrations between regions and municipalities that waste resources. Considering this, policymakers should make a concerted effort to avoid overlaps and duplications in the allocation of territorial responsibilities. A fragmented distribution of competences not only undermines administrative

efficiency, but also blurs accountability and hampers policy coordination. When multiple layers of government share similar functions without clear delineation, the result is often bureaucratic inertia, inter-institutional conflict, and inefficient use of public funds. Careful institutional design—anchored in subsidiarity principles and supported by mechanisms for intergovernmental coordination—is essential to ensure that decentralisation fosters, rather than hinders, effective governance.

Beyond Spain, these implications are also applicable to federal systems in which subnational units enjoy comparable legislative powers. For instance, in Germany, the federal structure combines very large Länder such as Bavaria with small ones such as Bremen or Berlin, a heterogeneity comparable to that between Spanish multi-provincial and single-province regions. Our results suggests that smaller units, closer to the local level, may achieve higher levels of socio-economic efficiency, while larger states tend to accumulate higher administrative costs and coordination challenges. A comparative application of our approach could therefore help to assess whether the efficiency gains observed in Spain also emerge in federal systems characterised by such asymmetries. As in Spain with its historical regions, certain German Länder with strong identities (e.g., Bavaria, Saxony, Thuringia) should preserve their institutional integrity, while a more decentralised reorganisation could be considered for the rest.

By contrast, countries with lower levels of decentralisation—particularly in the fiscal sphere—such as France or Italy should consider, in light of our results, the potential benefits of fiscal decentralisation for improving socio-economic efficiency. However, the Spanish case illustrates the risks of poorly designed structures: excessive intermediate administrations and weak coordination mechanisms undermine efficiency. Therefore, any move towards greater fiscal autonomy in these countries should be carefully designed to avoid the inefficiencies observed in Spain.

Overall, this study is in line with the OECD's guidance on multilevel governance reform (OECD, 2019) and complements the comparative analyses of fiscal decentralisation carried out by Martínez-Vázquez et al. (2017). While institutional specificities advise against general prescriptions, the key message is clear: the design of decentralisation is more important than decentralisation itself, and well-calibrated fiscal rules can make regional autonomy compatible with high efficiency.

The results presented offer four key contributions to ongoing debates in the field of regional science. First, they extend the classic argument on decentralisation proposed by Zhao and Zhang (1999), demonstrating that decentralisation can influence not only economic growth but also overall efficiency. Second, we show that administrative activism by subnational institutions plays a role that goes well beyond poverty alleviation: proactive regional governments appear capable of transforming public resources into higher output using fewer inputs. Third, building on recent evidence on convergence by Delgado et al. (2024), our analysis indicates that policy-driven convergence can enhance efficiency rather than simply promote equalisation, thereby introducing a performance-based perspective into the Spanish convergence debate. Fourth, the study adopts a horizontal comparative approach, focusing not on differences between levels of government (vertical comparison), but on variation within the same administrative tier—across regions with differing degrees of decentralisation. This methodological innovation provides a nuanced understanding of how institutional design at the same level of governance can significantly influence socio-economic efficiency. Taken together, these findings suggest that institutional decentralisation variables should be incorporated more systematically into future regional growth models.

We acknowledge the limitations of our study. Only regions of one country, Spain, were used. We also recognise that political decentralisation has not been taken into account, given that no Spanish region is politically decentralised. In addition, the data used in the study limit the

analysis of causality, as the decentralisation variables are dichotomous and exhibit no variation over time, and no identifiable exogenous event or shock within the time horizon considered was found. Our analysis is performed at the regional (NUTS-II) level due to the consistent availability of key socio-economic indicators in our DEA—such as the HDI and the S80/20 inequality ratio—for regions but not for provinces (NUTS-III). This choice has substantive and methodological implications. Aggregating provinces into regions smooths within-region heterogeneity; with provincial data we would expect wider dispersion of DEA efficiency scores and a sharper frontier, potentially revealing intra-regional leaders and laggards that are masked at the regional tier. Aggregation can attenuate estimated associations between decentralization and efficiency by reducing outcome variability; a province-level analysis could therefore yield larger absolute coefficients (or narrower confidence intervals) where intra-regional heterogeneity is sizeable. Because administrative and fiscal decentralisation are defined at the regional tier, a NUTS-III design would require a hierarchical specification (provinces nested in regions), region-clustered standard errors, and diagnostics for spatial dependence**.** While our focus on NUTS-II aligns with the institutional locus of decentralization and with data availability, extending the analysis to NUTS-III—once consistent provincial series are available—would refine benchmarking and enable the multilevel and spatial analyses we prioritise for future research.

Furthermore, future lines of research could include a multi-country sample to analyse regional socio-economic impact, not only in regards to administrative and fiscal decentralisation but also politically. New factors can be analysed regarding socio-economic effects, such as the northern-southern location of regions, the left-right axis with respect to the regional governing political party, as well as gender issues, taking into account either the gender of the regional president or the number of women within the regional government.

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