On the heterogeneity of regional fiscal multipliers in Spain, 1980–2019*

Iván Medrano-Escalada[†a] and Marcos Sanso-Navarro[a,b]

[a]Departamento de Análisis Económico, Universidad de Zaragoza, Spain

[b]IEDIS, Universidad de Zaragoza, Spain

imedrano@unizar.es, marcossn@unizar.es

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Abstract

This paper examines the heterogeneity of fiscal multipliers across Spanish NUTS2 regions using a balanced panel dataset spanning 1980–2019. Employing a local projection approach combined with a dynamic common correlated effects estimator that accommodates weakly exogenous regressors, we identify significant regional differences in the effects of government expenditure. The impacts tend to be positive and persistent on output and employment, but limited on labor productivity. Larger, denser, and more open regions exhibit stronger employment responses. These findings underscore the need for fiscal policies to account for the asymmetries – in both magnitude and persistence – displayed by regional multipliers.

Keywords: Fiscal multipliers; Spanish regions; Panel data; Heterogeneity; Bartik instruments.

JEL classification: E32, E62, H5, H72, R12.

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[†]Corresponding author. E-mail: imedrano@unizar.es. Address: Facultad de Economía y Empresa. Departamento de Análisis Económico. Gran Vía de Don Santiago Ramón y Cajal 18. 50005 Zaragoza, Spain.

1 Introduction

In response to the global financial crisis, central banks in advanced economies cut nominal interest rates to the zero lower bound, limiting the scope for conventional monetary policy. Alongside unconventional monetary measures, governments introduced substantial fiscal stimulus to contain the downturn. These events renewed academic interest in fiscal multipliers, a concept that, while seemingly straightforward – the output response to a one-percent increase in government spending as a share of gross domestic product (GDP) – poses several challenges for estimation.

An important concern when estimating fiscal multipliers is that government spending usually responds endogenously to economic conditions. Two main strategies have been used to address this issue. On the one hand, the narrative approach identifies exogenous fiscal changes by focusing on events unrelated to the business cycle, such as military spending (Ramey & Shapiro, 1998; Barro & Redlick, 2011; Ramey, 2011; Nakamura & Steinsson, 2014). On the other hand, the vector autorregressive (VAR) approach, introduced by Blanchard and Perotti (2002), isolates exogenous spending shocks through different identification strategies (Mountford & Uhlig, 2009; Auerbach & Gorodnichenko, 2012a, 2012b; Hernández de Cos & Moral-Benito, 2016). Results vary widely depending on the method, with estimated multipliers ranging from negative (Ilzetzki et al., 2013), to values between zero and one (Blanchard & Perotti, 2002; Ramey, 2011; Auerbach & Gorodnichenko, 2012b), and even above unity (Ramey & Zubairy, 2018; Miyamoto et al., 2018). Another challenge is that policy variables such as taxes or interest rates often move together with government spending, so estimated multipliers reflect average effects within the sample, and provide limited guidance for alternative policy settings. In this context, Ramey (2019) argues that the effects of fiscal policy depend on structural features of each economy – such as the exchange rate regime, the level of development, and the degree of openness – implying that there is no universal multiplier.

Building on the potential heterogeneity of fiscal multipliers, recent literature has increasingly emphasized the estimation of fiscal multipliers at the regional level; see Lucidi (2023) and references therein. The use of subnational data improves identification strategies relative to aggregate empirical frameworks (Auerbach et al., 2024). Moreover, the analysis of individual regions allows for controlling common shocks and policies – such as those induced by changes in distortionary taxes or monetary instruments – that simultaneously affect all units through time-fixed effects (Nakamura & Steinsson, 2014). Nevertheless, regional multipliers differ in important respects from national government spending multipliers. In this regard, Chodorow-Reich (2019) argue that a cross-sectional multiplier should be interpreted as a rough lower bound for a closed-economy, no-monetary-policy-response[1], deficit-financed multiplier.

This paper contributes to the literature on regional fiscal policy by providing new and comprehensive evidence on government spending multipliers for Spain. Specifically, we estimate public consumption multipliers for Spanish NUTS2 regions over the period 1980–2019, thus offering one of the longest and most detailed regional panels available for a European country. Spain provides a particularly suitable setting for examining heterogeneous regional fiscal multipliers for several reasons. First, it is the fourth-largest economy in the eurozone, where monetary policy is uniform across all members, ensuring that regional differences in estimated multipliers cannot be attributed to heterogeneous responses to monetary measures. Second, most tax policies are centralized, which guarantees consistency in the fiscal framework across regions and allows us to focus on the spending side of fiscal policy. Third, Spain exhibits substantial regional diversity in economic structure, income levels, labor market conditions, and financial development, providing fertile ground for studying the sources of heterogeneity in fiscal multipliers.

The empirical strategy combines local projections (Jordà, 2005) with Bartik (1991)-type instruments, following the identification frameworks of Gabriel et al. (2023) and Colombo et al. (2024), to isolate plausibly exogenous fiscal shocks. In addition, we employ an extended version of the common correlated effects (CCE) estimator (Pesaran, 2006), which is explicitly designed for heterogeneous dynamic panels with weakly exogenous regressors and unobserved common factors (Chudik & Pesaran, 2015). Proceeding in this way allows us to estimate the projection equation on a region-by-region basis and then compute the average of these individual estimates. The resulting region-specific fiscal multi-

[1] It is important to distinguish between the no-monetary-policy-response scenario and the zero lower bound (ZLB); see Nakamura and Steinsson (2014). While transitory demand shocks do not lead to permanent changes in relative prices across regions, and the exchange rate remains fixed, the decline in the relative short-run real interest rate following a public expenditure shock must dissipate over time. By contrast, it is the fall in long-term real interest rates that generates a high multiplier at the ZLB.

pliers capture both dynamic and spatial heterogeneity in the transmission of fiscal policy. To the best of our knowledge, this is the first study to calculate region-specific multipliers for the Spanish economy.

We also go beyond aggregate output effects by decomposing GDP per capita into employment per capita (hereafter, the employment rate) and labor productivity, following Bourdin et al. (2025). This decomposition enables a clearer understanding of the channels – job creation versus efficiency gains – through which fiscal shocks operate. Furthermore, we explore the regional determinants underlying the heterogeneity in the estimated multipliers, identifying which regional characteristics amplify or dampen the local effects of public spending. By combining identification and estimation techniques that are rarely applied jointly in the regional fiscal literature, we provide a more comprehensive and empirically grounded picture of how fiscal policy shapes regional economic dynamics, thereby enhancing the credibility and comparability of regional multiplier analyses.

Our findings indicate that government consumption has a positive and persistent effect on GDP per capita in several regions, primarily driven by job creation. We also uncover a heterogeneous trade-off between employment and productivity across regions, as the impact of government expenditure tends to operate either through employment or through productivity, but rarely through both simultaneously. This result is consistent with Bourdin et al. (2025), who document heterogeneous effects in the employment–productivity trade-off associated with Cohesion Policy funds in European regions. Moreover, we find substantial spatial and dynamic heterogeneity in the effects of public spending on output, employment, and labor productivity. Finally, we explore the determinants of this heterogeneity, showing that regional characteristics – such as labor effort, economic size, institutional quality, and public debt – shape both the magnitude and persistence of employment and productivity multipliers.

The remainder of the paper is structured as follows. Section 2 reviews the existing literature on the estimation of fiscal multipliers at the regional level. Section 3 describes the data sources and variables, while Section 4 outlines the empirical strategy. Section 5 presents the results, and Section 6 concludes.

2 Regional fiscal multipliers

The existing literature on regional fiscal multipliers can be broadly categorized into three main groups, based on the methodologies employed. The first one comprises studies that estimate panel data models, typically relying on the local projections approach introduced by Jordà (2005). In a review of related studies for the United States (US), Chodorow-Reich (2019) establishes a multiplier of 1.8, implying an aggregate no-monetary-policy-response multiplier of 1.7. Nakamura and Steinsson (2014) examine regional variations in military spending to estimate an 'open economy relative multiplier' of 1.5. Demyanyk et al. (2019) and Auerbach et al. (2024) analyze the effects of a well-identified demand shock by leveraging city-level spending data from the US Department of Defense. For the European Union (EU), Coelho (2019) estimates regional multipliers in response to federal expenditure shocks, finding a contemporaneous output multiplier of 1.8, but no significant effects on employment. Gabriel et al. (2023) find a government spending relative output multiplier of approximately 2, and an employment multiplier of 1.4 for the eurozone. In this same context, Brueckner et al. (2023) find a cross-sectional multiplier of 1.1 for regions with a high degree of local autonomy.

A second group of studies applies VAR models, which are relatively insensitive to regional idiosyncratic conditions and, therefore, facilitate the identification of fiscal shocks. Most related analyses focus on Italy, primarily due to the developmental divergence between the northern and southern regions. Deleidi et al. (2021) conclude that government investment exerts a greater stimulative effect on output than government consumption, estimating a multiplier of 2.8 for the former and 1.6 for the latter. Similar findings are reported by Deleidi (2022), who obtain a multiplier of 3.7 for investment and 1.9 for consumption. To account for dynamic heterogeneity and estimate multipliers at the regional level, Destefanis et al. (2022) and Lucidi (2023) employ Bayesian panel VAR techniques, uncovering significant heterogeneity across regions. Using a similar methodological approach, Coppola et al. (2024) further show that region-specific multipliers are higher during recessions than during expansions, particularly in central and southern Italy.

The third strand of the literature relies on input–output (I-O) techniques. Advances in data processing have made this type of analysis a powerful tool for assessing both intraregional economic linkages and interregional spillover effects; see the detailed description of this methodology in Miller and Blair (2009). Using this approach, Pérez et al. (2009) estimate a median impact value of 0.72 for EU structural funds in Spanish NUTS2 regions between 1995 and 1999. In the case of Italy, Benvenuti and Marangoni (1999) find that the Keynes–Leontief regional multiplier of investment ranges from 1.4 to 1.7, with higher values observed in southern regions. I-O models are particularly valuable for calculating regional multipliers because they provide detailed insights into the disaggregated behavior of the economy and allow for the explicit mapping of intersectoral and interregional dependencies; see Dietzenbacher (2002) and Tohmo (2004). However, these models rely on strong assumptions, and their policy analysis requires the a priori identification of shocks, which limits their usefulness as a counterfactual evaluation tool (Destefanis et al., 2022).

De Castro (2006) was the first to estimate the government spending multiplier for Spain, reporting values between 1.1 and 1.5. Subsequent studies for the country, such as Martínez and Zubiri (2014) and Hernández de Cos and Moral-Benito (2016), show that fiscal multipliers tend to be larger during recessions than in expansions. At the regional level, the only existing evidence is provided by Perez-Montiel and Manera (2022), who, using a heterogeneous panel structural VAR, estimates an infrastructure investment multiplier of 1.88 after five years, with positive and persistent effects on output. The present paper contributes to the literature on regional fiscal multipliers in Spain by explicitly accounting for heterogeneous dynamics across regions. As noted by Canova (2024), ignoring such heterogeneity may lead to biased cross-sectional estimates. In a panel data context, this author also proposes two estimation frameworks that do not require the preliminary grouping of regions. For cases with a small number of time observations, a partial pooling estimation is recommended. Given the relatively long time dimension of our sample, we adopt the alternative approach based on mean group time-series estimators (Pesaran, 2006), which are consistent and allow us to explore the spatial distribution of multipliers. Details regarding the data sources, key variables, and empirical strategy are provided in the following two sections.

3 Data sources and variables

The primary data source for our analysis is the BD.MORES database, maintained and regularly updated by the Spanish Ministry of Finance (Dabán et al., 2002). The units of analysis are the Spanish NUTS2 regions, corresponding to the 17 autonomous communities (the autonomous cities of Ceuta and Melilla are excluded). We extracted data on GDP and gross value added (GVA) of the non-market sector—both expressed in constant 2015 prices and on a per capita basis—as well as employment figures for the period 1980–2019. This database offers the longest consistent time series available for these variables across Spanish regions. Using this information, we define the employment rate as total employment divided by population, and labor productivity as GDP divided by employment.[2] Accordingly, the three key variables for which regional fiscal multipliers are estimated are real GDP per capita, the employment rate, and labor productivity.

Data on general government final consumption are not available at the regional level in Spain. Following related studies for the euro area by Brueckner et al. (2023) and Gabriel et al. (2023), we use the gross value added (GVA) of the non-market sector,[3] combined with intermediate consumption, as a proxy for public consumption expenditure, since the two are closely related. Hereafter, the terms government (or public) consumption and government (or public) spending are used interchangeably. This approach is justified because, although the non-market sector includes other institutions, the general government is primarily responsible for changes in its GVA. Moreover, previous studies have shown that the statistical properties of the corresponding time series are highly similar at the national level. Regional shares of intermediate consumption in the non-market sector are obtained from the PBL EUREGIO input–output database (Thissen et al., 2018), which provides one of the main components of government spending not captured by GVA.

[2] These definitions of the employment rate and labor productivity allow GDP per capita to be decomposed into its two components (Bourdin et al., 2025):

$$\underbrace{\frac{GDP}{Population}}_{\text{GDP per capita}} = \underbrace{\frac{Employment}{Population}}_{\text{Employment rate}} \times \underbrace{\frac{GDP}{Employment}}_{\text{Labor productivity}}$$

[3] Calculated as the sum of compensation of employees, consumption of fixed capital, and taxes less subsidies on production.

Figure 1 presents box plots of GDP per capita, employment rate, labor productivity, and public expenditure per capita for each region. These graphs illustrate not only the heterogeneity in the levels of these variables but also their interrelations across Spanish regions. High-income regions such as Madrid, Basque Country, and Navarre combine above-average GDP per capita with high labor productivity and relatively elevated public expenditure. By contrast, Catalonia and Balearic Islands achieve high GDP and employment per capita levels while exhibiting comparatively lower government spending, indicating different fiscal-policy configurations behind similar income outcomes. At the other end of the spectrum, southern regions such as Andalusia, Extremadura, and Canary Islands display persistently lower GDP per capita and productivity, while public expenditure levels remain moderate to high. In contrast to the marked heterogeneity in income and productivity, the employment rate shows considerably less dispersion across regions.

[Insert Figure 1 about here]

Figure 2 depicts the temporal evolution of the main variables considered in our analysis. All series exhibit a steady upward trend over the long run, reflecting the sustained growth of the Spanish economy since the 1980s. A common turning point is observed around the Great Recession, with GDP and employment experiencing a marked decline. In contrast, government spending continued to rise immediately after the crisis, consistent with the adoption of countercyclical policies, but began to contract from 2011 onwards following the implementation of austerity measures. Labor productivity also slowed during this period, although its adjustment was less abrupt than that of GDP or employment. The co-movement of public expenditure with the three outcome variables over time confirms their positive correlation, particularly between government spending and GDP. Another notable aspect of the data is the substantial regional variability in the trajectories of these variables, which underscores the heterogeneous relationships among them across units. This feature of our data must be taken into account when estimating the dynamic effects of public spending and the associated multipliers at the regional level in Spain.

[Insert Figure 2 about here]

4 Empirical strategy

4.1 Cross sectional dependence and dynamic heterogeneity

Spanish regions are closely interconnected through political, financial, commercial, fiscal, and cultural ties. Consequently, the performance of a given region may be influenced not only by its own characteristics but also by the conditions and developments of other regions. This interdependence is reflected in the presence of cross-sectional dependence in their economic indicators, which must be accounted for empirically to avoid estimation biases (Perez-Montiel & Manera, 2022). To test for cross-sectional dependence in our sample, we applied the CD test developed by Pesaran (2015) to the three variables under analysis, as well as to their cumulative changes across different time horizons ($h = 0, 1, 2, 3, 4$). The results, presented in Table 1, reject the null hypothesis of no cross-sectional dependence across regions for all variables and horizons. Having established the presence of cross-sectional dependence, we proceed to quantify its degree using the $\mathring{\alpha}$ exponent proposed by Bailey et al. (2016). The estimates, along with their 90% confidence intervals reported in Table 1, suggest that the coefficient is not statistically different from one. This finding can be interpreted as evidence of strong cross-sectional dependence across regions, which can be accounted for by introducing a common factor structure (Sanso-Navarro & Vera-Cabello, 2018).

[Insert Table 1 about here]

In addition to the presence of common shocks affecting all units and the omission of relevant variables, another challenge in estimating regional fiscal multipliers lies in the lack of justification for assuming a uniform response to policy shocks. Indeed, Canova (2024) shows that cross-sectional estimates of fiscal multipliers are biased when heterogeneous dynamic relationships exist; see also Pesaran and Smith (1995). To address this issue – particularly in contexts with a relatively long time dimension – the author recommends using average time-series estimators, such as the CCE framework (Pesaran, 2006). Related panel data estimators operate by estimating regressions for each cross-sectional unit individually and then averaging the resulting coefficients. Compared to traditional methods that impose parameter homogeneity, this procedure accommodates fully heterogeneous dynamics and provides region-specific estimates, thereby offering richer insights into the spatial distribution of regional fiscal multipliers. Moreover, panel CCE estimators account for unobserved common factors by incorporating cross-sectional averages of the regressors. This approach mitigates the influence of all forms of correlation, whether arising from spatial effects or unobserved common factors (Pesaran & Tosetti, 2011).

4.2 Local projections and CCE estimation

The cumulative government spending multiplier for a given variable is defined as the ratio of its cumulative change over h periods to the initial spending shock occurring at time t. This metric is widely regarded as a reliable measure of the medium-term effects of fiscal policy on economic activity. Building on this definition, we employ the local projection approach introduced by Jordà (2005) to estimate the cumulative effect of a government spending shock in region i on an economic outcome over a given horizon h.

$$\sum_{m=0}^{h} \frac{Y_{i,t+m} - Y_{i,t-1}}{Y_{i,t-1}} = \beta_i^h \sum_{m=0}^{h} \frac{G_{i,t+m} - G_{i,t-1}}{GDP_{i,t-1}} + \gamma_i X_{i,t-1} + \alpha_i + \mu_i F_t + \epsilon_{i,t+m}, \tag{1}$$

$\frac{Y_{i,t+m}-Y_{i,t-1}}{Y_{i,t-1}}$ represents the change in the variable of interest – GDP per capita, the employment rate, or labor productivity in our case – in region i between $t-1$ and $t+m$. Similarly, $\frac{G_{i,t+m}-G_{i,t-1}}{GDP_{i,t-1}}$ denotes the change in real government spending per capita in region i, relative to real GDP per capita in $t-1$. As noted by Bernardini et al. (2020), this specification ensures that the parameter β_i^h can be interpreted as the fiscal multiplier at horizon h in region i.

$X_{i,t-1}$ is a vector of control variables, including one lag of the dependent variable and the cumulative change in government spending. To address potential endogeneity arising from the construction of these variables, we instrument them using their own lags. Consistent with the arguments discussed in the previous subsection, F_t is a vector of common factors that account for cross-sectional dependence and capture the influence of aggregate shocks affecting region i, such as business cycle developments, monetary policy stances,[4] and spillovers from other regions.[5] This term can be regarded as a more general formulation of time fixed effects.

Following Nekarda and Ramey (2011), Dupor and Guerrero (2017), and Gabriel et al. (2023), we employ a Bartik (1991)-style instrument to capture changes in government spending:

$$B_{i,t} = s_i \sum_{m=0}^{h} \frac{G_{t+m} - G_{t-1}}{GDP_{t-1}}, \tag{2}$$

where $s_i = \frac{G_i}{G}$, with G_i and G representing, respectively, the sample averages of government spending per capita in region i and at the national level. This instrument allows for the identification of the effect of public expenditure on economic activity by linking changes in government spending to the differential regional exposure to variations in national public expenditure. The use of sample averages[6] allows us to control for potential structural changes in government spending across regions (Nekarda & Ramey, 2011) and helps mitigate endogeneity concerns by separating the regional share, s_i, from the business cycle.

A value of s_i greater than one indicates that, on a per capita basis, the government of region i spends more than the national average. Although the Bartik instrument allows public spending to vary more in regions with a higher share, this may pose challenges for regions that perform poorly during the cycle and are influential in central government decisions due to their political and economic significance. To ensure that this is not problematic in our context, we regressed the growth rate of national government spending on the growth rate of regional GDP – used as a proxy for the business cycle stance – interacted with the regional shares. A negative estimated coefficient would indicate that when regions with relatively higher spending are in a worse cyclical situation than others, national government expenditures increase. However, we obtain a positive coefficient, thus confirming the validity of our identification strategy. Additionally, we conducted the regression-based check proposed by Gabriel et al. (2023), who define the business cycle

[4] Analyzing the dynamic effects of government spending shocks in a regional context helps avoid the challenge of properly controlling for changes in the monetary policy stance – a common issue in fiscal policy analyses at the national level.

[5] Appendix A presents a robustness check of our results that accounts for a spatial lag of the cumulative change in real government spending constructed using an inverse-distance weights matrix.

[6] Appendix B presents a robustness check of the estimated regional fiscal multipliers using a time-varying share s_{it}.

stance as the difference between the regional GDP growth rate and the national average. This approach yielded the same conclusion.[7]

In line with previous arguments, expression (1) has been estimated using the CCE approach for dynamic models with weakly exogenous regressors, as proposed by Chudik and Pesaran (2015). Nonetheless, Canova (2024) notes that average time series estimators may be biased if the temporal dimension is insufficiently large, particularly when the dependent variable exhibits near non-stationary behavior. To assess whether this poses a potential concern in our data, we tested for the presence of a unit root in the three variables included on the left-hand side of expression (1) across different time horizons. For this purpose, we applied the unit root test for heterogeneous panels proposed by Pesaran (2007). Consistent with the CCE framework, this procedure incorporates cross-sectional means to eliminate the effects of all forms of correlation, calculates the Im et al. (2003) test statistic for each region, and then computes the average. The results reported in Table 2 indicate that the null hypothesis of non-stationarity is generally rejected for the variables under consideration. Therefore, even if concerns remain regarding the length of the temporal dimension in our sample, there is no evidence of potential biases arising from the non-stationary behavior of the dependent variables.

[Insert Table 2 about here]

5 Results

5.1 Region-specific fiscal multipliers

Estimated regional cumulative government consumption multipliers on GDP per capita across different horizons, together with their national averages, are reported in Table 3. Although regional fiscal multipliers are generally positive and statistically significant, their magnitude and persistence vary substantially across the country. In several regions – such as La Rioja, Madrid, Castile and León, the Valencian Community, and the Balearic Islands – the estimated values are consistently large and remain above one over multiple horizons, indicating strong and persistent effects of public expenditure. These findings align with Keynesian demand-side mechanisms, whereby increases in govern-

[7]These results are available from the authors upon request.

ment spending stimulate local output through higher aggregate demand and subsequent rounds of private expenditure.

By contrast, regions such as Asturias and Aragon display negative and statistically significant responses, suggesting contractionary dynamics that may reflect strong crowding-out effects on private demand in response to higher public-sector activity, consistent with neoclassical interpretations of fiscal policy. Murcia exhibits modest short-run effects that strengthen over longer horizons, whereas the initially positive influence of public expenditure in Cantabria, Castile-La Mancha, and Andalusia dissipates relatively quickly.

Although the Basque Country and Navarre share a common *foral regime*[8], their estimated multipliers display markedly different patterns. This divergence suggests that the mere existence of fiscal autonomy does not systematically determine the effectiveness of regional public spending. Overall, the spatial and dynamic heterogeneity uncovered here highlights that government consumption does not exert a uniform impact across the Spanish economy. Instead, its effectiveness appears to depend on regional characteristics and the temporal dimension of adjustment, consistent with theoretical predictions that fiscal multipliers are shaped by both demand- and supply-side forces.

The CCE estimator proxies unobserved common factors using cross-sectional averages of the regressors. Given the dimensions of our panel data, we include three lags of these averages (Pesaran, 2006; Chudik & Pesaran, 2015). To verify that this specification adequately captures the unobserved common-factor structure underlying our data, we compute the variant of the CD test proposed by Juodis and Reese (2022) on the residuals. The results, reported in the lower panel of Table 3, indicate that this is not a concern, as the null hypothesis of residual cross-sectional dependence cannot be rejected at the 10% significance level for any horizon. The one-sided version of the test developed by Millo (2017) also systematically rejects the null hypothesis of spatial correlation in the residuals.[9] Moreover, the effective F-test statistic of Olea and Pflueger (2013) exceeds 23, the

[8] An institutional arrangement that grants these regions extensive fiscal autonomy, including the power to levy and collect most taxes.

[9] Despite this result, we also conducted the same estimations including a spatial lag of the cumulative change in real government spending (Auerbach et al., 2020); see Appendix A. When proceeding in this way, both the magnitude and significance of the estimated cumulative output multipliers tend to decline (Table A.1). Nonetheless, this specification appears less reliable, as evidenced by the poorer performance of the residual cross-sectional dependence test at certain horizons. A similar pattern is observed in Appendix B, where the robustness of our results is examined using a time-varying share s_{it}.

threshold established by these authors for instrument relevance at the 5% significance level.

[Insert Table 3 about here]

To shed further light on the channels through which fiscal policy affects GDP per capita, Tables 4 and 5 report the cumulative fiscal multipliers for the employment rate and labor productivity, respectively. The results confirm pronounced heterogeneity across regions and horizons. In particular, Galicia, the Basque Country, Madrid, and Catalonia exhibit large and persistent employment responses, while productivity effects are weak or even negative, suggesting that fiscal shocks primarily operate through labor utilization. Turning to other regions, in Navarre, La Rioja, and Andalusia, the impact is driven mainly by productivity gains rather than employment increases. In Aragon, no channel responds significantly, consistent with the low and negative GDP multipliers reported above. In Castile–La Mancha and the Balearic Islands, both margins contribute, though with distinct dynamics: employment reacts immediately, whereas productivity gains emerge over time.

[Insert Tables 4 and 5 about here]

The residual CD test statistics reported in the lower panels of Tables 4 and 5 do not reject the null hypothesis, indicating that cross-sectional dependence is not a concern in these estimates. While the instruments for the employment rate multipliers are relevant across all horizons, the F-statistic falls slightly below the 5% significance threshold at the three- and four-year horizons for labor productivity. Comparing both dimensions, employment multipliers tend to peak in the short run and then decline gradually, whereas productivity responses – when positive – are more persistent and contribute to long-run output growth. Overall, the decomposition suggests that fiscal multipliers differ not only across space but also across transmission channels, with some regions benefiting primarily through job creation and others through productivity gains. This pattern underscores a heterogeneous trade-off between employment and productivity across regions. Beyond allowing for dynamic heterogeneous responses to government spending shocks, a further advantage of using average estimators in this context is their ability to reveal the spatial distribution of estimated multipliers. In this regard, Figure 3 presents choropleth maps of the statistically significant regional cumulative multipliers for GDP, employment, and labor productivity over two horizons ($h = 2, 4$). Consistent with the results described above, these maps reveal a clear north–south divide, with higher output and employment multipliers in the north and higher labor productivity multipliers in the south.

[Insert Figure 3 about here]

Canova (2024) proposes using the coefficient of variation (CV) of estimated regional fiscal multipliers to formally test for dynamic heterogeneity. Under the null hypothesis of homogeneity, and for each horizon, the distribution of multipliers would be concentrated around a central value, resulting in a low CV. Conversely, heterogeneity would imply a more dispersed distribution and, therefore, a higher CV. Based on these arguments, and considering the critical values reported by this author for $N = 20$ and $T = 40$, we compute the CV for our estimated region-specific multipliers. The results, presented in Table 6, indicate that output multipliers exhibit dynamic heterogeneity for horizons of up to two years. For employment and, particularly, labor productivity, the null hypothesis can only be rejected at shorter horizons.

[Insert Table 6 about here]

The evidence on the heterogeneity of fiscal multipliers across Spanish regions has important implications for policy design, as changes in government consumption may not generate uniform effects nationwide. The literature analyzing region-specific fiscal multipliers remains limited, which makes direct comparisons with our findings difficult. Although specific estimates are not reported, Perez-Montiel and Manera (2022) show that the infrastructure investment multiplier is higher in Spanish regions with GDP per capita above the national average. Similarly, Destefanis et al. (2022), Lucidi (2023), and Coppola et al. (2024) document substantial regional variation in fiscal multipliers across Italian regions. Building on this evidence, the next subsection investigates the potential sources of the heterogeneity observed in Spain.

5.2 Heterogeneity determinants

The consideration of government consumption multipliers on employment and labor productivity has enabled us to uncover the diversity of channels through which fiscal policy affects output. To gain further insight into the drivers of the spatial and dynamic heterogeneity identified in the estimated multipliers, we compiled data on a set of potential determinants. Following Faggian and Biagi (2003) and Mineshima et al. (2014), these determinants include indicators of factor utilization (unemployment rate and labor effort), economic size (GDP and total population), population density, financial development (bank branches per inhabitant), productive structure (competitiveness, R&D expenditures, and agricultural employment share), openness to trade, public infrastructure and debt, and institutional quality, proxied by the European Quality of Government Index (Charron et al., 2014, EQI). The definition, sources, and reference year of these variables are reported in Table C.1 in Appendix C.

Similarly to Destefanis et al. (2022), we computed Spearman and Pearson correlation coefficients[10] between the estimated fiscal multipliers and the potential determinants described above. The results are presented in Table 7. Regional fiscal multipliers on GDP are not significantly correlated with any of the variables, except for the inverse relationship between the immediate impact of government spending shocks on output and trade openness. Nevertheless, the signs of the coefficients remain informative. As expected, the correlations with unemployment are negative at the two-year horizon but become positive at the four-year horizon. This finding contrasts with much of the existing literature, which reports larger multipliers during economic downturns. In this regard, Destefanis et al. (2022) show that unused resources are positively correlated with the size of output multipliers in Italian regions, a result further corroborated by Coppola et al. (2024), who provide evidence of regime-dependent multipliers.

[Insert Table 7 about here]

An important feature of the estimated correlation coefficients is that fiscal multipliers for employment and labor productivity display opposite patterns, highlighting a tradeoff between these two dimensions, as emphasized by Bourdin et al. (2025). The most pos-

[10] Kendall's rank correlation coefficient yields similar results; see Table C.2 in Appendix C.

itive and significant correlations with the potential determinants considered are observed for employment multipliers at both the two- and four-year horizons. This is especially true for variables related to size, density, competitiveness, R&D expenditures, and openness. We also find evidence of an inverse relationship between employment multipliers and trade openness. In contrast, labor productivity multipliers are negatively associated with these indicators, although most of the corresponding correlation coefficients are not statistically significant over shorter horizons. These findings suggest that positive fiscal shocks tend to foster job creation in larger, denser, and more competitive regions with stronger innovation capacities, whereas in smaller or less diversified regions, they are primarily absorbed through efficiency gains. Moreover, international trade appears to reinforce these dynamics: regions with higher levels of openness exhibit stronger employment multipliers but weaker productivity responses.

Our results also point to a dual role of financial development. While its positive correlation with GDP multipliers suggests that a stronger financial sector amplifies the expansionary effects of public expenditure, the significant negative association with employment multipliers indicates that more financially developed regions may reallocate government spending toward less labor-intensive activities. This interpretation is further supported by the positive relationship observed between the number of bank branches and fiscal multipliers for labor productivity. The stock of public infrastructure appears to be only weakly related to GDP multipliers, yet it is positively associated with employment multipliers and negatively associated with labor productivity multipliers. These findings suggest that high-quality public services may enhance the employment response to fiscal shocks, even if they dampen productivity gains.

Public debt, in turn, is negatively correlated with GDP and productivity multipliers, consistent with the notion that fiscal capacity constraints limit the expansionary effects of government spending. However, its positive correlation with employment multipliers complicates this interpretation, pointing instead to a possible reallocation of fiscal resources toward job-preserving policies. The negative correlation between the EQI and both GDP and employment multipliers is counterintuitive, since higher institutional quality would, in principle, strengthen the transmission of fiscal policy. One possible explanation is that regions with weaker institutions exhibit greater scope for catch-up, such that additional spending generates larger GDP and employment effects, whereas regions with stronger institutions may already operate closer to full capacity.

The comparison of correlations between determinants and multipliers across different horizons reveals pronounced spatial and dynamic heterogeneity. Density-related coefficients generally increase over time, suggesting that scale effects become increasingly relevant in the medium term. The correlations for the share of agricultural employment become significant after four years, indicating that sectoral composition influences the persistence of fiscal shocks rather than their short-term impact. The number of bank branches exhibits a strengthening positive correlation with productivity multipliers as the horizon lengthens, implying that financial deepening reinforces the fiscal response of labor productivity over time. Finally, the correlations for public debt and institutional quality suggest that fiscal capacity plays a greater role in the persistence of fiscal multipliers, whereas governance is more relevant for their immediate magnitude.

5.3 Average cumulative multipliers

Figure 4 reports the average cumulative multipliers of government spending on output per capita,[11] employment rate, and labor productivity over a four-year horizon, as implied by the region-specific estimates. The solid blue line shows the average point estimate of β_i^h from equation (1) – previously reported in Tables 3, 4, and 5 – which captures the implied national multiplier. The shaded areas indicate the 95% (dark) and 70% (light) confidence intervals, illustrating the degree of precision associated with these estimates.

The cumulative multiplier for GDP per capita (Panel 4a) starts at 1.9 and gradually declines, stabilizing around 1.2 after four years. This trajectory indicates that positive public expenditure shocks generate a strong short-run stimulus that diminishes over time but remains persistently above unity. On average, a €1 increase in relative government spending yields a cumulative €0.28 increase in private output after two years, consistent with Keynesian effects in which public expenditures crowd in private demand. Building

[11] By running the regressions in per capita terms, we control for short-term population movements associated with changes in government spending (Nakamura & Steinsson, 2014). Nonetheless, we also estimated a regression in which the dependent variable is the cumulative change in population and the independent variable is the change in government spending, with both government spending and output in levels. We find that population responses to government spending shocks are small and statistically indistinguishable from zero within the analyzed horizon. These additional results, available from the authors upon request, support our claim that population changes do not drive our main findings.

on this, Chodorow-Reich (2019) argue that regional multipliers provide a lower bound for closed-economy multipliers under deficit financing and absent monetary policy responses. If spending is externally financed, this bound may fall by 0.1, implying a two-year closed-economy multiplier of about 1.2. Taken together, our estimates confirm that fiscal stimulus at the regional level exerts a quantitatively significant and persistent effect on output dynamics.

[Insert Figure 4 about here]

The average cumulative employment fiscal multiplier (Panel 4b) shows an immediate impact of about 1.5, remains relatively flat for two years, and then declines toward unity after four years, indicating that government spending strongly stimulates local labor markets in the short to medium run. By contrast, the aggregate multipliers for labor productivity (Panel 4c) stay close to zero throughout the entire horizon and display wide confidence intervals. The immediate multiplier is negative and becomes only mildly positive after three years, though it never attains statistical significance. Taken together, the national multipliers for employment and labor productivity corroborate the existence of a trade-off between these two outcomes at the aggregate level.

Previous results indicate that an increase in public expenditures exerts a strong positive and long-lived effect on output, transmitted primarily through employment creation rather than productivity gains. These findings are consistent with existing research on regional fiscal multipliers. In the European context, Gabriel et al. (2023) estimate an output multiplier of 2.1 using a Bartik instrument. Similarly, Nakamura and Steinsson (2014) report a two-year multiplier of 1.4 for the US, that increases to 2.5 when applying the Bartik approach. Other studies, such as Bernardini et al. (2020) and Acconcia et al. (2014), identify one- to two-year multipliers ranging from 1.8 to 2.8 across various regional settings. For Spain, Perez-Montiel and Manera (2022) estimate a five-year infrastructure investment multiplier of 1.9, which rises to 2.8 in regions with above-average GDP per capita.

The diverging aggregate dynamics of employment and productivity following a government spending shock also resonate with recent findings in the literature. Evidence that fiscal stimulus primarily operates through employment is consistent with Nakamura and Steinsson (2014), who report employment multipliers ranging from 1.3 to 1.8 depending on the methodology applied. Similarly, Brueckner et al. (2023) document an employment multiplier increasing from 1.1 to 1.4 after four years. In contrast, Gabriel et al. (2023) implicitly suggest that the positive cumulative output multiplier reflects both job creation and labor productivity gains. Coelho (2019) also find strong positive effects on output but no significant employment response to government spending in European regions, implying that efficiency improvements drive the results. In addition, Nekarda and Ramey (2011) and Auerbach et al. (2024) provide evidence that demand shocks can enhance labor productivity across US states. This evidence aligns with the literature on the trade-off between employment and productivity: De Michelis et al. (2013) document this relationship at the country level, while Bourdin et al. (2025) report similar evidence at the regional level in the context of EU Cohesion Policy.

6 Conclusions

This paper examines regional fiscal multipliers in Spain at the NUTS2 level over the period 1980–2019, combining a local projection approach with a dynamic CCE estimator that accounts for weakly exogenous regressors. The results indicate that government consumption generates positive and persistent effects on output and employment, whereas its influence on labor productivity is comparatively limited. Correlations between the estimated fiscal multipliers and potential determinants suggest that larger, denser, and more open regions display stronger employment responses. Moreover, promoting financial deepening and reducing public indebtedness appear to be alternative ways to enhance the positive effects of public expenditure shocks over time. From a policy perspective, these findings highlight that government spending shocks do not affect all regions uniformly. Consequently, countercyclical fiscal policies should incorporate regional asymmetries in both the magnitude and persistence of fiscal multipliers – an aspect particularly relevant for the design and implementation of EU Cohesion Policy.

Although this paper has focused on the estimation of public consumption multipliers, those associated with other categories of government expenditure – such as public investment, education, health, or defense – are essential for designing more targeted and effective fiscal interventions. The lack of sufficiently long and consistent regional data currently constrains this degree of disaggregation, but extending the analysis in this direction represents a promising avenue for future research. Progress along this dimension would also contribute to the development of fiscal frameworks that better align national objectives with regional capacities, thereby enhancing the long-term effectiveness of public spending.

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Tables and figures

Table 1: Cross-sectional dependence testing (Pesaran, 2015) for dependent variables.

	$h = 0$	$h = 1$	$h = 2$	$h = 3$	$h = 4$
GDP per capita					
CD test	46.02	51.53	54.46	56.09	57.11
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$\mathring{\alpha}$ **exponent**	1.004	1.004	1.004	1.004	1.005
	[0.872, 1.136]	[0.894, 1.115]	[0.907, 1.101]	[0.908, 1.101]	[0.907, 1.102]
Employment rate					
	$h = 0$	$h = 1$	$h = 2$	$h = 3$	$h = 4$
CD test	49.31	54.82	57.45	58.60	58.90
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$\mathring{\alpha}$ **exponent**	1.004	1.004	1.004	1.004	1.005
	[0.910, 1.098]	[0.928, 1.080]	[0.937, 1.072]	[0.935, 1.074]	[0.932, 1.077]
Labor productivity					
	$h = 0$	$h = 1$	$h = 2$	$h = 3$	$h = 4$
CD test	18.62	23.39	27.14	30.09	32.06
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$\mathring{\alpha}$ **exponent**	0.983	1.002	1.001	1.002	1.003
	[0.941, 1.025]	[0.968, 1.036]	[0.964, 1.039]	[0.960, 1.044]	[0.956, 1.050]

Note: h denotes the time horizon over which the cumulative change is computed. The null hypothesis posits the absence of cross-sectional dependence. Figures in parentheses report p-values. $\mathring{\alpha}$ denotes the cross-sectional dependence exponent as introduced by Bailey et al. (2016). Ninety-percent confidence intervals are provided in brackets.

Table 2: Panel unit root testing (Pesaran, 2007) for dependent variables.

		Augmentation lags			
	h	0	1	2	3
GDP per capita	0	-5.402	-4.291	-3.052	-3.086
	1	-3.963	-3.946	-2.714	-3.357
	2	-3.122	-3.425	-2.856	-3.017
	3	-2.710	-3.090	-2.684	-3.091
	4	-2.473	-2.807	-2.453	-2.999
Employment rate	0	-5.365	-4.473	-3.282	-2.557
	1	-4.062	-4.131	-2.685	-2.405
	2	-3.291	-3.365	-2.592	-2.066
	3	-2.858	-2.837	-2.253	-2.111
	4	-2.592	-2.490	-2.047	-2.071
Labor productivity	0	-5.446	-4.402	-3.624	-3.286
	1	-4.000	-4.358	-3.317	-3.116
	2	-3.425	-3.882	-3.288	-2.614
	3	-3.042	-3.519	-2.982	-2.540
	4	-2.845	-3.160	-2.621	-2.368

Note: h denotes the time horizon over which the cumulative change is computed. The null hypothesis posits non-stationarity. The critical values at the 1%, 5%, and 10% significance levels are –2.36, –2.20, and –2.11, respectively.

Table 3: Cumulative fiscal multipliers: GDP per capita.

Region (NUTS2)	$h = 0$	$h = 1$	$h = 2$	$h = 3$	$h = 4$
Galicia (ES11)	-4.166	0.526	-0.088	0.691	0.958
Asturias (ES12)	-1.634	-1.787	-3.138	-3.005*	-3.803**
Cantabria (ES13)	1.229*	1.508**	0.354	-0.327	-0.141
Basque Country (ES21)	1.214	2.666***	1.541***	1.675***	1.285***
Navarre (ES22)	-0.494	0.055	0.196	0.400	-0.262
La Rioja (ES23)	3.369***	2.845**	4.852***	3.298***	4.140**
Aragon (ES24)	-2.892	-1.383*	-2.243**	-2.868**	-2.884
Madrid (ES30)	2.293***	2.670***	3.711***	3.661***	3.787***
Castile and León (ES41)	2.173***	1.613***	2.585***	2.020***	1.812**
Castile-La Mancha (ES42)	1.719***	1.947***	1.031**	0.678*	0.705
Extremadura (ES43)	5.815***	0.112	1.970	1.796	7.233*
Catalonia (ES51)	1.623**	1.015***	0.818**	0.747	-0.006
Valencian C. (ES52)	4.326***	4.477***	2.354**	1.777*	2.958***
Balearic Islands (ES53)	3.523***	2.851***	2.659**	2.458*	3.462***
Andalusia (ES61)	1.541	5.116**	0.562	0.233	0.584
Murcia (ES62)	1.627	0.483	1.841	2.466	3.429***
Canary Islands (ES70)	1.392*	6.859*	0.379	1.578**	1.214**
Spain (ES)	1.929***	1.618***	1.278***	1.117**	1.209*
CDw	-1.16	0.86	0.09	1.66	-1.04
	(0.25)	(0.39)	(0.92)	(0.10)	(0.30)
F-test	35.65	37.49	31.70	28.46	27.34

Note: h denotes the time horizon over which the cumulative change is computed. The lower panel reports the variant of the CD test for residuals proposed by Juodis & Reese (2022), as well as the effective F-test statistic for weak instruments developed by Olea & Pflueger (2013). P-values are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 4: Cumulative fiscal multipliers: Employment rate.

Region (NUTS2)	h = 0	h = 1	h = 2	h = 3	h = 4
Galicia (ES11)	6.758***	3.798***	3.342***	3.254***	2.532***
Asturias (ES12)	5.530	-1.225	-2.309	-1.116	0.020
Cantabria (ES13)	1.263**	0.412	1.005	0.709	0.860
Basque Country (ES21)	3.263***	3.350***	3.147***	3.300***	2.887***
Navarre (ES22)	0.875	0.098	0.327	1.221***	1.676***
La Rioja (ES23)	-0.209	-2.659***	-2.756***	-2.981***	-2.911***
Aragon (ES24)	-0.068	0.868	1.002	-3.958	-3.086
Madrid (ES30)	3.086***	2.151	3.403***	3.613***	3.870***
Castile and León (ES41)	-1.387	3.734*	2.400***	1.767***	1.448***
Castile-La Mancha (ES42)	3.549**	0.103	-0.128	-0.426	-0.294
Extremadura (ES43)	0.870	0.059	-2.288	-4.418	-1.635
Catalonia (ES51)	1.344	2.298***	3.870*	5.253**	6.298
Valencian C. (ES52)	0.151	0.523	1.466	1.617	1.661
Balearic Islands (ES53)	-3.784**	-1.379	-1.387	-3.050	-2.154
Andalusia (ES61)	-0.061	-0.405	-0.052	0.608	0.677
Murcia (ES62)	4.180**	4.241***	2.542***	1.498***	0.697
Canary Islands (ES70)	2.010***	-2.822	1.989**	0.206	0.123
Spain (ES)	1.495**	1.266**	1.466***	1.159*	0.802
CDw	-1.45	-0.38	0.41	-0.39	-0.22
	(0.15)	(0.70)	(0.68)	(0.70)	(0.83)
F-test	38.16	37.87	27.93	24.80	23.21

Note: h denotes the time horizon over which the cumulative change is computed. The lower panel reports the variant of the CD test for residuals proposed by Juodis & Reese (2022), as well as the effective F-test statistic for weak instruments developed by Olea & Pflueger (2013). P-values are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 5: Cumulative fiscal multipliers: Labor productivity.

Region (NUTS2)	h = 0	h = 1	h = 2	h = 3	h = 4
Galicia (ES11)	-5.826***	-2.797**	-2.368**	-2.259***	-1.586*
Asturias (ES12)	-0.226	1.358**	0.684	1.351**	1.699***
Cantabria (ES13)	0.428	-0.788	-0.381	-0.068	0.170
Basque Country (ES21)	-2.416***	0.121	-1.859	-0.691	-0.912
Navarre (ES22)	1.935***	3.070**	1.699	0.538	-0.065
La Rioja (ES23)	1.682***	1.038	0.622	1.587	2.729***
Aragon (ES24)	-1.900	-1.377	-0.202	5.146	2.876
Madrid (ES30)	-0.889	-0.450	-0.351	0.091	0.732
Castile and León (ES41)	1.496	-0.211	-0.726	-1.167*	-1.069
Castile-La Mancha (ES42)	0.774	0.760	0.897*	1.529***	1.520***
Extremadura (ES43)	-5.503***	-4.894***	-2.105**	-0.819	-0.307
Catalonia (ES51)	1.123	-0.457	-1.165	-2.118*	-2.775
Valencian C. (ES52)	1.204**	0.430	-2.049	-1.779	-2.959**
Balearic Islands (ES53)	3.246**	2.996***	2.592***	3.703***	4.757***
Andalusia (ES61)	0.586*	2.995***	1.394***	0.961**	1.042*
Murcia (ES62)	-0.398	0.804	1.152**	1.868	0.788
Canary Islands (ES70)	-1.339	-2.038	-2.145***	-2.812**	-3.140***
Spain (ES)	-0.151	0.114	-0.069	0.224	0.447
CDw	1.27	0.21	-0.51	-0.79	-0.13
	(0.20)	(0.83)	(0.61)	(0.43)	(0.90)
F-test	42.94	34.05	24.24	20.81	18.70

Note: h denotes the time horizon over which the cumulative change is computed. The lower panel reports the variant of the CD test for residuals proposed by Juodis & Reese (2022), as well as the effective F-test statistic for weak instruments developed by Olea & Pflueger (2013). P-values are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 6: Dynamic heterogeneity test: Coefficient of variation (CV).

			Critical values		
	h	**CV**	10%	5%	1%
GDP per capita	1	1.207	10.510	6.426	4.541
	2	1.718	3.037	2.075	1.666
	4	1.839	2.174	1.608	1.317
Employment rate	1	2.840	10.510	6.426	4.541
	2	2.346	3.037	2.075	1.666
	4	3.264	2.174	1.608	1.317
Labor productivity	1	1.907	10.510	6.426	4.541
	2	5.375	3.037	2.075	1.666
	4	2.562	2.174	1.608	1.317

Note: h denotes the time horizon over which the cumulative change is computed. The null hypothesis posits dynamic homogeneity. Critical values are taken from Table 3 in Canova (2024).

Table 7: Correlation coefficients between cumulative fiscal multipliers and their potential determinants.

		GDP per capita			Employment rate			Labor productivity		
		$h = 0$	$h = 2$	$h = 4$	$h = 0$	$h = 2$	$h = 4$	$h = 0$	$h = 2$	$h = 4$
Unemployment	a)	-0.054	-0.179	0.071	0.379	0.012	0.039	-0.517**	-0.321	-0.267
	b)	0.149	-0.116	0.156	0.225	-0.028	0.108	-0.401	-0.236	-0.269
Labor effort	a)	0.243	0.297	0.287	-0.081	0.478*	0.478**	0.201	-0.162	-0.495**
	b)	0.242	0.421	0.347	-0.219	0.549**	0.483**	0.129	-0.190	-0.413*
GDP	a)	0.015	0.112	-0.017	0.105	0.686***	0.615***	-0.103	-0.269	-0.441*
	b)	0.103	0.170	0.016	0.011	0.551**	0.724***	0.081	-0.186	-0.361
Total population	a)	-0.015	0.027	-0.044	0.186	0.629***	0.566**	-0.211	-0.311	-0.444*
	b)	0.077	0.092	-0.010	0.007	0.460*	0.628***	0.040	-0.168	-0.372
Population density	a)	0.047	0.201	0.194	0.284	0.552**	0.556**	-0.108	-0.243	-0.368
	b)	0.137	0.319	0.191	0.163	0.475*	0.513**	-0.035	-0.185	-0.159
Bank branches	a)	0.333	0.368	0.218	-0.603**	-0.235	-0.282	0.475*	0.201	0.297
	b)	0.105	0.292	0.131	-0.510**	-0.354	-0.415*	0.252	0.233	0.433*
Competitiveness	a)	-0.370	-0.110	-0.294	0.172	0.424	0.546	0.022	-0.027	-0.027
	b)	-0.195	0.114	-0.175	0.148	0.475*	0.566**	0.081	-0.069	-0.062
R&D expenditure	a)	-0.286	-0.115	-0.226	0.343	0.482**	0.628***	-0.134	-0.022	-0.172
	b)	-0.124	0.073	-0.084	0.383	0.515**	0.676***	-0.133	-0.207	-0.256
Agriculture share	a)	0.103	-0.012	0.088	-0.047	-0.407	-0.449*	-0.047	0.034	0.167
	b)	0.121	0.083	0.252	0.050	-0.401	-0.452*	-0.233	0.051	0.171
Openness	a)	-0.488**	-0.226	-0.338	0.233	0.652***	0.684***	-0.044	-0.118	-0.289
	b)	-0.416*	-0.089	-0.319	0.169	0.619***	0.623***	0.095	-0.078	-0.336
Public infrastructure	a)	0.007	-0.044	-0.169	0.091	0.461*	0.446*	-0.147	-0.282	-0.368
	b)	0.024	-0.018	-0.103	-0.040	0.364	0.484**	0.043	-0.129	-0.325
Public debt	a)	-0.249	-0.353	-0.215	0.179	0.329	0.467*	-0.282	-0.320	-0.459*
	b)	-0.167	-0.181	-0.061	0.178	0.312	0.472*	-0.281	-0.409	-0.535**
Institutional quality	a)	-0.402	-0.360	-0.034	0.471*	-0.162	-0.248	-0.632***	-0.311	0.022
	b)	-0.308	-0.278	-0.040	0.467*	-0.222	-0.386	-0.575**	0.251	0.096

Note: h denotes the time horizon over which the cumulative change is computed. Panel (a) reports the value of the non-linear Spearman correlation coefficient, while Panel (b) reports that of the linear Pearson correlation coefficient. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

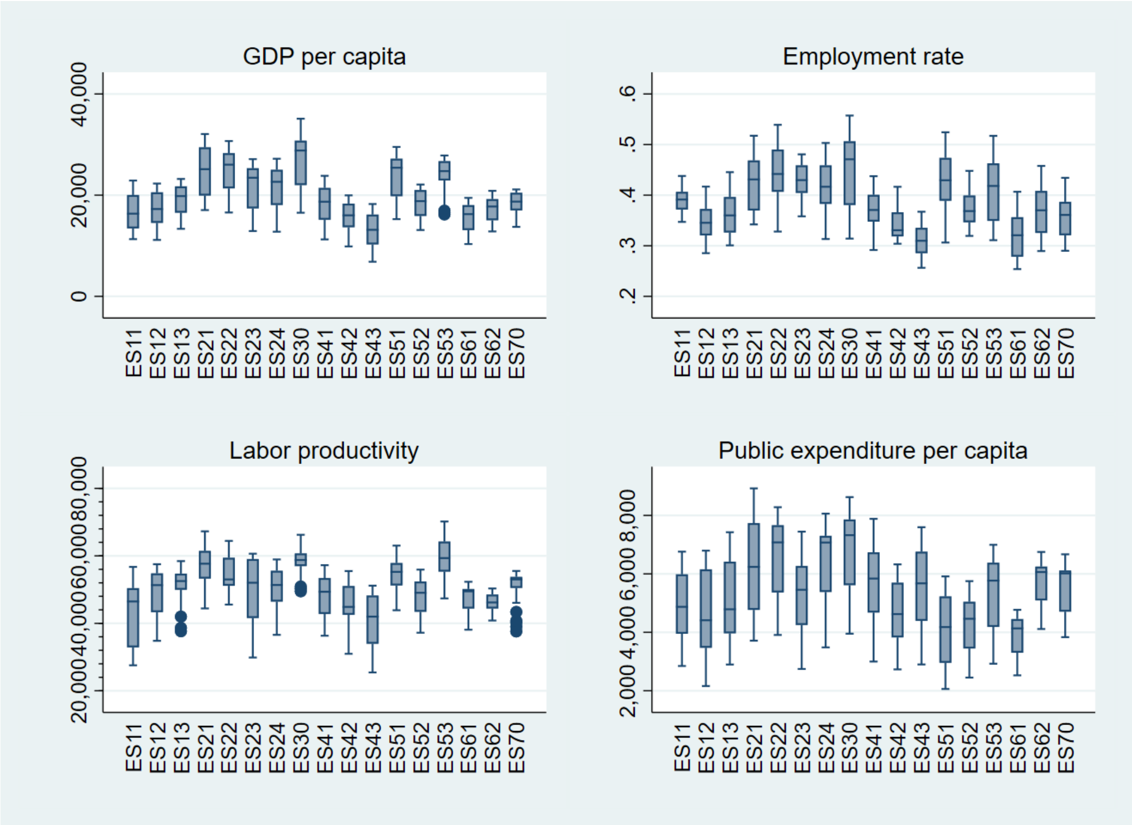


Figure 1: Sample description: Box plots of regional GDP per capita, employment rate, labor productivity, and public expenditure per capita (1980–2019).

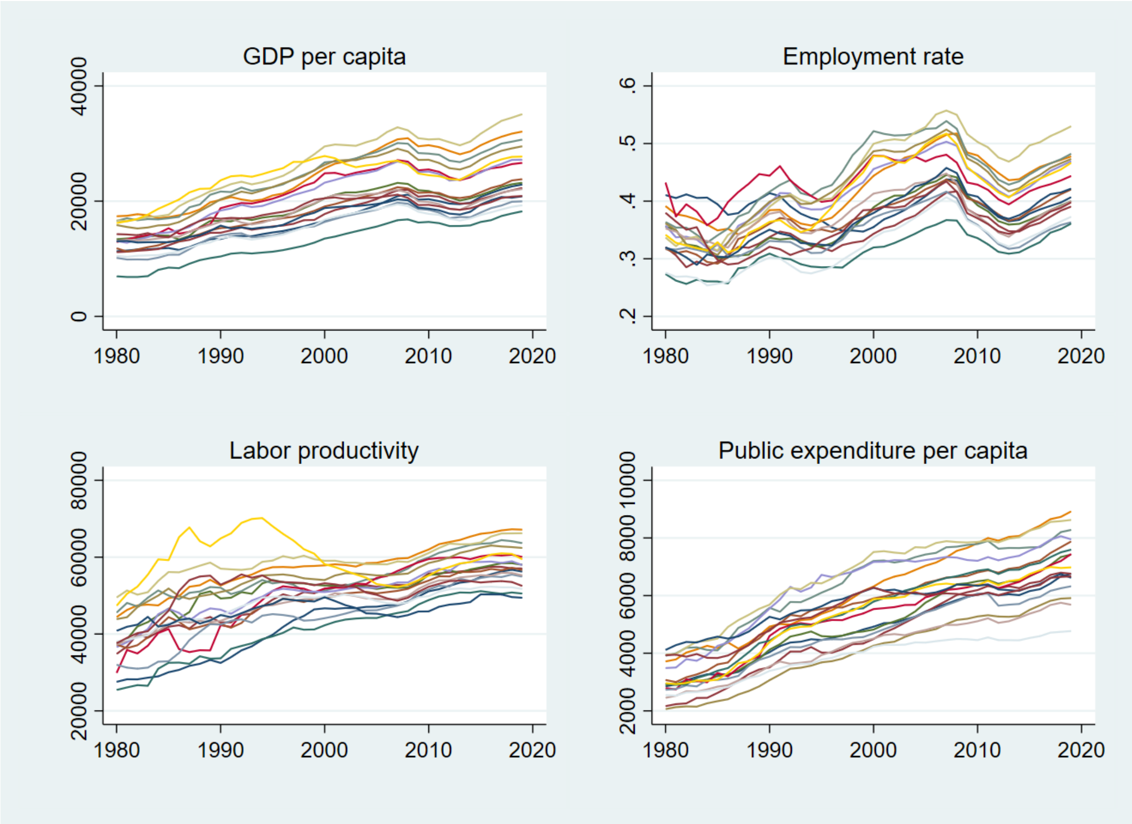
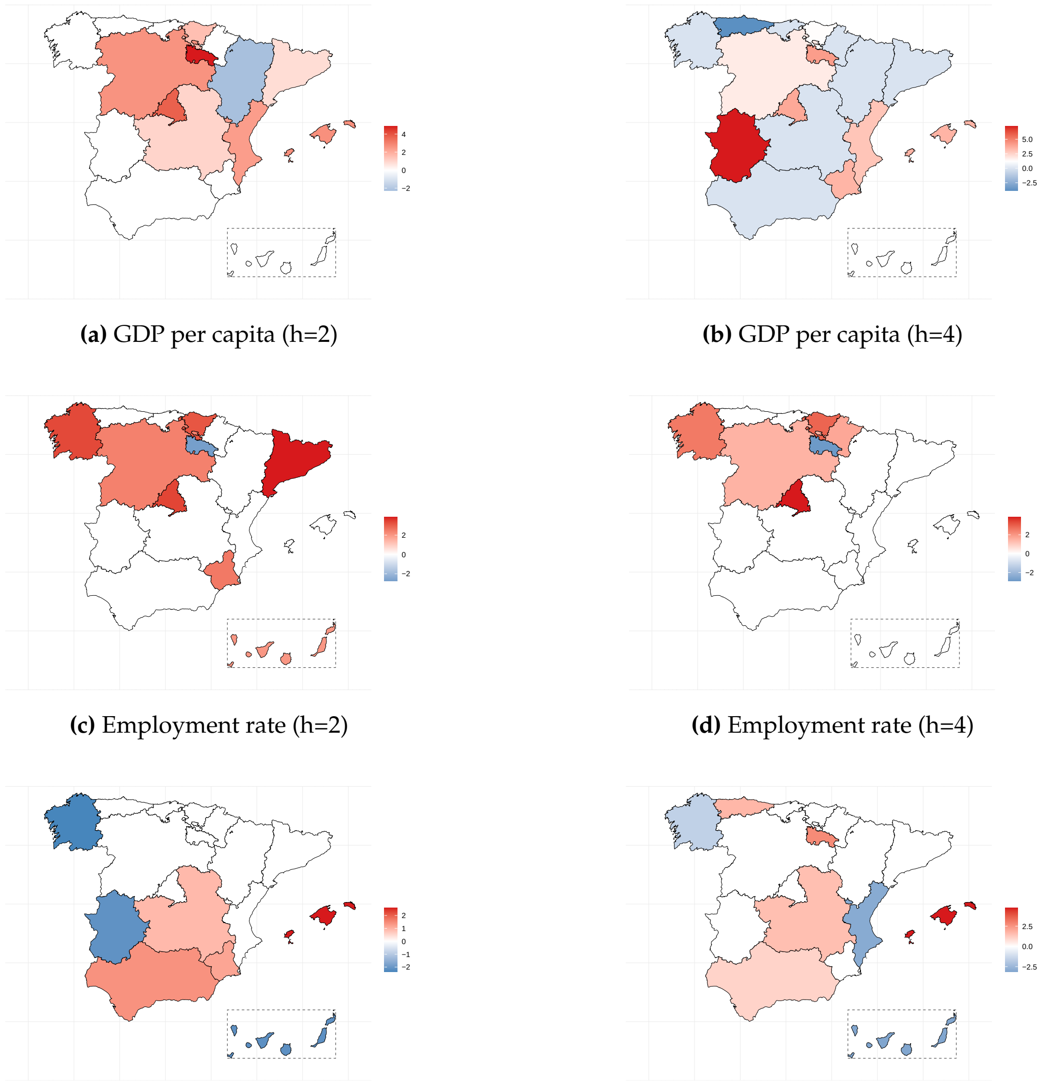


Figure 2: Evolution of regional GDP per capita, employment rate, labor productivity, and public expenditure per capita (1980–2019).



(a) GDP per capita (h=2)

(b) GDP per capita (h=4)

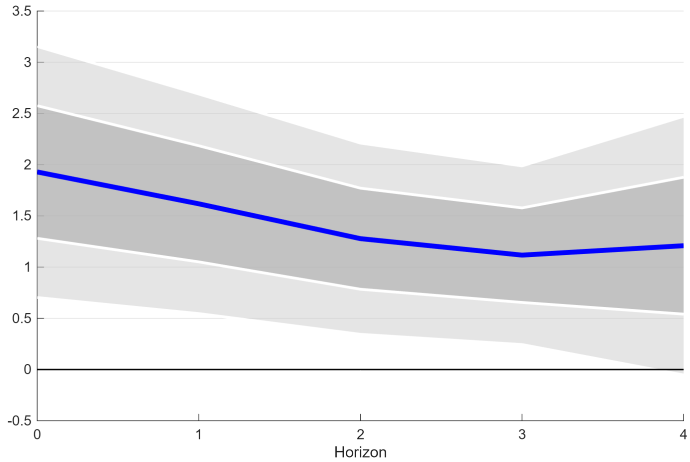
(c) Employment rate (h=2)

(d) Employment rate (h=4)

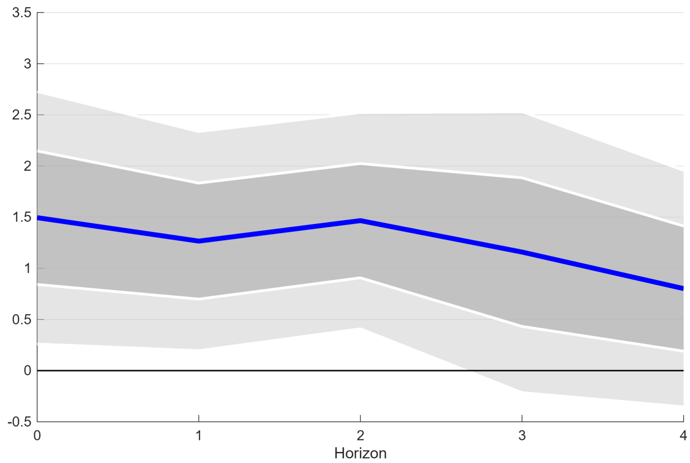
(e) Labor productivity (h=2)

(f) Labor productivity (h=4)

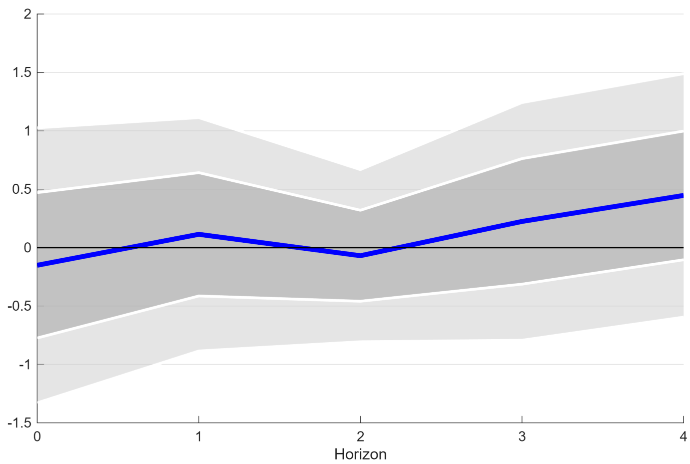
Figure 3: Choropleth maps: Statistically significant regional fiscal multipliers.



(a) GDP per capita



(b) Employment rate



(c) Labor productivity

Figure 4: Aggregate cumulative multipliers. Shaded areas indicate confidence bands (dark shade: 95% level; light shade: 70% level).

Appendix A. Robustness check: Spatial effects (inverse-distance weights matrix).

Table A.1: SLX-type model estimation: Cumulative fiscal multipliers on output.

Region (NUTS2)	$h = 0$	$h = 1$	$h = 2$	$h = 3$	$h = 4$
Galicia (ES11)	3.090***	2.666***	1.858***	1.941***	1.382
Asturias (ES12)	1.844***	2.808***	1.908***	1.818***	2.292***
Cantabria (ES13)	1.845	0.598	1.504*	1.016	1.632
Basque Country (ES21)	1.562***	2.329***	1.972***	1.933***	2.241***
Navarre (ES22)	2.274***	0.781	-0.308	-0.613*	-0.458
La Rioja (ES23)	5.965***	6.336***	6.418***	6.604***	6.803***
Aragon (ES24)	-2.353***	-2.827***	-1.343***	-1.357***	-0.703
Madrid (ES30)	1.144**	1.937***	2.786***	2.203***	2.56***
Castile and León (ES41)	1.740*	3.055	4.480***	3.151***	3.771***
Castile-La Mancha (ES42)	0.448	1.488**	1.527***	1.602***	1.675***
Extremadura (ES43)	1.741*	-2.217	-2.676	-1.623	-2.091
Catalonia (ES51)	1.033	0.588**	0.201	0.003	-0.422
Valencian C. (ES52)	2.572***	1.557**	3.353***	3.82***	4.051***
Balearic Islands (ES53)	4.614***	4.659***	4.976***	5.373***	6.742***
Andalusia (ES61)	0.098	2.078***	2.218***	2.066***	2.920***
Murcia (ES62)	1.356	-0.216	0.452	1.321***	1.452
Canary Islands (ES70)	-8.633	-28.273	-2.308	-21.632	14.217
Spain (ES)	1.851**	1.529	1.622***	1.654	2.488***
CDw	-0.92	-1.65	-1.25	-1.96	-1.68
	(0.357)	(0.099)	(0.212)	(0.05)	(0.092)
F-test	1.08	2.51	1.09	1.09	1.65

Note: h denotes the time horizon over which the cumulative change is computed. The lower panel reports the variant of the CD test for residuals proposed by Juodis & Reese (2022), as well as the effective F-test statistic for weak instruments developed by Olea & Pflueger (2013). P-values are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table A.2: SLX-type model estimation of output multipliers: Spatial lag of government spending.

Region (NUTS2)	h = 0	h = 1	h = 2	h = 3	h = 4
Galicia (ES11)	0.143***	0.182***	0.188***	0.190***	0.226***
Asturias (ES12)	0.036	-0.005	-0.135***	-0.139***	-0.120***
Cantabria (ES13)	-0.418*	-0.192	0.104	0.166	0.200**
Basque Country (ES21)	-0.005	-0.010	0.015	-0.014	0.032
Navarre (ES22)	0.142***	0.051	-0.049	-0.062**	-0.035
La Rioja (ES23)	0.139*	0.145*	0.104	0.116**	0.241***
Aragon (ES24)	-0.924***	-0.704***	-0.477***	-0.431***	-0.336***
Madrid (ES30)	-0.157***	-0.149***	-0.147***	-0.202***	-0.173***
Castile and León (ES41)	0.210*	0.257	0.294*	0.166**	0.171
Castile-La Mancha (ES42)	-0.324***	-0.013	0.037	0.059	0.106*
Extremadura (ES43)	1.280***	0.409	0.821	0.875***	1.156**
Catalonia (ES51)	0.064	0.115**	0.154***	0.144***	0.115***
Valencian C. (ES52)	-0.413***	-0.335***	-0.385***	-0.389***	-0.268***
Balearic Islands (ES53)	0.500***	0.213***	0.270	0.579**	1.272***
Andalusia (ES61)	-0.448***	-0.211	-0.073	0.072	0.000
Murcia (ES62)	-0.297**	-0.417***	-0.439**	-0.079	-0.227
Canary Islands (ES70)	-11.031**	-35.805**	-8.945	-27.144	10.008
Spain (ES)	-0.057	-0.065	-0.022	-0.018	0.035

Note: h denotes the time horizon over which the cumulative change is computed. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table A.3: SLX-type model estimation: Cumulative fiscal multipliers on employment.

Region (NUTS2)	h = 0	h = 1	h = 2	h = 3	h = 4
Galicia (ES11)	4.231***	4.665***	5.265***	5.315***	4.478***
Asturias (ES12)	0.620**	0.337	0.608**	0.716***	1.278***
Cantabria (ES13)	-2.358**	-1.108	0.787**	0.357	0.348
Basque Country (ES21)	3.062***	3.524***	3.685***	3.710***	3.741***
Navarre (ES22)	1.485***	0.873**	1.366***	1.817***	1.835***
La Rioja (ES23)	-0.082	-3.846***	-3.001***	-3.124***	-3.135***
Aragon (ES24)	0.450	0.758	1.922***	2.741***	2.259***
Madrid (ES30)	1.826***	1.105**	2.142***	1.651***	1.093***
Castile and León (ES41)	-0.625	0.555	-0.948	0.113	1.566**
Castile-La Mancha (ES42)	1.375	-0.009	-0.930**	0.382	0.457
Extremadura (ES43)	0.415	0.934	6.294	4.586	1.948
Catalonia (ES51)	-0.243	0.305	0.648	-3.651**	-4.277***
Valencian C. (ES52)	1.049	0.577	1.821***	3.261**	2.940***
Balearic Islands (ES53)	-0.990	-0.011	3.371***	5.800***	2.586***
Andalusia (ES61)	0.557*	0.517	0.177	0.266	0.191
Murcia (ES62)	5.823	2.603***	1.201**	0.560	0.431
Canary Islands (ES70)	16.623	21.721**	20.455***	15.519***	7.991
Spain (ES)	0.981	1.089	1.530	1.450	1.514**
CDw	0.54	0.93	0.20	0.72	-0.31
	(0.59)	(0.35)	(0.84)	(0.47)	(0.76)
F-test	1.50	2.56	1.12	1.05	1.42

Note: h denotes the time horizon over which the cumulative change is computed. The lower panel reports the variant of the CD test for residuals proposed by Juodis & Reese (2022), as well as the effective F-test statistic for weak instruments developed by Olea & Pflueger (2013). P-values are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table A.4: SLX-type model estimation of employment multipliers: Spatial lag of government spending.

Region (NUTS2)	h = 0	h = 1	h = 2	h = 3	h = 4
Galicia (ES11)	-0.257**	-0.021	0.130	0.222***	0.295***
Asturias (ES12)	-0.048	0.041	0.022	0.066**	0.064**
Cantabria (ES13)	-0.115	-0.202***	-0.048	0.045	0.046
Basque Country (ES21)	0.051	0.010	0.018	0.029***	0.011
Navarre (ES22)	0.080	0.030	0.138***	0.082***	0.037
La Rioja (ES23)	0.086	-0.052	-0.065	0.104	0.071
Aragon (ES24)	0.414***	0.368***	0.507***	0.561***	0.443***
Madrid (ES30)	-0.159***	-0.198***	-0.161***	-0.213***	-0.234***
Castile and León (ES41)	0.400**	0.552***	0.538***	0.449**	0.273***
Castile-La Mancha (ES42)	0.069	0.233	0.002	-0.405***	-0.448***
Extremadura (ES43)	-1.047***	-0.477*	-0.625	-0.684	-0.379
Catalonia (ES51)	0.134**	0.078	0.207**	0.588***	0.808***
Valencian C. (ES52)	-0.039	0.242*	-0.104	-0.275*	-0.232**
Balearic Islands (ES53)	-0.198	0.558	0.996***	1.445***	0.857***
Andalusia (ES61)	0.183***	0.085***	0.099***	0.131***	0.134***
Murcia (ES62)	0.554***	0.387***	0.343***	0.296***	0.326***
Canary Islands (ES70)	15.083	22.114**	23.789***	16.897**	7.599
Spain (ES)	0.075	0.048	0.084	0.083	0.051

Note: h denotes the time horizon over which the cumulative change is computed. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table A.5: SLX-type model estimation: Cumulative fiscal multipliers on labor productivity.

Region (NUTS2)	h = 0	h = 1	h = 2	h = 3	h = 4
Galicia (ES11)	1.024	-2.893***	-3.706***	-4.968***	-4.463***
Asturias (ES12)	0.467	1.492***	-0.295	0.168	0.751
Cantabria (ES13)	-5.826	1.853*	0.645	0.268	-0.358
Basque Country (ES21)	-5.318***	-3.463***	-3.155***	-2.920***	-2.833***
Navarre (ES22)	0.174	-0.060	-0.652	-1.693***	-2.950***
La Rioja (ES23)	6.509***	3.434**	2.567***	2.698***	3.869***
Aragon (ES24)	-1.615	-0.146	0.303	0.670	2.434***
Madrid (ES30)	0.022	0.264	0.879	1.429***	2.556***
Castile and León (ES41)	1.721***	2.615***	1.593***	2.017***	2.046**
Castile-La Mancha (ES42)	0.346	2.070***	2.962***	3.426***	3.945***
Extremadura (ES43)	4.182*	-0.478	-2.167	-2.798	-1.384
Catalonia (ES51)	0.717	-1.551*	-3.498**	-4.383***	-4.943***
Valencian C. (ES52)	1.658***	-0.883	-0.700*	-0.759	-1.030
Balearic Islands (ES53)	0.462	1.791	-0.139	1.719	2.985**
Andalusia (ES61)	-0.638	1.185**	0.884***	0.743***	1.191***
Murcia (ES62)	-2.930***	-14.925	-4.790	-0.975	1.475
Canary Islands (ES70)	3.873	-7.168	-7.777	-8.715	-0.051
Spain (ES)	0.490	-0.038	-0.043	0.117	0.111
CDw	-0.57	-1.46	-2.12	-2.13	-1.62
	(0.57)	(0.14)	(0.03)	(0.03)	(0.10)
F-test	0.61	2.51	1.15	1.08	1.59

Note: h denotes the time horizon over which the cumulative change is computed. The lower panel reports the variant of the CD test for residuals proposed by Juodis & Reese (2022), as well as the effective F-test statistic for weak instruments developed by Olea & Pflueger (2013). P-values are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table A.6: SLX-type model estimation of employment multipliers: Spatial lag of government spending.

Region (NUTS2)	h = 0	h = 1	h = 2	h = 3	h = 4
Galicia (ES11)	0.754*	0.096	0.057	-0.161	-0.020
Asturias (ES12)	0.037	0.185***	-0.135	-0.101*	-0.068
Cantabria (ES13)	1.904	0.100	0.207	0.145	0.099
Basque Country (ES21)	-0.284**	-0.127***	-0.094***	-0.064	-0.065***
Navarre (ES22)	-0.006	-0.048	-0.116***	-0.070***	-0.024
La Rioja (ES23)	0.138	-0.069	-0.096	-0.012	-0.057
Aragon (ES24)	-1.324**	-0.376*	-0.555	-0.347	0.148
Madrid (ES30)	0.089	0.110	0.134***	0.164***	0.169***
Castile and León (ES41)	0.013	0.010	0.030	-0.058	-0.106
Castile-La Mancha (ES42)	-0.048	0.008	0.515***	0.713***	0.898***
Extremadura (ES43)	2.146***	1.247***	1.313***	1.642***	1.776***
Catalonia (ES51)	-0.299	0.197**	0.300**	0.192	0.277
Valencian C. (ES52)	-0.243**	-0.319	0.048	0.100	0.166
Balearic Islands (ES53)	0.230	0.670	0.142	0.222	0.295
Andalusia (ES61)	-0.395***	-0.097	0.207**	0.200***	-0.027
Murcia (ES62)	-0.456**	-1.194	-0.431**	-0.586***	-0.616***
Canary Islands (ES70)	3.635	-8.828*	-10.659	-12.178	3.836
Spain (ES)	-0.024	0.044	0.029	0.041	0.050

Note: h denotes the time horizon over which the cumulative change is computed. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Appendix B. Robustness check: Time-varying regional government spending share s_{it}.

Table B.1: Time-varying regional government spending shares: Cumulative fiscal multipliers on output.

Region (NUTS2)	$h = 0$	$h = 1$	$h = 2$	$h = 3$	$h = 4$
Galicia (ES11)	0.153	0.358	-0.012	0.145	0.542*
Asturias (ES12)	0.176	-0.450	-1.270	-1.428*	-1.068
Cantabria (ES13)	3.468***	3.345**	2.391**	1.472***	1.370***
Basque Country (ES21)	1.176***	2.245***	1.207***	1.134**	0.090
Navarre (ES22)	0.274	0.272	-0.113	-0.334	-0.723
La Rioja (ES23)	3.201***	3.141***	2.573**	1.198	0.955
Aragon (ES24)	-0.601**	-1.462	-1.482*	-3.035*	-1.587*
Madrid (ES30)	2.064***	3.073***	3.636***	3.933***	3.602***
Castile and León (ES41)	2.583***	1.089**	0.775	0.251	0.385
Castile-La Mancha (ES42)	2.839	-0.146	-0.439	-0.788	-0.535
Extremadura (ES43)	-0.750	0.517	2.688*	1.850	3.429*
Catalonia (ES51)	2.187	1.602*	1.027***	1.398	1.400
Valencia (ES52)	3.399***	3.527***	2.398**	3.319***	3.796***
Balearic Islands (ES53)	3.156***	3.098***	3.582***	3.258**	3.828***
Andalusia (ES61)	2.693	3.705***	2.774***	4.554***	4.103***
Murcia (ES62)	9.226	2.435**	1.118	0.789***	0.520
Canary Islands (ES70)	0.418	6.532**	1.383***	3.580***	2.988***
Spain (ES)	1.384**	1.799***	1.152***	1.133**	1.241***
CDw	-0.44	-0.23	-1.40	-2.03	-2.02
	(0.66)	(0.82)	(0.16)	(0.04)	(0.04)
F-test	48.96	41.74	42.26	46.39	49.88

Note: h denotes the time horizon over which the cumulative change is computed. The lower panel reports the variant of the CD test for residuals proposed by Juodis & Reese (2022), as well as the effective F-test statistic for weak instruments developed by Olea & Pflueger (2013). P-values are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table B.2: Time-varying regional government spending shares: Cumulative fiscal multipliers on employment.

Region (NUTS2)	h = 0	h = 1	h = 2	h = 3	h = 4
Galicia (ES11)	4.491***	4.343***	3.850***	3.667***	3.264***
Asturias (ES12)	0.799	0.818	-0.506	-0.440	0.646
Cantabria (ES13)	0.850	0.701	0.315	0.051	-0.221
Basque Country (ES21)	2.628***	3.199***	2.931***	2.983***	2.898***
Navarre (ES22)	-3.255	-2.594**	-3.315**	-3.200	-2.252
La Rioja (ES23)	-1.459	4.607*	-1.379	-2.805***	-2.688***
Aragon (ES24)	-0.198	-3.203**	-4.535***	-9.513	-4.499***
Madrid (ES30)	2.343***	3.728***	3.841***	4.305***	4.964***
Castile and León (ES41)	2.348**	-0.498	-0.630	1.239	2.256***
Castile-La Mancha (ES42)	0.495	-0.648	-0.803	-1.126**	-0.464
Extremadura (ES43)	1.531	-0.982	1.135	0.709	0.451
Catalonia (ES51)	1.762	1.951**	1.932**	1.135	1.878
Valencia (ES52)	1.802***	1.188	-0.581	0.562	0.562
Balearic Islands (ES53)	-4.136	0.143	1.741	5.426	1.198
Andalusia (ES61)	0.017	0.596	0.636	2.119***	2.101***
Murcia (ES62)	0.651	0.558	0.300	-0.105	-0.951
Canary Islands (ES70)	0.450	-11.771	0.754	-0.366	-0.433
Spain (ES)	1.056**	1.301	1.183**	1.222	1.114*
CDw	-1.57	-0.56	-0.98	-0.71	-0.84
	(0.12)	(0.57)	(0.33)	(0.48)	(0.40)
F-test	50.87	43.78	46.01	51.77	56.41

Note: h denotes the time horizon over which the cumulative change is computed. The lower panel reports the variant of the CD test for residuals proposed by Juodis & Reese (2022), as well as the effective F-test statistic for weak instruments developed by Olea & Pflueger (2013). P-values are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table B.3: Time-varying regional government spending shares: Cumulative fiscal multipliers on labor productivity.

Region (NUTS2)	h = 0	h = 1	h = 2	h = 3	h = 4
Galicia (ES11)	-5.620**	-3.752***	-2.746***	-2.683***	-2.067***
Asturias (ES12)	2.247*	8.669	0.411	4.553	5.487***
Cantabria (ES13)	1.012	0.405	-0.118	0.002	0.512
Basque Country (ES21)	-2.472***	-2.455**	-3.815	-2.693	-3.960
Navarre (ES22)	2.653	4.215**	4.700**	4.699	5.857
La Rioja (ES23)	3.007***	5.534***	6.434***	6.379***	5.248***
Aragon (ES24)	-2.197**	-1.648*	0.157	8.894	3.393
Madrid (ES30)	-0.137	-0.740*	-0.419	-0.492*	-0.387
Castile and León (ES41)	-2.422	-1.432	-2.336**	-2.836***	-2.344**
Castile-La Mancha (ES42)	-0.897	-0.150	2.033***	2.743***	2.599***
Extremadura (ES43)	-1.192	-1.740*	-1.126	0.134	1.290
Catalonia (ES51)	-1.707	-1.482	-2.793	-1.488	-3.118
Valencia (ES52)	1.403*	1.735*	0.854	0.928*	1.359
Balearic Islands (ES53)	4.881***	6.535***	8.303**	6.557**	7.539***
Andalusia (ES61)	3.815***	1.080	1.666**	1.992	2.336
Murcia (ES62)	0.368	-0.911	0.629	2.299***	4.243**
Canary Islands (ES70)	-0.700	-1.036	-1.487	-1.828	-3.418
Spain (ES)	0.062	0.283	0.270	0.558	1.101
CDw	-0.54	-1.84	-1.41	-0.88	-0.82
	(0.59)	(0.07)	(0.16)	(0.38)	(0.41)
F-test	53.61	45.06	47.98	53.37	58.60

Note: h denotes the time horizon over which the cumulative change is computed. The lower panel reports the variant of the CD test for residuals proposed by Juodis & Reese (2022), as well as the effective F-test statistic for weak instruments developed by Olea & Pflueger (2013). P-values are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Appendix C. Determinants of regional fiscal multipliers.

Table C.1: Potential determinants of regional fiscal multipliers: Variable definition, reference year, and data source.

Variable	Definition	Year	Source
Unemployment	Unemployment rate	2000	BD.MORES
Labor effort	Activity rate	2000	BD.MORES
GDP	Real gross domestic product	2000	BD.MORES
Total population	Number of inhabitants	2000	BD.MORES
Population density	Number of inhabitants per square kilometer	2000	BD.MORES
Bank branches	Number of bank branches per inhabitant	2007	Bank of Spain
Competitiveness	European Regional Competitiveness Index (RCI)	2016	European Commission
R&D expenditure	Total expenditures in R&D, as percentage of GDP	2000	Eurostat
Agriculture share	Employment in agricultural activities, as percentage of total employment	2000	BD.MORES
Openness	Foreign imports plus exports, as a percentage of GDP	2000	ICEX
Public infrastructure	Stock of public infrastructure	2000	BD.MORES
Public debt	Public debt, as percentage of GDP	2000	Bank of Spain
Institutional quality	European Quality of Government Index (EQI)	2010	University of Gothenburg

Table C.2: Kendall's rank correlation coefficients between cumulative fiscal multipliers and their potential determinants.

	GDP			**Employment rate**			**Labor productivity**		
	$h = 0$	$h = 2$	$h = 4$	$h = 0$	$h = 2$	$h = 4$	$h = 0$	$h = 2$	$h = 4$
Unemployment	-0.058	-0.147	0.015	0.279	0.044	-0.015	-0.368**	-0.250	-0.177
Labor effort	0.177	0.206	0.191	-0.103	0.338*	0.338*	0.132	-0.074	-0.353
GDP	0.015	0.074	0.000	0.059	0.529***	0.471***	-0.088	-0.177	-0.279
Total population	-0.015	0.015	-0.029	0.059	0.471***	0.441**	-0.147	-0.206	-0.338*
Population density	0.029	0.147	0.132	0.221	0.397**	0.397**	-0.132	-0.132	-0.235
Bank branches	0.206	0.265	0.132	-0.397**	-0.132	-0.191	-0.338*	0.162	0.177
Competitiveness	-0.191	-0.015	-0.147	0.177	0.294*	0.412**	0.029	-0.059	-0.015
R&D expenditure	-0.154	-0.066	-0.154	0.257	0.346*	0.463**	-0.110	-0.022	-0.125
Agriculture share	0.088	-0.029	0.074	-0.074	-0.309*	-0.309*	-0.015	0.015	0.118
Openness	-0.338*	-0.132	-0.265	0.147	0.471***	0.529***	-0.059	-0.147	-0.191
Public infrastructure	-0.015	-0.044	-0.118	0.059	0.353*	0.294	-0.118	-0.206	-0.279
Public debt	-0.184	-0.213	-0.110	0.139	0.228	0.287	-0.228	-0.228	-0.302*
Institutional quality	-0.265	-0.265	-0.015	-0.132*	-0.132	-0.162	-0.460**	-0.221	0.000

Note: h denotes the time horizon over which the cumulative change is computed. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.