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LOCAL AUTONOMY AND GOVERNMENT SPENDING MULTIPLIERS: EVIDENCE FROM EUROPEAN REGIONS

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JEL Classification: E12, E32, E62, F33, R12

Keywords: Fiscal Decentralization, public spending hypothesis, local autonomy index, elasticity of output to changes in government spending, multipliers, New Keynesian model of a monetary union

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Local Autonomy and Government Spending Multipliers: Evidence from European Regions*

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September 2019¶

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Using a panel of 268 European regions during 1990-2014, we document that the degree of local autonomy has a significant effect on the government spending multiplier. Measured with the "Local Autonomy Index" constructed by a panel of experts under the auspices of the European Commission, the estimated effect of regional government spending on regional output is on average close to zero in countries with the lowest degree of local autonomy, while it is around one in countries with the highest degree of local autonomy. Consistent with literature, we find that regional government spending multipliers are state dependent: larger when labor markets are slack and output is below trend than when labor markets are tight and output is above trend. Greater local autonomy increases the multipliers in all states, and more so when labor markets are slack and output is below trend. To explain the empirical findings, we build a DSGE model where both local and central government spending contributes to a public good that enhances productivity of the private sector.

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1 Introduction

Politeia (πολιτεία) is an ancient Greek word used by philosophers such as Plato and Aristotle. It derives from the word polis ("city-state"), and is principally related to the form of government. Ober (2016) for example argues that the economic expansion of ancient Greece, was due to its political system which was largely decentralized and democratic, instilling in people the attitude that the government was working for them, rather than against them.

The global financial crisis and the subsequent sovereign debt crisis questioned severely the integrity of European Integration. After winning a majority in the 2011 Scottish Parliament election, the Scottish National Party pressed for an independence referendum. In 2014, Scots voted 55 percent to 45 percent to remain in the United Kingdom. Separatist politicians in Catalonia have been pushing for independence from Spain. Both Flemish parties in the Belgian parliament demand independence. While movements of independence also gain ground in Lombardy and Veneto in Italy. All these movements resuscitate questions such as: What should be the best form of government in Europe? Is local autonomy a solution? Should we consider the "United Politeias of Europe" as the new model of governance?

We make two contributions to this debate. Our first contribution is empirical: we provide estimates of regional government spending multipliers for European regions and show how these multipliers depend on the degree of local autonomy. We use a standard panel model to estimate the effect that regional government spending has on regional gross value added (GVA). Two main novelties of our empirical analysis are as follows. First, we measure the degree of local autonomy with a novel index, the so-called "Local Autonomy Index". This country-specific index was constructed by a panel of experts under the auspices of the European Commission. The index not only encompasses fiscal autonomy, but also legal, organizational, institutional and policy autonomy as well. To our knowledge, we are the first to use this dataset on local autonomy to estimate how regional government spending multipliers vary with the degree of local autonomy. This is a more comprehensive measure of local autonomy than measures based on sub–national expenditures and revenues relative

to the government expenditures and revenues. Second, to overcome the lack of data on regional government spending, we use regional gross value added of the non-market sector as a proxy for regional government spending. We show that government spending in the national accounts is closely linked to the gross value added of the non-market sector, and demonstrate that the statistical properties of the two time series are very similar at the national level.

Our main empirical finding is that the regional government spending multiplier is significantly increasing in the degree of local autonomy. The direct effect of local autonomy on output is statistically insignificant. Local autonomy only affects output via its interaction with regional government spending. The estimated coefficients imply that at the sample mean of the local autonomy index, the impact multiplier is about 0.3, and the cumulative multiplier is about 0.7. At the sample minimum of the local autonomy index, both the impact and the cumulative multipliers are close to zero. At the sample maximum of the local autonomy index, the impact multiplier is 0.5 and the cumulative multiplier is 1.1.

The empirical part of the paper contains three further results that are noteworthy. First, the estimated multipliers are larger when controlling for the quality of the local government. Second, multipliers are larger during recessions than expansions. Third, estimating the econometric model based on country-level data yields larger government spending multipliers than estimating the model based on regional data.

In order to shed some light on the public good mechanism, we provide estimates of the effects that local government spending has on the capital stock and total factor productivity. Our panel data model estimates show that local government spending has a significant positive effect on capital. And this effect is significantly increasing in local autonomy. For TFP the results are less clear. The estimated coefficient on the interaction between government spending and local autonomy is positive but the estimate is imprecise; we cannot reject the null of a zero effect of local autonomy on the impact that government spending has on total factor productivity at the conventional significance levels.

Our second contribution is a theoretical model. Following Barro (1990) and Aschauer (1989a), we assume that the government provides public goods that affect the productivity of the private sector. An innovation of our model is that both, local and central government, contribute to the production of the public goods. We interpret the weight parameter on local government spending in the production function of the public good as a measure of the degree of local autonomy. Local and central government spending are imperfect substitutes in the production function of the public good. Both local and central government spending are financed through lump-sum taxes at the central government level. Financial markets are assumed to be complete and prices to be sticky. The price stickiness ensures that government spending at any government level generates a demand effect that stimulates output. At the same time, the increase in government spending generates an additional expansionary effect on output. This is because increases in government spending increase the production of public goods that enhances productivity of the private sector. In the theoretical model, as long as the public good is productive, multipliers at the local and at the country level are an increasing function of the degree of local autonomy.

Our results are line with the "Decentralization Theorem" of Oates (1972) that establishes the superiority of decentralized public good provision over the centralized case. The conclusion that decentralized governments will provide the efficient level of public goods has been tested extensively with data. Yet, there is no clear cut answer in the existing literature: results depend on the specific index used to measure decentralization, the case study, and the economic variable used to assess the effects of decentralization. The results of empirical studies on the impact of fiscal decentralization on economic growth that have been conducted on a cross-country analysis end up with controversial results[1]. Empirical results concerning the impact of decentralization on economic growth for individual countries are not less ambiguous than those detected in the studies among countries.[2] Feld and Schnellenbach (2016)

[1]See, for example, Oates (1995), Phillips and Woller (1997), Davoodi and Zou (1998), Thieben (2000, 2003), Iimi (2005), Brueckner (2006),and Thorton (2007) among others.

[2]For instance, Jin and Weingast (2005),argue that decentralization was an important contributing factor to rapid economic growth in China since the early 1980s. In contrast, Blanchard and Shleifer (2000) argue

offer a survey of these empirical studies, and also use a quantitative meta-analysis to explore the size of the effects and to evaluate their significance. They conclude that the positive relationship between decentralization and public good provision and growth mainly holds for developed countries, while for developing countries the link between decentralization and growth is weak.

The remainder of the paper is organized follows. In Section 2, we present the data and in Section 3 the empirical model. Section 4 discusses the empirical findings and provides extensive sensitivity analysis. Section 5 presents the theoretical model. Section 6 concludes.

2 The Data

2.1 The Local Autonomy Index

A basic obstacle to analyze the macroeconomic effects of fiscal autonomy from an empirical standpoint is its measurement. Ideally, fiscal autonomy or decentralization measures should take into account its multi-dimensional nature, including political, institutional and organizational aspects. But it also should look at both sides of the budget (expenditure and tax decentralization) and the actual degree of autonomy given to sub-national governments over tax and spending decisions.

However, the existing literature uses measures of fiscal decentralization based on the expenditure and tax revenue ratios: the share of sub-national government expenditures/revenues in general government expenditures/revenues; net of intergovernmental transfers. Some authors adopt alternative measurements for the independence of sub-national level governments, such as, the self-reliance ratio, measured as the share of own local revenues in total revenues (See, e.g., Oates (1995)); and the share of grants over revenues (See, e.g., Rodden (2002)). Yet, larger sub-national revenue and spending shares do not necessarily mean greater local autonomy. Thus a unified index of fiscal decentralization is desirable.

that local governments retarded growth in Russia in the 1990s.

For this reason in the current study we use the Local Autonomy Index, which was constructed by a panel of experts under the auspices of the European Commission, and which is available in annual basis from 1990 to 2014 (Ladner and Baldersheim (2015)) to measure the degree of local autonomy within the European Union. This measure of decentralization goes beyond the share of funds managed by local authorities and captures the extend to which local authorities can decide on how to spend these funds. The conceptualization of the Local Autonomy Index follows closely the methodology of the Regional Authority Index constructed by Hooghe et al. (2010).[3]

We describe now the Local Autonomy Index (LAI) in more detail. The code book for the index contains 11 variables: 1) Institutional depth, 2) Policy scope; 3) Effective political discretion; 4) Fiscal autonomy 5) Financial transfer system; 6) Financial self-reliance; 7) Borrowing autonomy; 8) Organizational autonomy; 9) Legal protection ; 10) Administrative supervision and 11) Central or regional access.

1. *Institutional depth (ID).* This index refers to the extent to which a local government is formally autonomous and has a choice regarding which tasks to perform. The overall *ID* scores range from 0 to 3: '0 = local authorities can only perform mandated tasks' and '3 = local authorities are free to take on any new tasks (residual competences) not assigned to other levels of government'.

2. *Policy scope (PolS).* This index measures the range of functions (tasks) where the local government is effectively involved in the delivery of the services, be it through own financial resources and/or through own staff. Ladner and Baldersheim (2015) chose the main public policies that European local governments are responsible for—primary education, social assistance, primary health services, land use, public transport, housing, police and caring functions. The score 0 stands for 'not at all', 0.5 for partly and 1 for fully responsible. The scores are added up, and normalised such a way that

[3]Some adaptions were made to capture the specific characteristics of local authorities and additional variables are included relative to Hooghe et al. (2010) and the data is produced in a form that the two indexes can be easily matched.

the overall *PolS* score is between 0 and 4.

3. *Effective political discretion (EPD).* This index refers to the extent to which a local government can decide on service aspects of the same 8 public functions defined in the previous index. Local authorities may have no (0), some (0.5) or real authoritative control (1) over the 8 tasks. The scores are added up across the 8 aspects of public services, and normalised such a way that the overall *EPD* score is between 0 and 4.

4. *Fiscal autonomy (FIN).* This index represents the extent to which local governments can independently tax its population. It ranges from '0 = local authorities set base or rate of minor taxes' to '4 = local authorities set base and rate of more than one major tax (personal income, corporate, value added, property or sales tax)'. The overall *FIN* score is between 0 and 4.

5. *Financial transfer system (FTS).* This index indicates the proportion of unconditional financial transfers to total financial transfers received by the local government. It ranges from '0 = conditional transfers are dominant (unconditional = 0–40% of total transfers)' to '3 = nearly all transfers are unconditional (unconditional = 80–100%)'. The overall *FTS* score is between 0 and 3.

6. *Financial self-reliance (FSR).* This index measures the proportion of local government revenues derived from own/local sources (taxes, fees, charges). It ranges from '0 = own sources yield less than 10% of total revenues' to '3 = own sources yield more than 50%'. The overall *FSR* score is between 0 and 3.

7. *Borrowing autonomy (BA).* This index refers to the extent to which local government can borrow. It ranges from '0 = local authorities cannot borrow' to '3 = local authorities may borrow without restriction imposed by higher-level authorities'. The overall *BA* score is between 0 and 3.

8. *Organizational autonomy (OA).* This index depicts the extent to which local govern-

ments are free to decide about their own organization and electoral system. It ranges from '0 = local executives are appointed by higher-level authorities and local authorities cannot determine core elements of their political systems (electoral districts, number of seats, electoral system)' to '4 = executives are elected by the citizens or the council and the municipality may decide some elements of the electoral system, and local authorities hire their own staff, fix the salary of their employees, choose their organizational structure and establish legal entities and municipal enterprises'. The overall OA score is between 0 and 4.

9. *Legal protection (LP).* This index refers to the existence of constitutional or legal means to assert local autonomy. It ranges from '0 = no legal remedy for the protection of local autonomy exists' to '3 = remedies of constitutional clauses or statutory regulations and recourse to the judicial system, plus other means that protect local autonomy such as e.g. listing of all municipalities in the constitution or the impossibility to force them to merge'. The overall LP score is between 0 and 3.

10. *Administrative supervision (AS).* This index represents the unobtrusive administrative supervision of local government. It ranges from '0 = administrative supervision reviews legality as well as merits/expediency of municipal decisions' to '3 = there is very limited administrative supervision'. The overall AS score is between 0 and 3.

11. *Central or regional access (CRA).* This index measures the extent to which local authorities are consulted to influence higher-level governments' policy-making. It ranges from '0 = local authorities are never consulted by higher-level governments and there are no formal mechanisms of representation' to '3 = local authorities are either consulted or have access to higher-level decision-making through formal representation; and substantial influence'. The overall CRA score is between 0 and 3.

The Local Autonomy Index (LAI) is a weighted average of the above 11 indexes

$$LAI = \frac{1}{13}\left(\frac{LA}{3} + 2\frac{OA}{4} + 2\frac{PS}{4} + 3\frac{ID + 3EPD}{16} + 3\frac{3FIN + 3FSR + BA}{16} + \frac{FTS + AS}{7} + \frac{CRA}{3}\right)$$

The weights in the formula were determined by the panel of experts. To divide the sum in the bracket by 13 makes the value of LAI to be between 0 and 1. The higher is the index, the more autonomy the local authorities have. The level of coding varied from country to country depending on the nature of local autonomy. In a unitary country where all municipalities have the same autonomy, all variables and the Local Autonomy Index have the same value at municipal, regional and country level. In other countries there are asymmetries across municipalities or regions within country. Given the heterogeneity in terms of avaliable level of aggregation across countries in the dataset, we decide to use the country level Local Autonomy Index. Thus, we assigned the country level Local Autonomy Index to each region of that country in each year. This country level index was either countructed as such, or if the index was constructed at the lower terrritorial level, it was aggregated from the lower to higher territorial level with population weights.

2.2 Regional European Data

Our regional data come from Cambridge Econometrics' European Regional Database (ERD), which is a highly disaggregated dataset across both sectoral and sub-regional dimensions. Eurostat's REGIO database is the primary source of data for the ERD. The database consists of a wide range of economic and demographic indicators for the EU28 and Norway[4]. The data is published at the NUTS3 level of disaggregation although some indicators are limited to the NUTS2 level. The ERD uses the NUTS 2010 regional classification and the 2010 version of the European System of Regional and National Accounts (ESA2010). The dataset includes among others Gross Value Added (GVA), Gross Domestic Product (GDP), and Gross Fixed Capital Formation (GFCF), and hours worked by six sectors. The six

[4]We exclude Switzerland and Norway from our regression analysis.

sectors are (1) Agriculture, forestry and fishing, (2) Industry excluding construction, (3) Construction, (4) Wholesale, retail, transport, accommodation & food services, information and communication, (5) Financial & business services (6) Non-market services. ERD data is annual and covers the period 1980-2014 for old member states of the EU (countries joined up until 1995) and 1990-2014 for the new member states of the EU (countries joined after 1995).

ERD is constructed in such a way that the country aggregates of its various time series equal to the corresponding time series in the AMECO dataset, the macroeconomic dataset provided by the European Commission's Directorate General Economic and Financial Affairs (DG EcFin). The ERD includes only real variables expressed in 2005 constant price euros. They were obtained by deflating the nominal variables using price deflators from the AMECO dataset. However, the sectoral price deflators from AMECO are limited in disaggregation to national data only for agriculture and industry excluding construction and services. This means that, for any given country, the price index for any sub-sector within industry or services will be the same as a result of the limitations in consistent data availability.

2.3 Regional Government Spending data

Ideally, we would like to use real "final consumption expenditure of general government" (henceforth, government spending). Unfortunately data on government spending is not available at the regional level. However, real value added of the non-market sector is available, and we will use it as a proxy for government spending. We do so, since we argue that there is a close link in the national accounts between government spending and the value added of the non-market sector. Moreover, we demonstrate with country level aggregate data that the value added of the non-market sector is indeed a good proxy for government spending.

First we establish the link between government spending (final consumption expenditure of general government) and the value added of the of the non-market sector in the national accounts. (see Lequiller and Blades (2014) for more detail). The non-market sector in ERD

consists of the following sub-sectors: "Public administration and defense", "Education", "Human health and social work", "Arts, entertainment and recreation", "Other service activities" and "Activities of household and extra-territorial organizations and bodies". The value added of the first sub-sector, "Public administration and defense", is the value added of the general government. The next two sub-sectors, "Education" and "Human health and social work", are closely linked to the government in the national accounts, while the last three linked only loosely. The system of national accounts define government spending as

Final consumption expenditure of general government
=Gross value added of the general government
+Intermediate inputs of the general government
+Social transfers in kind purchased market production
−Market output and output for own final use
−Payments for non-market output

The difference between government spending and the gross value added of the general government is largely due to intermediate inputs and social transfers in kind. However, intermediate inputs and social transfers in kind constitute government purchases from "Education" and "Human health and social work". Hence government purchases generate primarily the value added of these two sectors in addition to the value added of "Public administration and defense.

However, it is still an empirical question to what extent the value added of the non-market sector is a good proxy of government spending. To answer the question we turn now to the time series properties of the national time series of the value added of non–market sector and government spending. The government spending data come from the AMECO database, while the value added of non–market sector comes from the ERD from where we use the national aggregates. The correlation between value added of non–market sector per hour and government spending per hour is 0.987 while the correlation between the log of these two variables are 0.981. We regressed government spending per hour on the value added of

non–market sector per hour with and without country and time fixed effects. We also run the regressions in logs. All six regressions indicate a significant and strong relationship between these two variables. The regression coefficients are statistically significantly different from zero at the 1% level (See Table 1).

3 Econometric Model

Our baseline econometric model is:

$$\ln(y_{it}) = a_i + b_t + \phi \ln(y_{it-1}) + \alpha \ln(g_{it}^{cyc}) + \beta \ln(g_{it}^{cyc}) \cdot LAI_{it} + \gamma LAI_{it} + u_{it}, \qquad (1)$$

where i, denotes region i at the NUTS2 level; t, denotes year t; $\ln(y)$, is the natural logarithm of value added per hour; $\ln(g^{cyc})$, is the variation in government expenditures per hour that is exogenous to output per hour (see equation (2), below); LAI, is a measure of local autonomy (the Local Autonomy Index); a_i, are region fixed effects and b_t, are year fixed effects.

We generate variations in government expenditures that are exogenous to output by estimating the following equation:

$$\ln(g_{it}) = c_i + d_t + \theta \ln(y_{it}) + r_{it} \qquad (2)$$

where $g_i^{cyc} = \hat{r}_{it}$ is the residual obtained from estimating equation (2). In equation (2), we instrument output by the interaction between the natural logarithm of the international oil price and region's average value added share of industrial production. For an example of a related paper that uses variation in the international oil price as an instrument for output when computing exogenous variation in government spending, see Fatas and Mihov (2013).

In dynamic panel models with fixed effects, as in equation (2), least squares estimates are biased (see e.g. Wooldridge (2002)). To avoid that bias we instrument $\ln(y_{it-1})$ with the lag of its first difference. To assess instrument quality we compute the Kleibergen Paap

F-statistic. The F-statistic on the null hypothesis that the first-stage coefficient on the lagged first difference is equal to zero is around 64. According to Stock and Yogo (2005), we can reject that the maximal IV size distortion is larger than 10 percent at the 5 percent significance level.

Differentiating in equation (2) $\ln(y)$ with respect to $\ln(g^{cyc})$, one obtains an impact (period t) and a cumulative (long-run) elasticity:

$$\varepsilon^{impact} = \alpha + \beta LAI_{it} \qquad \varepsilon^{cumulative} = \frac{\alpha + \beta LAI_{it}}{1 - \phi} \tag{3}$$

The coefficient α measures the impact elasticity when LAI=0. The coefficient β measures how this elasticity changes when LAI, the local autonomy index increases. The government spending multipliers are calculated by multiplying the elasticities in (3) with the inverse of the average share of government spending in GVA

$$\left.\frac{dy}{dg^{cyc}}\right|_i = \varepsilon^i \frac{y}{g^{cyc}} \qquad i \in \{impact, cumulative\}. \tag{4}$$

For a kernel density plot of the LAI and the share of government spending in GVA see Panels A and B of Appendix Figure 1, respectively.

4 Results

4.1 Baseline Model Estimates

Table 2 reports estimates of the baseline model. The table shows that the estimated coefficient α is negative and significantly different from zero at the 5 percent level while the estimated coefficient β is positive and significantly different from zero at the 1 percent level. The positive β suggests that the impact of government spending on output is increasing in local autonomy. The coefficient γ is not significantly different from zero at the conventional significance levels. Since γ measures the effect of a 1-unit change in LAI on the natural logarithm of output

when government spending is zero (which per construction is the case at sample mean), the interpretation is that on average there is no significant relationship between output and local autonomy. Local autonomy only impacts output through its interaction with government spending. The estimated coefficients imply that at sample mean of the local autonomy index, a 1 euro increase in government spending per hour increases output per hour by around 0.29 euros on impact. The cumulative effect is larger, 0.68 euros. The interquartile range of the government spending multiplier is $[0.21, 0.35]$ on impact, and $[0.48, 0.82]$ cumulatively.

Figure 1 plots regional government spending multipliers based on the estimates in Table 2. On the y–axis of Figure 1 is the effect of regional government spending per hour on regional output per hour (dy/dg^{cyc}); on the x–axis are sample values of the local autonomy index. The figure shows that at sample minimum of the local autonomy index the regional government spending multiplier is close to zero. As the local autonomy index increases, the regional government spending multiplier increases. At sample maximum of the local autonomy index the impact multiplier is around 0.5; the cumulative multiplier is around 1.1. At sample mean of the local autonomy index the impact multiplier is around 0.3; the cumulative multiplier is around 0.7.

4.2 Controlling for Government Quality

The response of private demand to a fiscal intervention may also depend on the quality of government and institutions. In this section we discuss estimates when we add an interaction term between government spending and the quality of government to the baseline model. Our measure of the quality of government is the European Quality of Government Index (EQI). This index is based on survey data on corruption and governance at the regional level within the EU. The data focus on both perceptions and experiences with public sector corruption, along with the extent to which citizens believe various public sector services are impartially allocated and of good quality.[5] It is the first source of data to date that allows

[5]With the support of Directorate-General for Regional Policy of the European Union, two rounds of surveys has been carried out. The first one was carried out in 2010 when 34000 citizens were surveyed across

researchers to compare quality of government within and across countries in such a multi-country context. The index is reported for 2010 and 2013 when the two rounds of surveys have been conducted. We took the average of the two indexes. The final index is between 0 and 1 where quality of government is increasing in the value of the index. This variable is time-invariant. Consequently in the model with fixed effects we only include the interaction term (the effect of EQI is absorbed by the fixed effects).

Table 3 reports the relevant estimates. One can see that the estimated β coefficient is almost identical to Table 2. The coefficient on the interaction between government spending and EQI is significantly positive. Specifically, this coefficient is 0.21. It can be interpreted as follows: a one standard deviation (0.18) increase in the quality of government raises the regional output elasticity of regional government spending by around 4 percentage points. If Greece, for example, were to improve its average EQI (0.37) to the average EQI prevalent in Germany (0.72) it would result in an increase of the regional output elasticity of regional government spending by around 8 percentage points; this amounts to an increase of the regional government spending multiplier of around 0.4 units. Thus, overall, the results in Table 3 suggest that regional government spending multipliers are an increasing function of local autonomy and government quality.

4.3 State-Dependent Multipliers

A number of empirical papers have documented that government spending multipliers are state dependent (see e.g. Auerbach and Gorodnichenko (2012); Brueckner and Tuladhar (2014); Nakamura and Steinsson (2014); Ramey and Zubairy (2018)). In this section we

European regions, and the second one was carried out in 2013 when 85000 citizens were surveyed. The samples were constructed in such a way that they allowed to construct QoG indexes at the NUTS2 regional level for 24 EU countries. There were sixteen survey questions incorporated in the regional QoG indexes which can be divided into three groups. The first group is the "Quality Pillar" which includes questions on citizens' perception about the quality of government services, about trustworthiness of local media and corruption in local elections. The second group is the "Impartiality Pillar" which includes questions on citizens' perception about impartiality of government services, that is, equality in access to government services. The third group is the "Corruption Pillar" which includes questions on citizens' perception about their experience with corruption in government services. Answer to these sixteen questions are aggregated to one index both in 2010 and 2013. For more details about the surveys and the methodology see Charron et al. (2014, 2015).

examine how the effects of regional government spending on regional output depend on the state of the economy and the degree of local autonomy.

4.3.1 Expansions vs. Contractions

We define expansions (contractions) as those periods when output is above (below) its region-specific trend. That is, we estimated $\ln(y_{it}) = a_i + a_i t + b_t + e_{it}$ and then obtained the de–trended, i.e. residual, output series, $\hat{e}_{it}$. Output expansions are those periods in which $\hat{e}_{it} > 0$; contractions are when $\hat{e}_{it} < 0$.

Table 4 shows that the regional output effects of regional government spending are larger during contractions than expansions. To start with, the estimated α is negative and significantly different from zero at the one percent level in expansions, while it is positive and significantly different than zero at the five percent confidence level in contractions. Moreover β is also estimated to be positive and significantly different than zero at the five percent confidence level. As a result, at sample mean of the LAI, during contractions the impact multiplier is around 0.7 while during expansions it is around -0.6. Thus, the first result of Table 4 is that the regional government spending multiplier is nearly 1.3 units larger during contractions than expansions.

One can also see from Table 4 that local autonomy raises the government spending multiplier in both states. At sample minimum of the LAI, the impact output multiplier is around 0.4 during contractions; during expansions it is around -0.8. At sample maximum of the LAI, the impact multiplier is around 0.8 during contractions and -0.4 during expansions. Figure 2A visualizes the difference in the regional government spending multiplier for expansions and contractions across sample values of the LAI.

4.3.2 Slack vs. Tight Labor Markets

We now examine how the effects of local government spending on regional output differ depending on slack in the labor market. Our (inverse) proxy for slackness in the labor market

is the employment rate. We split the sample into observations with above mean employment rates (tight labor market) and below mean employment rates (slack labor market).

Table 5 shows that slackness in the labor market increases the spending multiplier. In region-years with below mean employment rates, the impact multiplier is around 0.7 at sample mean of the LAI. In region-years with above mean employment rates, it is around 0.2.

One can also see from Table 5 that slack in the labor market raises the effect that local autonomy has on the multiplier. At sample minimum of the LAI, the impact multiplier is around 0.2 in region-years with below mean employment rates; in region-years with above mean employment rates the multiplier is around 0. At sample maximum of the LAI, the impact multiplier is around 1.0 in region-years with below mean employment rates; while in region-years with above mean employment rates the multiplier is around 0.3. Figure 2B visualizes the difference in the regional government spending multiplier for slack and tight labor markets across sample values of the LAI.

4.4 Country vs. Regional Data

In this section we examine how effects differ depending on whether country or regional data are used for the estimation. Regional data enables to estimate a regional effect; country data enables to estimate a country–wide effect. The country–wide effect could be larger than the regional effect because of positive spillovers that arise from interregional trade, labour and capital flows: local government spending raises output of a region (as found in our baseline analysis), and this might have positive effects on the output of other regions.

Panel A of Table 6 shows results based on country data, and for comparisons, Panel B shows results based on regional data. The β coefficients are slightly larger in Panel A than in Panel B. Standard errors on β are also larger in Panel A than in Panel B.[6] In terms of the average impact elasticity of government spending on output: country level data suggests

[6]This is expected since there are a lot more observations when regional data are used compared to country data.

that it is around 8 percent while regional data suggests that it is around 6 percent. In terms of government spending multipliers: country level data shows that the average impact (cumulative) multiplier is 0.37 (1.84); with regional data the average impact (cumulative) multiplier is around 0.14 (0.31). At the 75th percentile of the LAI, the impact (cumulative) multiplier is around 0.4 (2.1) based on country level data and around 0.2 (0.4) based on regional data.

Overall, the message from Table 6 is that regional estimates are a lower bound of the positive effect that local autonomy has on the government spending multiplier. Figure 3 visualizes the country-wide and regional government spending multiplier across sample values of the LAI. One can see that across all values of the LAI index the country-wide multiplier is larger than the regional multiplier.

4.5 Effects on Capital and Total Factor Productivity

In order to evaluate how local government spending impacts on private output, in this section we examine the effects of local government spending on capital and total factor productivity.[7] The government can have a direct effect on TFP, or can facilitate the accumulation of private capital. To investigate this hypothesis we re-estimate equation (1) substituting gross value added for private capital per hour and TFP. Table 7 shows estimates of the β coefficient as well as the elasticity effects at LAI mean, median and its interquartile range. Figure 4 plots the elasticity effects across the sample range of the LAI. The β coefficient is positive for both capital and TFP. The coefficient is larger for TFP than for capital; however it is less precisely estimated for TFP. Only for private capital we can reject that the β coefficient is significantly different from zero at the conventional significance levels. This suggests that the impact of local government spending on private capital is significantly increasing in local government's autonomy; for TFP, although the documented relation is still increasing, the

[7]TFP is calculated as a residual with a capital share of 0.3: $TFP = \ln(Y) - 0.3\ln(K) - 0.7\ln(L)$, where Y is GVA, K is capital and L is hours worked. Capital is calculated from the regional investment series with the perpetual inventory method, depreciation, $\delta = 0.06$.

message is less clear as the coefficient is imprecisely estimated.

Hence, looking back at the results of Aschauer (1989b), our results suggest that public services - such as law and order, or public administration – are likely to bear a complementary relationship to private capital. Specifically, a higher level of public services of this type is expected to raise the marginal product of private capital in more decentralized regions. In the thoeretical model we develop below we incorporate this externality in the production function.

4.6 Financial Autonomy vs Institutional Autonomy

The mutual interdependence between economic and institutional aspects of local autonomy makes it hard to isolate them empirically. Institutional aspects are necessary to understand fiscal intergovernmental relationships, and constitutional guarantees are essential to distinguish autonomy from decentralization. In this section, we attempt to disentangle financial from institutional autonomy using the different variables in the Code Book of the *LAI* data. We described these variables in Section 3.1

We construct the Financial Autonomy Index as a weighted average of fiscal autonomy, financial self-reliance, borrowing autonomy and financial transfer system.[8] Similarly, we construct the Institutional Autonomy Index as a weighted average of organizational autonomy, institutional depth, policy scope and effective political discretion.[9]

By definitions, the Financial Autonomy Index captures the extent to which local governments can raise their own revenue, have their own tax base, borrow and receive unconditional transfers from the central government. The Institutional Autonomy Index expresses the extent to which local governments are free to decide about their own organization, are

[8]We use the same weights used from the Code Book when constructing the Local Autonomy Index. The weights reflect the panel of experts opinion about the importance of each aspect of financial autonomy to overall financial autonomy of local governments. Specifically, Financial Autonomy Index=(9·Fiscal Autonomy+9·Financial Self–reliance+3·Borrowing Autonomy+Financial Transfer System)/75.

[9]Again we use the respective weights from the Code Book for constructing the Local Autonomy Index. The weights reflect the panel of experts opinion about the importance of each aspect of financial autonomy to overall financial autonomy of local governments. Specifically, Institutional Autonomy Index=(2·Organizational Autonomy+3·Institutional Depth+2·Policy Scope+ 9·Effective Political Discretion)/61.

autonomous in the choice of the tasks they want to perform, have a range of tasks where they are effectively involved, and, finally, have an influence about how they want to carry out those tasks.

Figure 5 shows how the relationship between government spending and output varies as a function of: (i) financial autonomy (FA); (ii) institutional autonomy (IA).

The figure is based on the estimates of an econometric model that includes two interaction terms, government spending times a financial autonomy index; and government spending times an institutional autonomy index:

$$\ln(y_{it}) = a_i + b_t + \alpha \ln(g_{it}) + \beta_1 \ln(g_{it}) \cdot FA_{it} + \beta_2 \ln(g_{it}) \cdot IA_{it} + \gamma_1 FA_{it} + \gamma_2 IA_{it} + u_{it}$$

Specifically, Figure 5 shows on the $y-$axis $(\alpha + \beta_1 FA_{it})$ and $(\alpha + \beta_2 IA_{it})$; on the $x-$axis are FA and IA.

According to Figure 5 the effectiveness of government spending increases with both financial autonomy and institutional autonomy; however, the slope is steeper for financial autonomy. This suggests that financial autonomy matters more for the relationship between government spending and output than institutional autonomy. Greater financial autonomy increases the impact that regional government spending has on regional output, and more so than institutional autonomy.

5 How can local autonomy affect government spending multipliers? A theoretical model

In this section, we sketch a theoretical framework to help us interpret our empirical findings. The model we develop shares a lot of similarities with the model developed in Nakamura and Steinsson (2014) (and earlier work by Pappa and Vassilatos (2007); Benigno and Benigno (2003); Gali and Monacelli (2008) and Corsetti et al. (2017)). We differentiate from the

existing literature by modeling local autonomy and investigating how it affects spending multipliers in our theoretical framework.

The economy is a monetary union which consists of two regions, home and foreign, each populated by a continuum of identical, infinitely lived agents. The population of the entire economy is normalized to one. The population of the home region is denoted by n . Regions are otherwise symmetric. The representative household in each region is endowed with one unit of time, and derives utility from consuming a basket of goods produced in both regions. There is no migration, so households supply labor and capital to domestic firms only. Time is discrete. Firms produce output using capital and labor inputs. We assume that the local public good affects firms' productivity positively. Firms and households make their decisions after observing the government spending shocks. Financial markets are complete. That is, all agents have access to the financial market of the monetary union, where they can trade state-contingent nominal bonds. Monetary policy is conducted at the union level by a central bank who sets the union-wide interest rate. Tax collection is also achieved at the union level, while regional spending is split between the regional and the central government and its entirely financed by transfers at the central level. The public good is produced using regional and central spending as inputs. The weight parameter of regional spending in the production technology of the local public good defines the degree of local autonomy. For countries with a lot of autonomy this parameter is high, while in countries that are more centralized the public good is produced mostly through spending by the central government. Below, we describe the economy of the home region.

Households

There is a large number of households in each region. The utility of the home region's household is characterized by:

$$E_0 \sum \beta^t u(C_t, L_t) \tag{5}$$

where $0 < \beta < 1$, stands for the household's discount factor, consumption of the composite good is denoted by $C_t > 0$, $0 < L_t < 1$ stands for hours worked and E is an expectation operator. Households own the capital stock, they choose how much to invest and the rate of utilization of the capital stock. If $\tilde{K}_t$ denotes the physical stock of capital available for use in period t and I_t the amount of investment chosen by the household in period t. The capital stock evolves according to:

$$\tilde{K}_{t+1} = (1-\delta)\tilde{K}_t + \Phi(I_t, I_{t-1}) \tag{6}$$

where δ denotes the capital depreciation rate in the steady state and $\Phi(I_t, I_{t-1})$ are adjustment costs in investment. The effective capital is related to the capital stock by $K_t = u_t\tilde{K}_t$, where u_t denotes capital utilization.

The purchase of consumption and investment goods is financed by after-tax labor and capital income, profit income, and lump-sum transfers. The household has also access to the union financial market, where state-contingent nominal bonds can be traded.[10] The household faces the period–budget constraint given by:

$$P_tC_t + P_tI_t + P_tCC(u_t)\tilde{K}_t + E_tQ_{t,t+1}D_{t+1} \leq (1-\tau_t)W_tL_t + R_t^k u_t\tilde{K}_t + D_t + \Pi_t + T_t \tag{7}$$

where P_t is the price level, D_{t+1} is the holdings of the state–contingent nominal bond that pays one unit of currency in period $t+1$ if a specified state is realized, $Q_{t;t+1}$ is the period$-t$ price of such bonds, W_t is the nominal wage rate, τ_t, is a tax on labor income levied by the central government, Π_t is profit income from the monopolistic competitive domestic firms, and T_t is a lump-sum transfer. Finally, $CC(u_t)$ is a convex function associated with utilizing the capital stock and R_t^k denote the rental rate of effective capital services.

The household maximizes (5) subject to (7) and its maximization problem determines

[10]Given that in our empirical analysis the union represents a country is difficult to believe that within a country financial markets are incomplete. However, in experiments we do not present here for economy of space we show market incompleteness does not change qualitatively our results.

the supply of labor, investment and the optimal consumption saving decision.

The supply of labor is determined by:

$$\frac{u_l(C_t, L_t)}{u_c(C_t, L_t)} = (1 - \tau_t)\frac{W_t}{P_t} \tag{8}$$

where subscripts on the function u denote partial derivatives. The above first order condition states that the marginal rate of substitution between leisure and consumption equals the real after–tax consumption wage. The optimal utilization rate is given by:

$$CC'(u_t) = \frac{R_t^k}{P_t} \tag{9}$$

The optimal consumption–saving decision is described by the following Euler equation:

$$E_t Q_{t,t+j} = \beta^j E_t \frac{u_c(C_{t+j}, L_{t+j})}{u_c(C_t, L_t)} \frac{P_t}{P_{t+j}} \tag{10}$$

so that the inter–temporal marginal rate of substitution equals the price of the state–contingent bond.

The optimal investment decision is given by:

$$\begin{gathered} q_t = \beta(1-\delta)E_t q_{t+1} + \beta E_t\{(CC'(u_{t+1})u_{t+1} - CC(u_{t+1}))u_c(C_{t+1}, L_{t+1})\} \\ q_t \Phi_1(I_t, I_{t-1}) + \beta E_t[q_{t+1}\Phi_2(I_{t+1}, I_t)] = u_c(C_t, L_t) \end{gathered} \tag{11}$$

where q_t is the multiplier associated with (6).

The private consumption basket consists of domestically produced and imported goods. Denote C_{Ht} the composite of domestically produced goods, and C_{Ft} the composite of goods that are imported. Then, we define the composite consumption good as:

$$C_t = \left[\varphi_H^{\frac{1}{\eta}} C_{Ht}^{\frac{\eta-1}{\eta}} + \varphi_F^{\frac{1}{\eta}} C_{Ft}^{\frac{\eta-1}{\eta}}\right]^{\frac{\eta}{\eta-1}} \tag{12}$$

where parameter $\eta > 0$ denotes the intraregional elasticity of substitution and parameters

$0 < \varphi_H, \varphi_F < 1$ with $\varphi_H + \varphi_F = 1$, represent preferences for domestic versus foreign goods. Notice that if $\varphi_H > n$, household preferences are characterized by home bias[11].

Solving the household's expenditure–minimizing problem yields the following demand functions for domestically produced and imported goods:

$$C_{Ht} = \varphi_H C_t \left(\frac{P_{Ht}}{P_t}\right)^{-\eta}, \qquad C_{Ft} = \varphi_F C_t \left(\frac{P_{Ft}}{P_t}\right)^{-\eta} \tag{13}$$

where where P_{Ht} is the price index of domestically produced goods, and P_{Ft} is the price index of imported goods, which are related to the home price level P_t by:

$$P_t = \left[\varphi_H P_{Ht}^{1-\eta} + \varphi_F P_{Ft}^{1-\eta}\right]^{\frac{1}{1-\eta}} \tag{14}$$

Throughout the analysis, we assume that firms set prices in the sellers' local currency and the law-of-one-price holds, so that the cost of imported goods in the home consumption basket is simply the price charged by foreign exporting firms since the exchange rate is fixed in a monetary union.

Firms

There is a continuum of firms producing differentiated goods indexed in the interval $[0, 1]$. The production of goods requires labor input and effective capital stock. The production function of firm j is given by:

$$Y_{Ht}(j) + Y_{Ht}^*(j) + Y_{Ht}^G(j) = K_t^{1-\alpha} L_t^{\alpha} \left(Y_t^G\right)^{\mu} \tag{15}$$

where $Y_{Ht}(j)$ is the output of type$-j$ goods sold in the domestic market; $Y_{Ht}^*(j)$ is the output of type$-j$ goods exported to the foreign market; $Y_{Ht}^G(j)$ is the output of type$-j$ goods sold to the government; and L_t and $K_t = u_t \tilde{K}_t$ are the labor and effective capital

[11] Following Nakamura and Steinsson (2014) we assume that also I_t is a composite investment good given by an index of all the products produced in the economy analogous to the composition of consumption goods.

inputs, respectively. The variable Y_t^G denotes the public good produced in the region that whenever $\mu \geq 0$ is assumed to increase private productivity. Following Arrow and Kurz (1970), Aschauer (1989a); Aschauer (1989b), we assume that the public good, Y_t^G, enters the private production function and is taken as exogenous by the firms.

The goods produced by the continuum of firms in the local economy are transformed into final consumption according to

$$C_{Ht}+I_{Ht}=\left[\int_0^1 Y_{Ht}(j)^{\frac{\theta-1}{\theta}}dj\right]^{\frac{\theta}{\theta-1}},\quad C^*_{Ht}+I^*_{Ht}=\left[\int_0^1 Y^*_{Ht}(j)^{\frac{\theta-1}{\theta}}dj\right]^{\frac{\theta}{\theta-1}},\quad G_{Ht}=\left[\int_0^1 Y^G_{Ht}(j)^{\frac{\theta-1}{\theta}}dj\right]^{\frac{\theta}{\theta-1}}, \tag{16}$$

where $\theta > 1$, denotes the elasticity of substitution between differentiated products, C^*_{Ht} denotes the consumption of domestic goods by the foreign households and G_{Ht} the composite of domestically produced goods purchased by the local and the central government defined in the next section.

The cost-minimizing problem of the final good sector implies demand functions for each type of goods:

$$Y^d_{Ht}(j)=n(C_{Ht}+I_{Ht})\left(\frac{P_{Ht}(j)}{P_{Ht}}\right)^{-\theta}, Y^{d*}_{Ht}(j)=(1-n)(C^*_{Ht}+I^*_{Ht})\left(\frac{P_{Ht}(j)}{P_{Ht}}\right)^{-\theta}, Y^{Gd}_{Ht}(j)=nG_{Ht}\left(\frac{P_{Ht}(j)}{P_{Ht}}\right)^{-\theta} \tag{17}$$

where $P_{Ht}(j)$ is the price of type$-j$ good, and $P_{Ht}=\left[\int_0^1 P_{Ht}(j)^{1-\theta}dj\right]^{\frac{1}{1-\theta}}$ is the corresponding price index. Here we assume that government demand for differentiated goods, Y^{Gd}_{Ht}, takes the same form as private demand.

Firms are price takers in the input market and monopolistic competitors in the product markets. Following Calvo (1983), at each t each domestic producer is allowed to reset her price with a constant probability, $(1-\gamma)$, independently of the time elapsed since the last adjustment. Producers face domestic (private and public) and foreign demand for their product. Since they do not engage in international price discrimination and the exchange rate is fixed, the real exchange rate is equal to the ratio of foreign to domestic prices: $S_t = P^*_t/P_t$. When a type$-j$ producer receives a signal to change her price, she chooses her new price

$P_{Ht}(j)$ so as to maximize her expected present value of profits:

$$E_t \sum_{z=t}^{\infty} \gamma^{z-t} Q_{t,z} \left[P_{Ht}(j) - MC_z \right] Y_z^d(j) \tag{18}$$

where MC_t is the nominal marginal cost, which is identical across firms since all firms face the same input market, and Y_t^d is the demand schedule for type$-j$ good described by the sum of demands in (17), that is $Y_{Ht}^d(j)+Y_{Ht}^{d*}(j)+Y_{Ht}^{dG}(j) = Y_t^d$. The cost minimizing problem of the firm yields the marginal cost function:

$$MC_t = \frac{W_t R_t^k}{\alpha \left(Y_t^G\right)^{\mu} K_t^{1-\alpha} L_t^{\alpha-1}}. \tag{19}$$

The solution to the profit-maximizing problem gives the optimal pricing rule:

$$P_{Ht}(j) = \frac{\theta}{\theta - 1} \frac{\sum_{z=t}^{\infty} \gamma^{z-t} Q_{t,z} MC_z Y_t^d}{\sum_{z=t}^{\infty} \gamma^{z-t} Q_{t,z} Y_t^d}. \tag{20}$$

Since all firms face the same production function and wage, they have the same marginal costs and they will set the same price when the probability of changing their price appears.

Risk sharing

It is useful to note that combining the home and foreign consumption Euler equations, the assumption of complete financial markets yields the risk sharing condition:

$$\frac{u_c(C_t^*, L_t^*)}{u_c(C_t, L_t)} = \varpi_0 S_t \tag{21}$$

where ϖ_0=1, so that initially the households in the two regions have equal amount of wealth. The risk-sharing condition links the ratio of foreign to domestic prices (i.e., the real exchange rate) to the marginal rate of substitution between consumption in the two regions, so that all households face identical relative prices of consumption goods in the world market.

Regional fiscal governments

Total government spending in the home region is nG_{Ht}. In accordance with (17), G_{Ht} is the composite of domestically produced goods purchased by the local and the central government. These expenditures are split between the local and the central governement, a percentage ξ of those purchases are directed to the local government, i.e., $G_{Ht}^{L} = \xi G_{Ht}$ and $G_{Ht}^{C} = (1-\xi)G_{Ht}$. In other words, ξ represents the amount of steady state government spending administered by the local government. However, ξ does not measure the degree of local autonomy in the region. The fact that the local government receives a part of government purchases to spend locally does not talk to the autonomy of the local government. Where government spending to be thrown into the ocean, the size of the fiscal multiplier would only depend on the size of the region, not whether the local or the central government would throw this money to the sea. In order to make local autonomy meaningful we assume, first, that public spending is not useless, but that instead it serves as an input for the production of the public good in the home region. Second, we assume that the public good can be produced using local government expenditures and central expenditures. We assume that in more autonomous regions local expenditures have a higher share in the production of the local public good. In particular, we assume that the regional public good is produced through the following technology:

$$Y_t^G = \left[\lambda \left(G_{Ht}^L\right)^{\psi} + (1-\lambda)\left(G_t^C\right)^{\psi}\right]^{\frac{1}{\psi}} \tag{22}$$

where parameter $\psi \in (-\infty, 1]$, is the substitution parameter between the local spending and the central spending in the production of the local public good and λ characterizes the amount of local spending used in the local good's production. The elasticity of substitution between local and central spending is zero when $\psi = -\infty$, and we have the Leontief case, when $\psi = 0$, the public good production function is a Cobb Douglas, while when $\psi = 1$ local and central government spending are perfect substitutes. $G_t^C = (1-\xi)(G_{Ht} + G_{Ft}^*)$ represents the total spending by the central government and combines the purchases of public goods from both regions.

Here the crucial parameter is λ since it determines how much local spending contributes to the production of the public good. For $\lambda = 0$, regional spending is useless for the production of public good, whereas $\lambda = 1$ implies that what matters for the production of the public good in the domestic region is solely the expenses of the local government and the central government contributions are a pure waste. We postulate that λ in our theoretical model represents the degree of the local autonomy since in more local autonomous regions the public good is mostly produced and decided by the regional governments, while in more central regions it is the central government responsible for the production of the public good.

The Federal government

The Federal government keeps taxes fixed and finances government spending through lump sum taxes.[12] Since financial markets are complete any risk associated with variation in lump-sum taxes and transfers across the two regions is undone through risk-sharing and Ricardian equivalence holds.

We assume that the government spending in each region follows an AR(1) process and estimate the persistence of this process using our data on real value added of the non-market sector in our sample.

Monetary Policy

We model the behavior of the central bank by assuming a Taylor-type of rule for the setting of the union-wide interest rate, R_t:

$$\hat{R}_t = \varrho_R \hat{R}_{t-1} + (1 - \varrho_R)\psi_\pi \pi_t^u \tag{23}$$

[12]We have also considered a balanced budget rule where the central government moves taxes to balance the budget after increases in government spending. The central government budget constraint in case of a balanced budget is given by: $nP_{Ht}G_{Ht} + (1-n)P_{Ft}G_{Ft} = \tau W_t(L_t + L_t^*)$. Finally, we have also considered a third alternative in which the central government issues nominal debt, B_t, taxes nominal wage income at the rate τ_t in both regions and has access to lump-sum taxes to finance both local and central government expenditures and interest payments on debt. Labor taxes are used to keep debt from exploding. Results are similar qualitatively with the ones presented here.

with $\pi_t^u = n\pi_t + (1-n)\pi_t^*$.

Calibration

We calibrate the model using the annual European regional data. Table 8 displays the values used. We set $n = 0.08$ to match the average size of a region in our sample between 1990-2012 in terms of share of total GDP. We assume non-separable preferences between consumption and labor (see, Greenwood et al. (1988)) for which consumption and labor are complements for households[13]. Many studies emphasize the importance of complementarity between consumption and hours worked for generating higher fiscal multipliers[14]. With such preferences a government expenditure shock generates a need for higher labor supply. If consumption and hours worked are complements, the surge in labor supply further stimulates output and consumption.

The utility function is described by:

$$u(C_t, L_t) = \frac{\left(C_t - \Xi L_t^{1+1/\nu}/(1+1/\nu)\right)^{1-\sigma}}{1-\sigma}$$

Table 8 reports our calibrated parameters. The subjective discount factor is set to $\beta = 0.96$. We set the Frisch elasticity of labor supply and the risk aversion parameter to one. The estimates of the elasticity of substitution between home and foreign goods vary substantially in the literature. For example, Hooper et al. (2000) estimate trade elasticities for the G7 countries in the interval (0, 0.6), while Bodenstein (2010) report mean estimates between 4 and 6. Given that our union concerns regions in the same country we allow this elasticity to be on the higher range and set $\eta = 4$. Following the evidence presented in Alvarez et al. (2006)

[13]Notice that assuming separable preferences would also deliver similar predictions for regional and country multipliers. However, as we will show later assuming GHH preferences helps us match numerically the size of the multipliers we report in our empirical exercise and their dependence on the local autonomy index.

[14]See, e.g., Bilbiie (2011), Nakamura and Steinsson (2014), and Monacelli and Perotti (2008), among others. Gnocchi et al. (2016) build an otherwise-standard business cycle model with housework, calibrated consistently with data on time use, in order to discipline complementarity between consumption and hours worked and relate its strength to the size of fiscal multipliers.

for European countries, we assume that prices change, on average, every twelve months and we set the Calvo parameter equal to 0.25. We set the elasticity of substitution across varieties $\vartheta = 6$, implying a steady state markup of 20%. To set the home bias parameter, following Nakamura and Steinsson (2014), we calculate the average share of services in regional nominal gross value added and set $\varphi_H = 0.66$. We investigate the robustness of our results to the choice of this variable. We set the rate of depreciation of capital equal to 6%. The investment adjustment costs function is parametrized as follows:

$$\Phi(I_t, I_{t-1}) = \left[1 - \phi\left(\frac{I_t}{I_{t-1}}\right)\right] I_t,$$

where $\phi(1) = \phi'(1) = 0$ and $\phi''(1) = 0.1$. In the steady state capital utilization equals one and the elasticity of capital utilization cost is set to 1.1.

As for the government parameters, the steady steady state share of government spending to GDP, in the data, corresponds to the non-market services nominal gross value added to regions' nominal gross value added and its average between 1990 and 2012 is 0.23. To set the persistence of regional spending shocks we have performed fixed effect panel regressions with year dummies on the log non-market gross value added per hour regressed on its lagged value, the estimated coefficient is 0.87. As for the split of government expenditures between the local and the central government, the average share of local government expenditure relative to general government expenditure in our sample equals 0.28 and we set parameter ξ accordingly. Finally, the substitution parameter between the regional spending and the central spending in the production of the local public good we assume a Cobb-Douglas production, setting $\psi = 0$[15]. The coefficient regarding the productivity of the regional public good is set to 0.2 and in the next session we investigate the sensitivity of our results to the value of this parameter. The central monetary authority follows a Taylor rule with the standard coefficients for inflation and interest rate smoothing,$\psi_\pi = 1.5$ and $\rho_R = 0.95$.

[15]Differing ψ changes the curvature of the results presented in Figure 8 below, but has no effect whatsoever for the ranking of multipliers according to the degree of local autonomy. Since in the data this relationship is linear, the Cobb-Douglas matched best qualitatively our empirical findings.

The parameter λ varies on the $[0, 1]$ interval in our simulations since it is the model equivalent of the degree of local autonomy in public spending.

Results

A Regional Government Spending Shock

Before reporting the values of the country and regional multipliers we present in Figure 6 the transmission of regional fiscal shocks in our model economy when $\lambda = 0.1$ (circled lines) , an intermediate level of $\lambda = 0.5$ (squared lines) and for a high level of $\lambda = 0.9$ (diamond lines). Continuous lines present the dynamics for the home economy, while dotted lines represent the responses of the foreign economy's variables.

In general a shock to the regional government spending in our economy results to an output expansion that is accompanied by increases in home inputs, investment is not crowded out by the fiscal shock, and consumption also increases due to our assumption of GHH preferences. The increase in domestic consumption results, due to the high substitutability between home and foreign goods, to an increase in the demand for foreign goods. For that reason both investment and consumption demand increase but the increase in output is less than one. Recall that the home region is very small relative to the foreign region, as a result, the increase in foreign demand is very small. Now turning to the productivity of the public good, the increases in regional spending increase the productivity of the home economy (and the foreign economy yet since the size of the home economy is very small, the latter effect is small as well), however, the higher is the share of local goods in the production of the public good, i.e., the higher is the degree of local autonomy the higher the production of the public good and the higher the increase in the productive capacity of the local economy.

In other words the regional government spending shock increases demand in the local economy without generating a negative wealth effect and this tends to increase local output. Yet, when this spending is used for the production of the public good directly from the

regional government this results into higher productivity of the local public good which, in turns, stimulates also the supply side of the economy increasing investment and capital and capital utilization. The higher the local input in the production of the public good, the bigger the productive effect of regional spending. Finally, notice that the increases in the regional spending increase also spending in the foreign region, since part (a very small one) of those expenses increase the production of the public spending in the foreign region. Yet, with no changes in foreign demand, the supply effect of the increase in the regional spending results in excess supply of production abroad and a moderate drop in investment and employment.

Regional and Country Government Spending Multipliers

In accordance to our empirical estimates we compute impact regional government spending multipliers as the ratio of the response of regional GDP or Capital at the impact period to the initial movement of the regional fiscal variable and we refer to this as the regional impact multiplier. We also calculate similarly the country, or aggregate, impact multiplier as the ratio of total output or physical capital (i.e., the weighted sum of the GDP (or physical capital) responses in the two regions) to the initial movement of total government spending (i.e., the weighted sum of regional government spending). We report the entire path of the responses up to 10 years by presenting the present value of the impulse responses of regional GDP and aggregate GDP and the fiscal variable, which we call the cumulative regional and country multiplier, respectively[16].

As mentioned earlier, the mechanism through which local autonomy affects the size of the multipliers comes entirely from the productive nature of the local government spending. If the public good would not enhance private production, the regional multiplier would not vary with the degree of local autonomy. Since local spending enhances the production of the public good which, in turn, increases private productivity increases in λ translate into

[16]Following Nakamura and Steinsson (2014), we have also calculated multipliers from simulated data, when running regressions of a similar form as in the empirical part of our paper. Results are very similar independently of the method used to calculate the fiscal multipliers.

increases of the size of the regional multiplier both on impact and cumulative. The top panel of Figure 7 presents aggregate (circled-lines) and regional (crossed-lines) output multipliers as a function of parameter λ. Continuous and dotted lines lines represent the impact and cumulative multipliers, respectively. Clearly, regional multipliers are a positive function of the degree of local autonomy. For $\lambda = 0$, local spending is useless for the production of public good and only central spending contributes to the production of the public good and for that reason the regional multiplier is much lower in that case, as it relates only to the local demand effects of the spending shock. As the share of local spending in the production of the local public good increases the regional multiplier increases. Aggregate (country) multipliers are also a positive function of λ, but the slope of the relation between the country multiplier and the degree of local autonomy is less steep. This is due to the fact that when we calculate aggregate multipliers we sum the multipliers of both regions and, as we shall see in the next section, the size of the region, other things equal, decreases the size of the multiplier for low degrees of local autonomy.

In the bottom panel of Figure 7 we present regional capital multipliers (crossed dotted lines depict cumulative multipliers and continuous crossed lines impact multipliers)[17]. Qualitatively the picture is similar to the left panel of the figure. Since government spending affects the marginal return on capital, a government spending shock in this framework should lead to higher capital multipliers for $\mu > 0$. Yet, the increase in public spending crowds out private investment and, as a result, the output multiplier could be lower. The former effect seems to dominate in our calibration and capital multipliers are positive and increase with the degree of local autonomy.

The range of the theoretical capital multipliers is comparable to the range of the multipliers we report in our empirical exercise. When we turn to output multipliers the theoretical

[17]Country capital multipliers are much smaller than regional multipliers and follow the same pattern as the ones presented in the right panel of Figure 8, but we do no present them here since in the empirical exercise we only compute regional capital multipliers. The reason why country capital multipliers are lower comes from the fact that when government spending is productive, an increase in home regional spending crowds out foreign capital, as a result, country multipliers due to the small size of the home region are smaller and they can even be negative.

model suggests lower cumulative than impact multipliers in the [0.5,1] interval, while Figure 1 suggests that cumulative multipliers vary in the [0,1] interval, and impact multipliers in [0,0.5) interval. That is, one caveat of our model is that it lacks a mechanism to bring more long lasting effects from the changes in regional government spending. This is due to the fact that government spending in our model economy has supply side effects that increase the productive capacity of the private sector, however, output is demand determined and as a result, the increases in the productive capacity of the economy reduces the demand expansion due to sticky prices.

Sensitivity Analysis

In this section we examine the sensitivity of our results to various assumptions and parameters that are difficult to calibrate, or for which we cannot take a steady stance about how they should be modeled in our theoretical framework. For economy of space we present sensitivity results for regional cumulative multipliers, but results for the other multipliers are easily available by the authors upon request.

The size of the region

To start with, we have set the size of the region equal to the average size of a region in our sample. Most of the regions in our empirical analysis are small, yet bigger regions also exist in our sample (Catalonia and Lombardy, for example, represent approximately 20% of Spanish and Italian GDP, respectively) and for that reason on the top panel of Figure 8 we report output (left panel) and capital multipliers (right panel) when we vary the degree of local autonomy together with the size of the home region from 8% to 45%. For any size of the region multipliers are a positive function of the degree of local autonomy. Yet, the smaller the region the bigger the gains from local autonomy. In other words, the slope of the curves in Figure 8 depend negatively on the size of the region. For $\lambda = 0$, the size of the multiplier increases with the size of the region. When $\lambda = 0$, the bigger the size of the region, the

bigger the demand effect from the spending shock and the bigger the multiplier. Now when $\lambda > 0$, increases in regional spending increase also the regional productive capacity, adding a supply effect to the government expansion and the output multiplier increases. Yet, for very high values of $\lambda > 0.8$ ($\lambda > 0.5$) output (capital) multipliers decrease with the size of the region. To understand this result it is easier to consider the limit case in which $\lambda = 1$. In that case, all the regional spending is used to produce the regional public good and this increases the public good production. However, an increase in the size of the region in this case, from the one hand increases the demand effect of the regional shock, but, on the other hand, increases the productive capacity of the economy. Since output in the economy is demand-determined, due to the assumption of sticky prices, less capital and labor is needed to satisfy the increased output demand. Hence, the size of the capital multiplier and, partly, of the output multiplier is reduced.

Home bias

We have set the home bias parameter equal to 0.66 in our benchmark economy in order to account for the fact that a substantial amount of goods produced regionally involve services that are mostly local. Yet, within a country many services are tradable and for that reason in this section we investigate the sensitivity of our results by assuming different degrees of home bias. The left panel of the second row of Figure 8 presents output multipliers and the right panel capital multipliers when we vary simultaneously the degree of local autonomy as well as the degree of home bias.[18] The degree of home bias is crucial in determining the size of the regional multiplier but not in affecting its relationship with the degree of local autonomy. If agents in one region consume more of domestic goods, an increase in regional government spending (even when $\lambda = 0$), due to sticky prices will stimulate more demand in that region, increasing the regional multiplier. Hence, higher home bias results in higher output multipliers independently of the degree of local autonomy. However, capital

[18]Notice that the value of φ_H^* is set so as to make sure that the overall demand for home products as a fraction of total demand is equal to the size of the home population relative to the total population in the union. See also Nakamura and Steinsson (2014).

multipliers depend inversely on the degree of home bias. This is because we assume that investment goods are produced in the same way as consumption goods. As a result, an increase in regional spending which is only produced with home goods, crowds out investment the higher is the home bias in the production of investment goods. Even so, the higher the positive effect of local spending on regional productivity the smaller the crowding out effect on investment and the higher the capital multipliers.

Productivity of public good

The analysis of the productive role of public capital accumulation and public services has been firmly established in the mainstream economic literature by the seminal work of Arrow and Kurz (1970). Aschauer (1989a) ; Aschauer (1989b) identified the decline in infrastructure investment as an important factor underlying the US productivity slowdown during the 1970s and 1980s. This view is often referred to as "the public capital hypothesis". Barro (1990) produced an endogenous growth model with a public sector. Under constant returns to scale in private capital and expenditure in public services, the size of the government sector is shown to have permanent effects on the output growth rate. Barro's analysis has been later extended in multiple directions[19]. Empirically, (Holtz-Eakin (1994)) casted doubt in the results of Aschauer (1989a) and Aschauer (1989b) by showing that in the data the marginal product of public capital is uniformly lower than the marginal product of private capital[20]. Summing up, the government's role as provider of productive public services and its ability to influence economic growth appears to have been thoroughly investigated without reaching a consensus about the size of the productivity of the public good in the private production function.

The third panel of Figure 8 presents results investigating how the productivity of the public good affects the size of regional multiplier. Similarly with our empirical findings, if we only consider local autonomy without interacting it with the goods and services provided by

[19]See, e.g., Baxter and King (1993), Fisher and Turnovsky (1995), Devarajan and Zou (1996), Glomm and Ravikumar (1997), Corsetti and Roubini (1996), Turnovsky (1996), among others.

[20]Kocherlakota and Yi (1996) later questioned these results.

the government at the local level we would have ended up concluding that local autonomy does not matter. In our theoretical model, when the public good is not productive (i.e., $\mu = 0$) increases in the degree of local autonomy do not translate in increases in the regional multiplier, since the additional supply side effect from the regional fiscal expansion is nullified in this calibration. On the contrary, it is obvious that for higher productivity of the public good the regional multipliers for both output and capital increase more steeply with the degree of local autonomy, since in that case the size of μdetermines the size of the positive output effect stemming from the regional fiscal expansion. Now the bigger is the share of the regional spending in the production of the regional public good, the higher the regional multiplier for both output and capital.

The share of spending managed by the regional government

In the existing literature that concerns the economic effects of decentralization, most authors choose the budget data approach and they approximate the degree of fiscal decentralization using the share of sub-national government expenditures/revenues in general government expenditures/revenues; net of intergovernmental transfers (see, for example, Xie and Zou (1999)). In our model such a measure corresponds to the parameter ξ, which denotes the share of spending that the local government receives from the total spending in the region. Initially, we have calibrated the model to match the average share of local versus total government spending in the data. In the next panel of Figure 8 we present how the cumulative regional multipliers change when we vary the economic size of the local government together with the degree of local autonomy as measured by the parameter λ. This exercise can also be useful to understand why measuring local autonomy as the share of sub-national government expenditures in general government expenditures can be misleading.

Increases in the share of local to total government expenditures affect obviously the size of the regional fiscal multiplier and its relation with the degree of local autonomy. Higher values of ξ for a given degree of local autonomy decrease the multiplier.

In the case of $\lambda = 0$, increases in ξ decrease monotonically the regional spending multiplier. Naturally, if $\lambda = 0$ the regional spending is unproductive, so the more is spent by the local government, the more the central spending that is useful for the production of the public good is crowded out and the smaller is the regional multiplier. On the contrary, when $\lambda = 1$, the regional multiplier is almost independent of the share of local to central spending.

Separable Preferences

In the top panel of Figure 9 we report regional output and capital cumulative multipliers when instead of GHH we use separable preferences for the utility function[21]. As it is apparent from the figure although the positive dependence of the multiplier on the degree of local autonomy does not change, the size of both the capital and output multipliers is lower than the one we obtain when we use GHH preferences in Figure 7.

The elasticity of substitution between local and central government spending

In the benchmark specification we have assumed a Cobb Douglas for the production of the public good. Here, we show that assuming that local and central spending are imperfect substitutes or complements by setting $\psi = 0.5$ and $\psi = -0.5$, respectively does not change qualitatively our predictions about the positive dependence of the output and capital multipliers to the degree of local autonomy. Since both assumptions can be reasonable as someone could argue that substitutability can be justified as health care or public investment is concerned, however, for some goods such as defense spending central and local spending could be thought of as complements. In the last panel of Figure 9, we present results when we allow different degrees of substitutability or complementarity between the local and the central government expenditures. When $\psi = -0.5$, local and central public goods are complements

[21] In this case, we define utility by:

$$u(C_t, L_t) = \frac{C_t^{1-\sigma}}{1-\sigma} - \Xi \frac{L_t^{1+\nu}}{1+\nu}.$$

and increases in λ increase the regional multiplier but in a decreasing way. On the contrary assuming that central and local public goods are substitutes implies a convex relation between the local degree of autonomy and the regional multiplier. The data revealed a linear relationship and seem to support the Cobb Douglas specification for the production for the public good.

6 Conclusions

6.1 Summary

This paper evaluates the effect of local autonomy on the size of the regional government spending multiplier. Such an assessment is rather important considering the ongoing discussions in Europe for the need of a Fiscal Sustainability and Growth or the debate about the size of the multiplier. Our results reveal that local autonomy per se does not affect local output. However, via its interaction with the goods and services provided by the government it does affect it! More decentralized governments are able to deliver more productive public goods and the supply effect of the increase in government spending translates in higher local multipliers. The government spending in more autonomous regions (i) results in higher government spending multipliers; (ii) can be more effective supporting recovery during recessions; (iii) has significant spillover effects and (iv) crowds in private capital. In our theoretical model, we model local autonomy as the share of regional spending dedicated to the production of the local public good and we show that our empirical results can only be rationalized in models in which public goods are assumed to enhance the productivity of regional goods.

6.2 Policy Implications

Our study shows empirically that, within the European regions, higher local autonomy enhances the efficiency of local governments in providing public goods, reconfirming the "Decentralization Theorem" of Oates (1972) and resuscitating the "Politeia" of the ancient

Greece as a better form of government. Moreover, we show that local autonomy can be particularly important in times of crisis, as it can increase the ability of governments to counteract negative demand shocks like the shock Europe experienced after the great recession. A secondary but important result of our analysis is that the output effect of local government spending is estimated to be considerable and positive during recessions, while it is estimated to be negative during expansions, suggesting a bigger role for countercyclical policies at all government levels in the European Union. Our theoretical exercise suggests that only when local autonomy is accompanied by the efficient production of public goods it can benefit the local as well as the aggregate economy of the union as a whole.

References

Alvarez, L., Dhyne, E., Hoeberichts, M., Kwapil, C., Bihan, H. L., Lünnemann, P., Martins, F., Sabbatini, R., Stahl, H., Vermeulen, P. and Vilmunen, J.: 2006, Sticky prices in the euro area: A summary of new micro evidence, *Journal of the European Economic Association* **4**(2-3), 575–584.

Arrow, K. and Kurz, M.: 1970, *Public Investment, the Rate of Return, and Optimal Fiscal Policy*, John Hopkins University Press.

Aschauer, D.: 1989a, Is public expenditure productive?, *Journal of Monetary Economics* **23**(177-200).

Aschauer, D. A.: 1989b, Does public capital crowd out private capital?, *Journal of Monetary Economics* **24**, 171–188.

Auerbach, A. J. and Gorodnichenko, Y.: 2012, Measuring the output responses to fiscal policy, *American Economic Journal: Economic Policy* **4**(2), 1–27.

Barro, R. J.: 1990, Government spending in a simple model of endogenous growth, *Journal of Political Economy* **98**(5), 103–125.

Baxter, M. and King, R.: 1993, Fiscal policy in general equilibrium, *American Economic Review* **83**(3), 315–34.

Benigno, G. and Benigno, P.: 2003, Price stability in open economies, *Review of Economic Studies* **70**(4), 221–251.

Bilbiie, F.: 2011, Nonseparable preferences, frisch labor supply, and the consump- tion multiplier of government spending: One solution to a fiscal policy puzzle,, *Journal of Money, Credit and Banking* **43**(1), 221–251.

Blanchard, O. and Shleifer, A.: 2000, Federalism with and without Political Centralization: China versus Russia, *Technical Report 7616*, NBER Working Papers.

Bodenstein, M.: 2010, Trade elasticity of substitution and equilibrium dynamics, *Journal of Economic Theory* **145**(3), 1033 – 1059.

Brueckner, J.: 2006, Fiscal Federalism and Economic Growth, *Journal of Public Economics* **90**(10-11), 2107–2120.

Brueckner, M. and Tuladhar, A.: 2014, Local government spending multipliers and financial distress: Evidence from japanese prefectures, *Economic Journal* **124**, 1279–1316.

Calvo, G.: 1983, Staggered prices in a utility maximizing framework, *Journal of Monetary Economics* **12**(3), 383–398.

Charron, N., Dijkstra, L. and Lapuente, V.: 2014, Regional governance matters: Quality of government within european union member states, *Regional Studies* **48**, 68–90.

Charron, N., Dijkstra, L. and Lapuente, V.: 2015, Mapping the regional divide in europe: A measure for assessing quality of government in 206 european regions, *Social Indicators Research* **122**, 315–346.

Corsetti, G., Kuester, K. and Muller, G.: 2017, Fixed on flexible: Rethinking exchange rate regimes after the great recession, *IMF Economic Review* **65**(3), 586–632.

Corsetti, G. and Roubini, N.: 1996, Optimal government spending and taxa- tion in endgenous growth models, *Technical Report 5851*, NBER Working Papers.

Davoodi, H. and Zou, H.-F.: 1998, Fiscal Decentralization and Economic Growth. A Cross-Country Study, *Journal of Urban Economics* **43**, 244–257.

Devarajan, S., S. V. and Zou, H.: 1996, The composition of public ex- penditure and economic growth, *Journal of Monetary Economics* **37**(2-3), 313–344.

Fatas, A. and Mihov, I.: 2013, Policy volatility, institutions, and economic growth, *Review of economics and Statistics* **95**(2), 362–376.

Feld, Lars, u. B. and Schnellenbach, J.: 2016, Fiscal federalism, decentralization and economic growth: A meta- analysis, *Economic Inquiry* **54**(3), 1445–1463.

Fisher, W. and Turnovsky, S.: 1995, The composition of government expenditure and its consequences for macroeconomic performance, *Journal of Economic Dynamics and Control* **19**(4), 747–786.

Gali, J. and Monacelli, T.: 2008, Optimal monetary and fiscal policy in a currency union, *Journal of International Economics* **76**(1), 116–132.

Glomm, G. and Ravikumar, B.: 1997, Productive government expenditures and long-run growth, *Journal of Economic Dynamics and Control* **21**(1), 183–204.

Gnocchi, S., Hauser, D. and Pappa, E.: 2016, Housework and fiscal expansions, *Journal of Monetary Economics* **79**, 94–108.

Greenwood, J., Hercowitz, Z. and Huffman, G. W.: 1988, Investment, capacity utilization, and the real business cycle, *American Economic Review* **78**, 402–417.

Holtz-Eakin, D.: 1994, Public-sector capital and the productivity puzzle, *The Review of Economics and Statistics* **76**(1), 12–21.

Hooghe, L., Marks, G. and Schakel, A. H.: 2010, *The Rise of Regional Authority: A Comparative Study of 43 Democracies*, Routledge.

Hooper, P., Johnson, K. and Marquez, J.: 2000, Trade elasticities for the g-7 countries.

Iimi, A.: 2005, Decentralization and economic growth revisited: an empirical note, *Journal of Urban Economics* **57**, 449–461.

Jin, Hehui, Y. Q. and Weingast, B.: 2005, Regional Decentralization and Fiscal Incentives: Federalism, Chinese Style, *Journal of Public Economics* **89**(9-10), 1719–1742.

Kocherlakota, N. R. and Yi, K.-M.: 1996, A simple time series test of endoge- nous vs. exogenous growth models: An application to the united states, *The Review of Economics and Statistics* **78**(1), 26–134.

Ladner, A. Keuffer, N. and Baldersheim, H.: 2015, Local Autonomy Index for European countries (1990-2014), *Technical report*, European Commission, Tender No 2014CE16BAT031.

Lequiller, F. and Blades, D.: 2014, *Understanding National Accounts:Second Edition*, OECD Publishing.

Monacelli, T. and Perotti, R.: 2008, Fiscal policy, wealth effects and markups.

Nakamura, E. and Steinsson, J.: 2014, Fiscal Stimulus in a Monetary Union: Evidence from US Regions, *American Economic Review* **104**(3), 753–792.

Oates, W.: 1972, *Fiscal Federalism*, Harcourt Brace Jovanovich, New York.

Oates, W.: 1995, *Comment on Conflicts and Dilemmas of Decentralization by Rudolf Hommes*, Annual World Bank Conference on Development Economic, The World Bank,.

Ober, J.: 2016, *Ther rise and fall of Classical Greece (The Princeton History of the Ancient World)*, Princenton University Press.

Pappa, E. and Vassilatos, V.: 2007, The unbearable tightness of being in a monetary union: Fiscal restrictions and regional stability, *European Economic Review* **6**(51), 1492–1513.

Phillips, K. and Woller, G.: 1997, Fiscal decentralization and ldc economic growth: An empirical investigation, *Journal of Development Studies* **34**(4), 139–148.

Ramey, V. and Zubairy, S.: 2018, Government spending multipliers in good times and in bad: Evidence from us historical data, *Journal of Political Economy* **126**, 850–901.

Rodden, J. A.: 2002, The dilemma of fiscal federalism: Grants and fiscal performance around the world, *American Journal of Political Science* **46**(3), 670–687.

Stock, J. and Yogo, M.: 2005, *Testing for Weak Instruments in Linear IV Regression*, Vol. Identification and Inference for Econometric Models: Essays in Honor of Thomas Rothenberg, Cambridge University Press.

Thieben, U.: 2000, Fiscal Federalism in Western European and selected other countries. Centralization or decentralization? What is better for economic growth?, *Deutsches Institut für Wirtschaftsforschung* (224).

Thieben, U.: 2003, *Fiscal decentralization and economic growth in high income OECD countries*, Institute for Fiscal Studies, London.

Thorton, J.: 2007, Fiscal decentralization and economic growth reconsidered, *Journal of Urban Economics Economics* **61**, 64–70.

Turnovsky, S. J.: 1996, Optimal tax, debt, and expenditure policies in a growing economy, *Journal of Public Economics* **60**(1), 21–44.

Wooldridge, J. M.: 2002, *Econometric analysis of cross section and panel data*, MIT Press: Cambridge, MA.

Xie, D. and Zou, H.-F.: 1999, Fiscal decentralization and economic growth in the united states, *Journal of Urban Economics* **45**, 228–239.

Table 1: Value added of non-market sector and government spending per hour

	Government spending per hour		
Value added of non-market sector per hour	1.09*** (0.007)	0.83*** (0.014)	0.72*** (0.025)
Country fixed effects	No	Yes	Yes
Time fixed effects	No	No	Yes
	Log of government spending per hour		
Log of value added per hour	0.89*** (0.016)	0.50*** (0.019)	0.08*** (0.026)
Country fixed effects	No	Yes	Yes
Time fixed effects	No	No	Yes

- Significant 10 percent level; **5 percent level; ***1 percent level. Huber robust standard errors (clustered at the region level) in parentheses.

Table 2. Baseline Results

	At LAI Mean	At LAI Median	At LAI Interquartile Range
Impact Multiplier	0.29	0.30	[0.21 , 0.35]
Cumulative Multiplier	0.68	0.70	[0.48 , 0.82]
Model Estimates: Dependent Variable is $Ln(y_{it})$			
$Ln(g^{cyc}_{it})$ $[\alpha]$	-0.05** (0.02)		
$Ln(g^{cyc}_{it})*LAI_{it}$ $[\beta]$	0.19*** (0.07)		
LAI_{it} $[\gamma]$	-0.16 (0.17)		
$Ln(y_{it-1})$ $[\varphi]$	0.57*** (0.10)		
Region Fixed Effects	Yes		
Time Fixed Effects	Yes		
Observations	6563		
Regions	268		

- Significant 10 percent level; **5 percent level; ***1 percent level. Huber robust standard errors (clustered at the region level) in parentheses.

Table 3. Controlling for Government Quality

	At LAI Mean	At LAI Median	At LAI Interquartile Range
Impact Multiplier	0.38	0.39	[0.30 , 0.44]
Cumulative Multiplier	0.84	0.85	[0.67 , 0.96]
Model Estimates: Dependent Variable is $Ln(y_{it})$			
$Ln(g^{cyc}_{it})$ [α]	-0.02 (0.02)		
$Ln(g^{cyc}_{it})*LAI_{it}$ [β]	0.18*** (0.08)		
LAI_{it} [γ]	-0.06 (0.18)		
$Ln(g^{cyc}_{it})*(EQI_i - AVG(EQI_i))$ [ζ]	0.21*** (0.06)		
$Ln(y_{it-1})$ [φ]	0.54*** (0.09)		
Region Fixed Effects	Yes		
Time Fixed Effects	Yes		
Observations	6563		
Regions	268		

- Significant 10 percent level; **5 percent level; ***1 percent level. Huber robust standard errors (clustered at the region level) in parentheses.

Table 4. State Dependence: Expansions vs. Contractions

	Panel A: Expansions		
	At LAI Mean	At LAI Median	At LAI Interquartile Range
Impact Multiplier	-0.55	-0.55	[-0.61 , -0.50]
Cumulative Multiplier	-0.55	-0.55	[-0.59 , -0.49]
	Panel B: Contractions		
	At LAI Mean	At LAI Median	At LAI Interquartile Range
Impact Multiplier	0.71	0.70	[0.61 , 0.76]
Cumulative Multiplier	1.30	1.30	[1.13 , 1.41]

	Model Estimates: Dependent Variable is $Ln(y_{it})$	
	Expansions	Contractions
$Ln(g^{cyc}_{it})$ [α]	-0.20*** (0.06)	0.04** (0.02)
$Ln(g^{cyc}_{it})*LAI_{it}$ [β]	0.13 (0.16)	0.20** (0.10)
LAI_{it} [γ]	0.14 (0.46)	-0.05 (0.18)
$Ln(y_{it-1})$ [φ]	-0.03 (0.12)	0.46*** (0.14)
Region Fixed Effects	Yes	Yes
Time Fixed Effects	Yes	Yes
Observations	4419	1876
Regions	268	268

- Significant 10 percent level; **5 percent level; ***1 percent level. Huber robust standard errors (clustered at the region level) in parentheses.

Table 5. State Dependence: Slack vs. Tight Labor Market

	Panel A: Slack Labor Market		
	At LAI Mean	At LAI Median	At LAI Interquartile Range
Impact Multiplier	0.71	0.72	[0.58 , 0.82]
Cumulative Multiplier	1.43	1.45	[1.15 , 1.63]
	Panel B: Tight Labor Market		
	At LAI Mean	At LAI Median	At LAI Interquartile Range
Impact Multiplier	0.17	0.18	[0.12 , 0.21]
Cumulative Multiplier	0.40	0.40	[0.12 , 0.48]

	Model Estimates: Dependent Variable is $Ln(y_{it})$	
	Slack Labor Market	Tight Labor Market
$Ln(g^{cyc}_{it})$ [α]	-0.03 (0.03)	-0.03 (0.02)
$Ln(g^{cyc}_{it})*LAI_{it}$ [β]	0.34**** (0.11)	0.13 (0.10)
LAI_{it} [γ]	-0.58** (0.24)	0.03 (0.23)
$Ln(y_{it-1})$ [φ]	0.50*** (0.13)	0.57*** (0.14)
Region Fixed Effects	Yes	Yes
Time Fixed Effects	Yes	Yes
Observations	3018	3531
Regions	175	191

- Significant 10 percent level; **5 percent level; ***1 percent level. Huber robust standard errors (clustered at the region level) in parentheses.

Table 6. Country vs. Regional Data

	Panel A: Country Data		
	At LAI Mean	At LAI Median	At LAI Interquartile Range
Impact Multiplier	0.37	0.38	[0.28 , 0.44]
Cumulative Multiplier	1.84	1.82	[1.39 , 2.12]
	Panel B: Regional Data		
	At LAI Mean	At LAI Median	At LAI Interquartile Range
Impact Multiplier	0.14	0.13	[0.07 , 0.18]
Cumulative Multiplier	0.31	0.32	[0.16 , 0.42]

	Model Estimates	
	Country Data	Regional Data
$Ln(g^{cyc}_{it})$ $[\alpha]$	-0.04 (0.05)	-0.06*** (0.02)
$Ln(g^{cyc}_{it})*LAI_{it}$ $[\beta]$	0.21* (0.13)	0.15*** (0.07)
LAI_{it} $[\gamma]$	-0.31 (0.30)	-0.06 (0.15)
$Ln(y_{it-1})$ $[\varphi]$	0.80*** (0.07)	0.57*** (0.09)
Country/Region Fixed Effects	Yes	Yes
Time Fixed Effects	Yes	Yes
Observations	639	6424
Countries/Regions	27	262

- Significant 10 percent level; **5 percent level; ***1 percent level. Huber robust standard errors (clustered at the region level) in parentheses.

Table 7. Effects on Capital and TFP

	Panel A: Capital		
$dln(k)/dln(g^{cyc})$	At LAI Mean	At LAI Median	At LAI Interquartile Range
Impact Elasticity	0.06	0.07	[0.06 , 0.07]
Cumulative Elasticity	0.68	0.69	[0.58 , 0.75]
	Panel B: TFP		
$d(TFP)/dln(g^{cyc})$	At LAI Mean	At LAI Median	At LAI Interquartile Range
Impact Elasticity	0.30	0.30	[0.25 , 0.33]
Cumulative Elasticity	1.88	1.89	[1.89 , 2.08]

	Estimated β Coefficients	
	Capital	TFP
$Ln(g^{cyc}_{it})*LAI_{it}$ [β]	0.10*** (0.02)	0.49 (0.37)
Region Fixed Effects	Yes	Yes
Time Fixed Effects	Yes	Yes
Observations	5064	5064
Regions	268	268

- Significant 10 percent level; **5 percent level; ***1 percent level. Huber robust standard errors (clustered at the region level) in parentheses.

Table 8. Calibrated parameters

Calibration		
parameter	description	value
β	Discount factor	0.96
n	Home size	0.08
η	Elasticity of substitution between regional goods	4
ν	Frisch elasticity	1
σ	Inverse of relative risk aversion	1
φ_H	Weight of home goods in home consumption basket	0.66
θ	Elasticity of substitution between varieties	6
δ	Capital depreciation rate	0.06
φ	Investment adjustment costs parameter	0.10
cc_u	Elasticity of capital utilization cost	1.1
γ	Calvo parameter	0.25
α	Production function curvature	0.65
μ	Productivity of regional public good	0.2
ξ	Share of local spending on total regional spending	0.28
ψ	Substitution of regional and central spending in production of local public good	0
G_H/Y	Share of spending in regional output	0.23
ρ_G	Persistence of spending shock	0.87
ρ_R	Lagged dependence in Taylor rule	0.95
ψ_π	Inflation coefficient in Taylor rule	1.5

Figure 1. Local Government Spending Multipliers

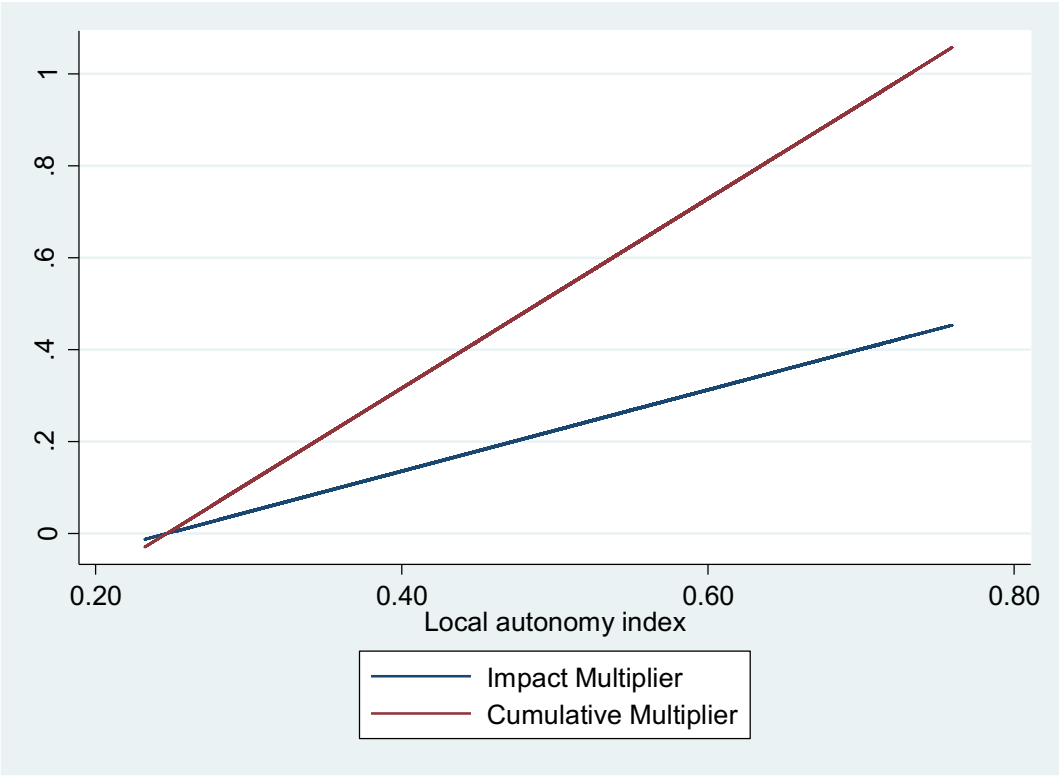
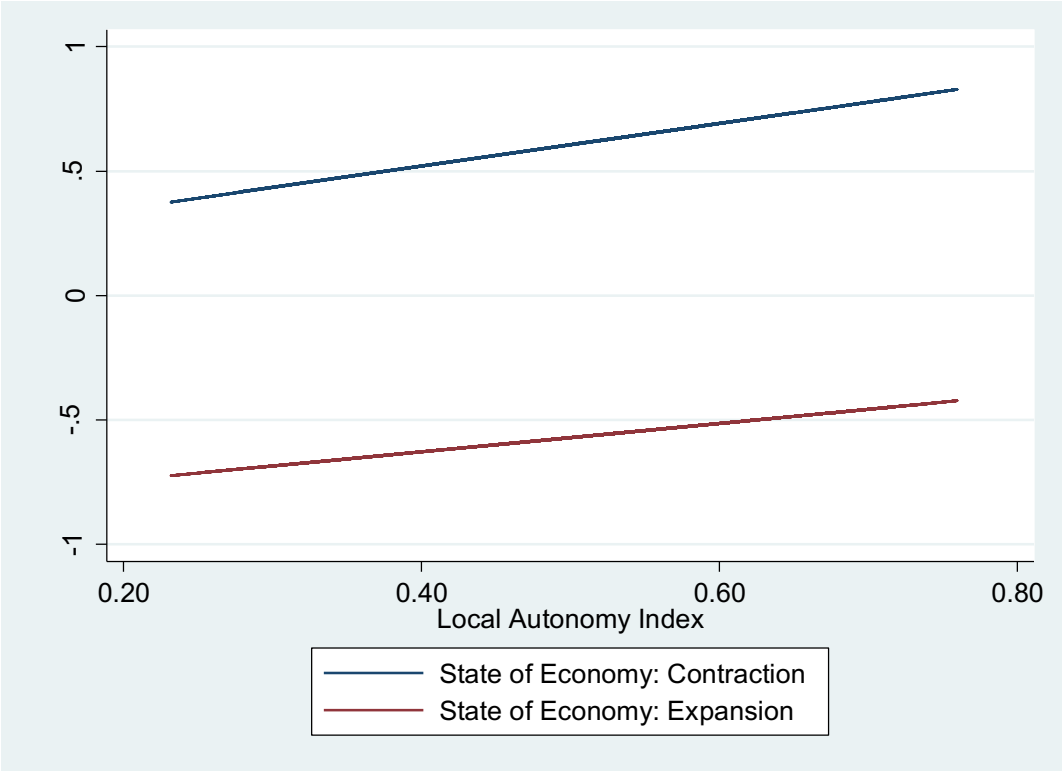


Figure 2. Local Government Spending Multipliers
(State-Dependent Multipliers)

Panel A: Contractions vs. Expansions



Panel B: Slack vs. Tight Labor Market

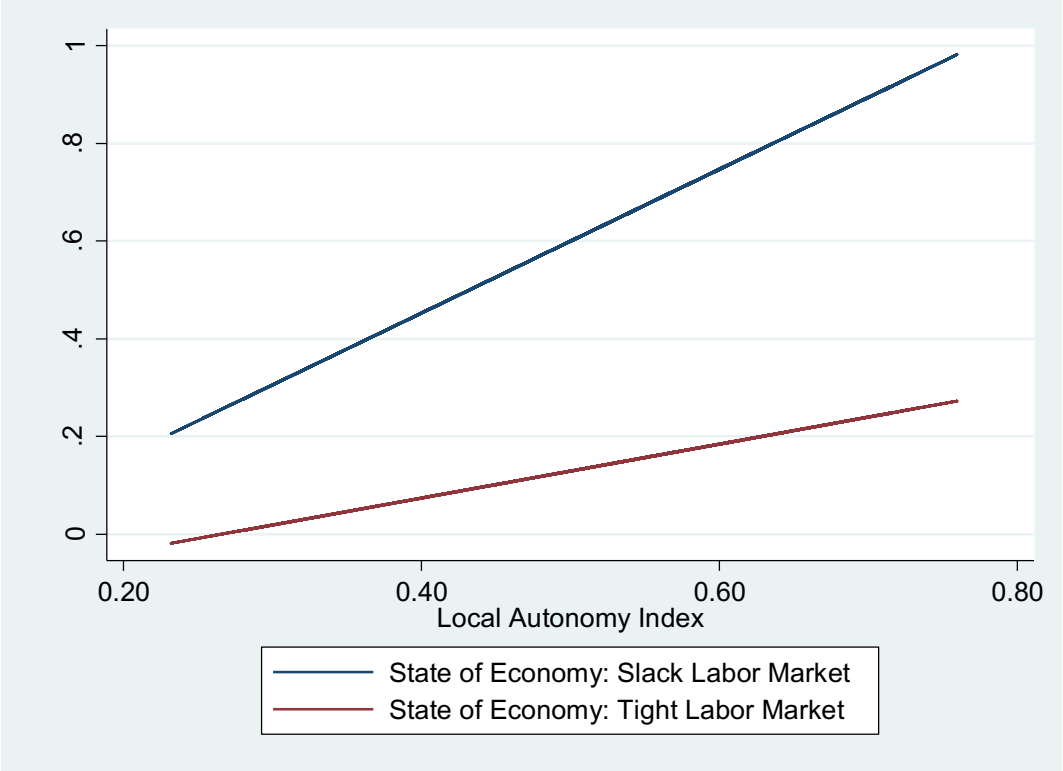


Figure 3. Regional vs Country-Wide Local Government Spending Multipliers

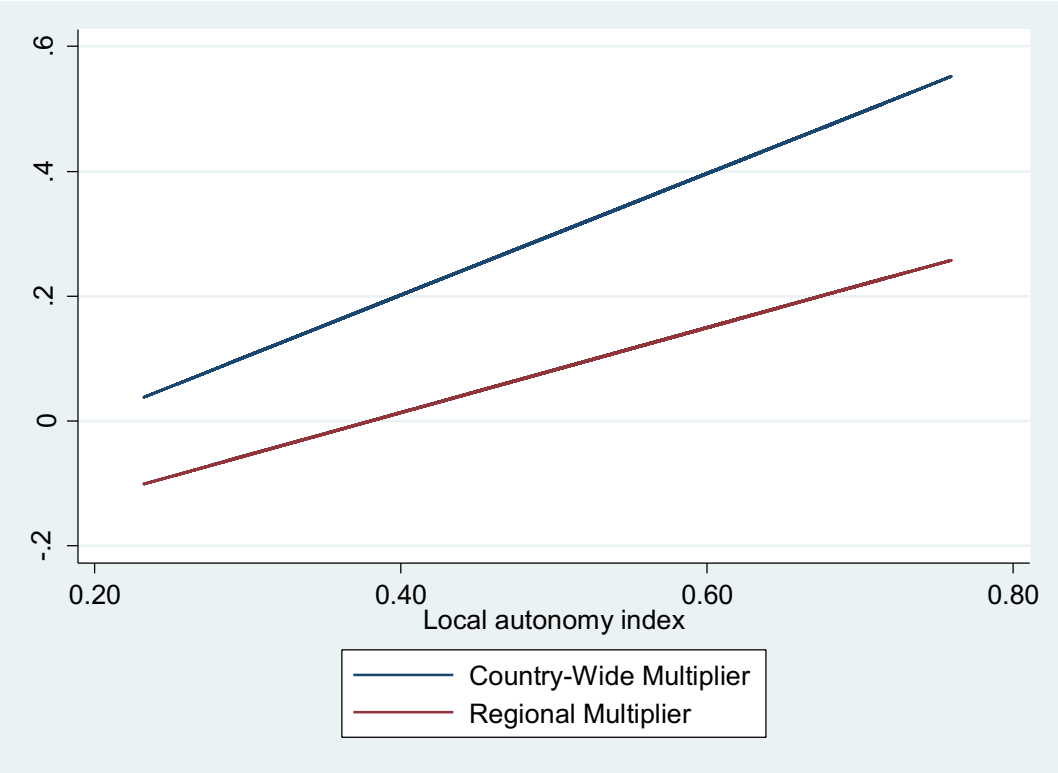


Figure 4. Elasticity Effects of Local Government Spending on Capital and TFP

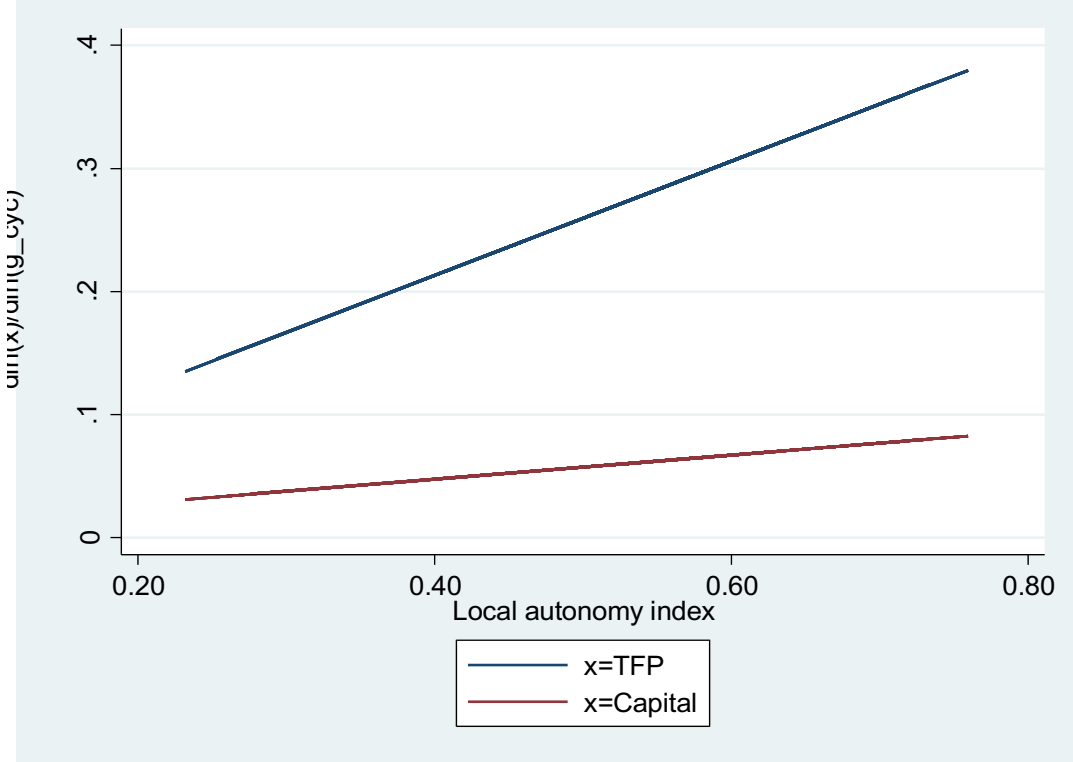


Figure 5. Local Government Spending Multipliers
(Financial vs. Institutional Autonomy)

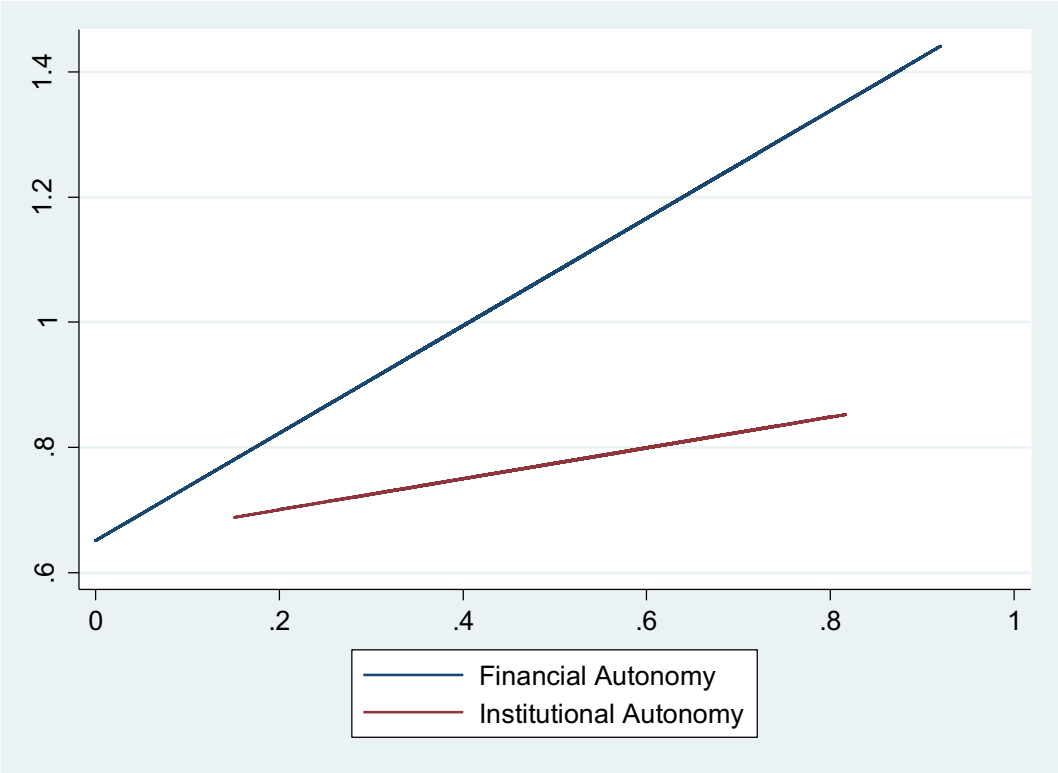
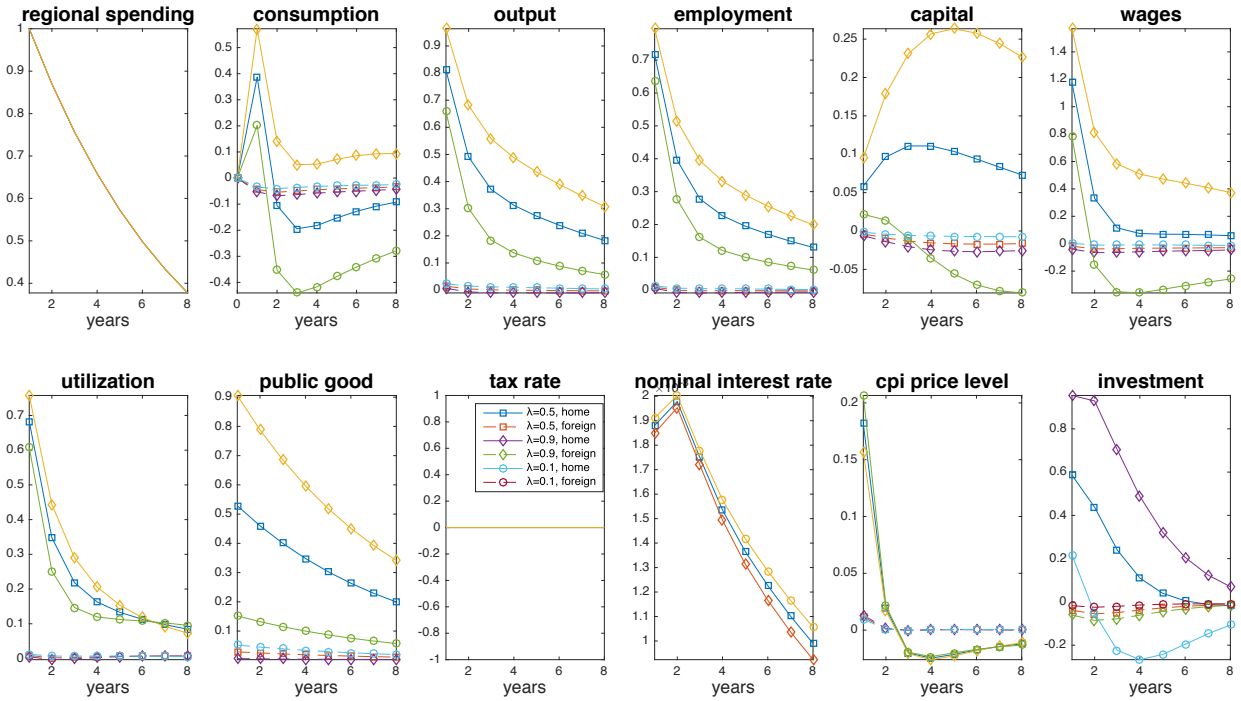
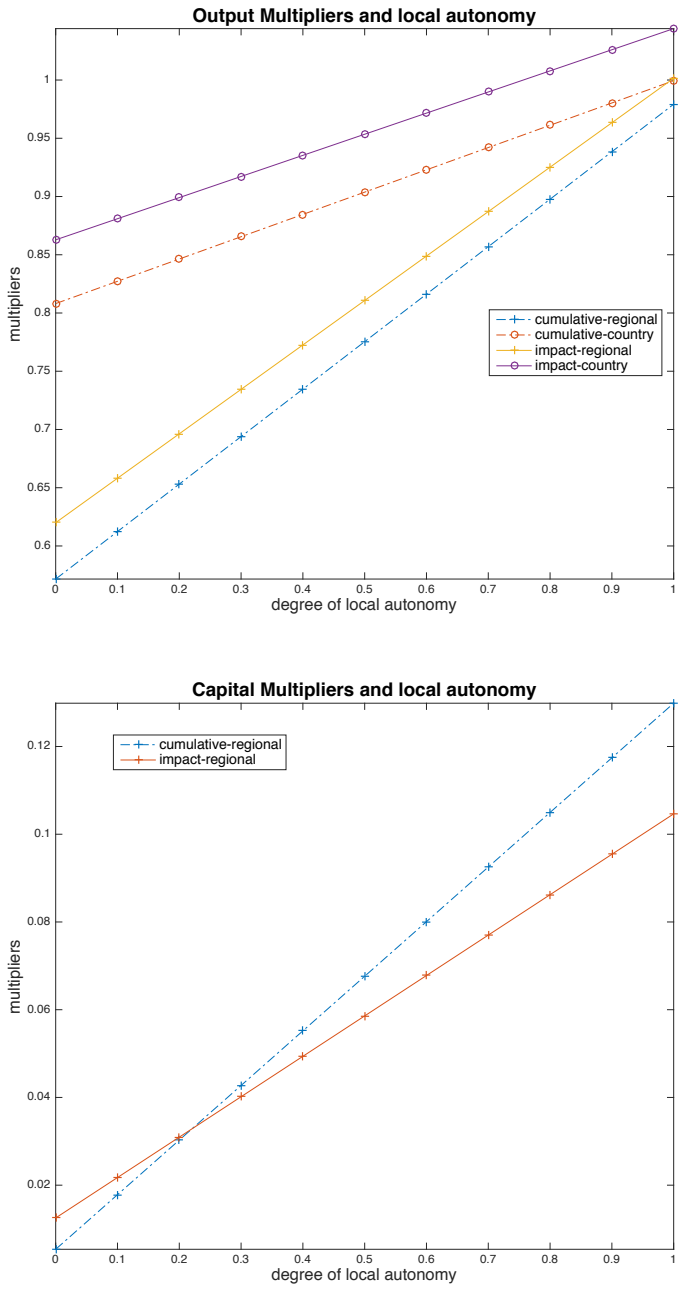


Figure 6 Impulse responses to a Regional Government Spending Shock



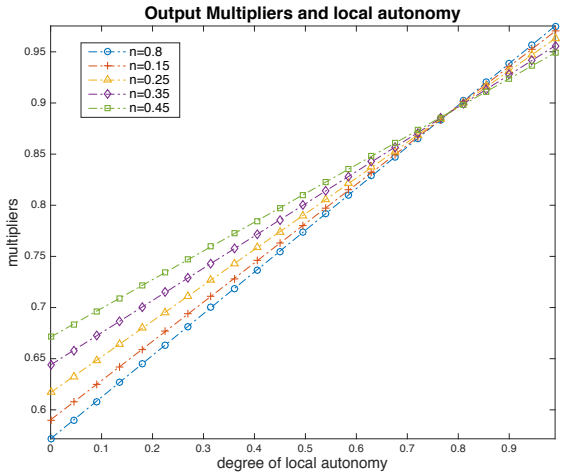
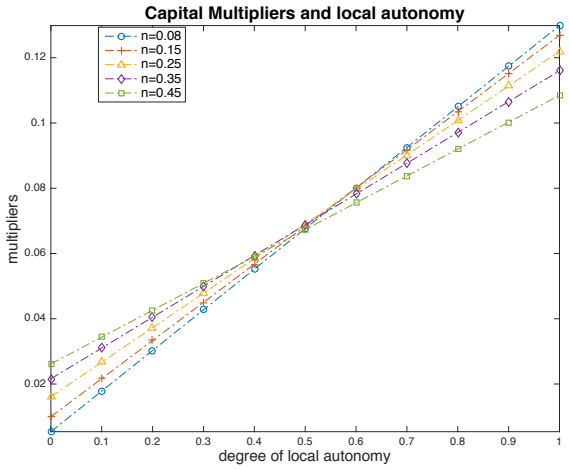
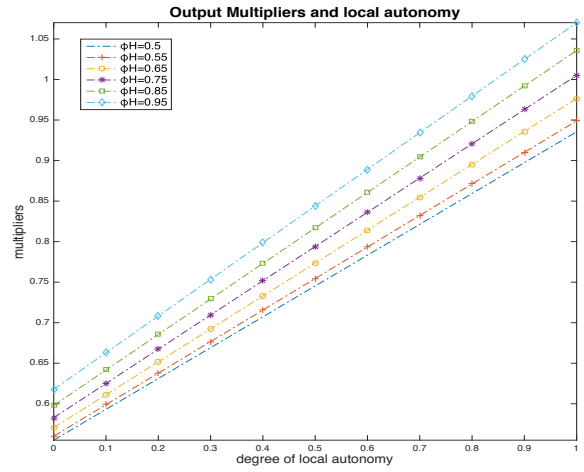
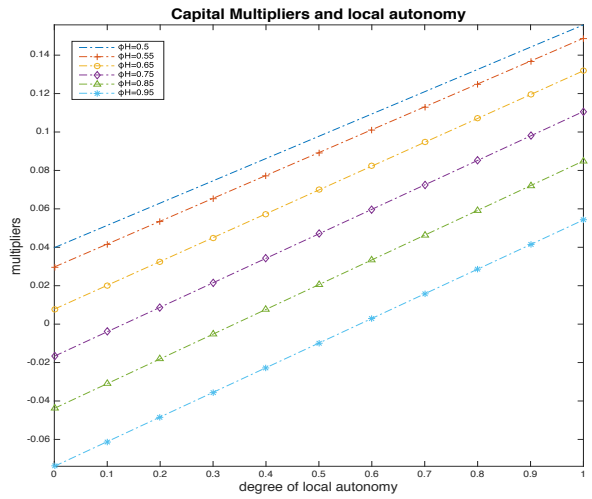
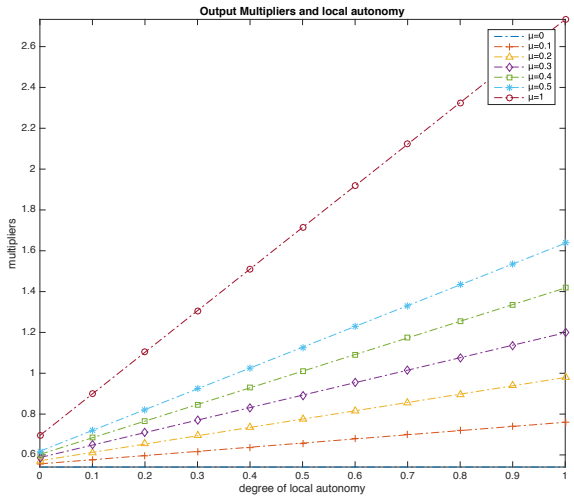
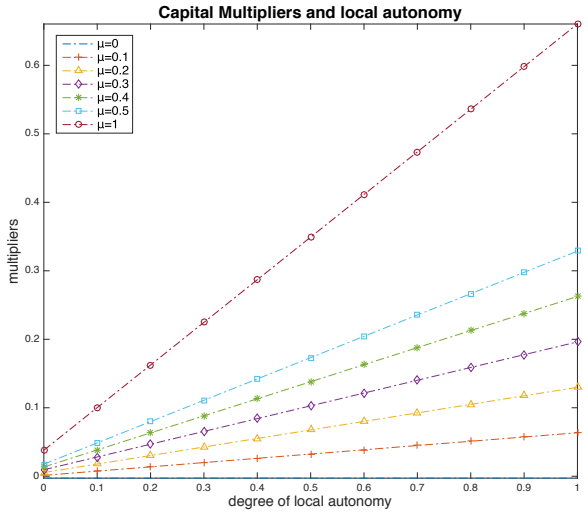
Notes: The graph presents IRFs of the home and the foreign region to a shock in the home government spending. The responses of home variables appear with continuous lines while foreign responses are depicted by dotted lines. The IRFs are plotted for different values of λ=0.1 (circled), λ=0.5 (squared) and λ=0.9 (diamond).

Figure 7 Government spending multipliers as a function of Local Autonomy



Notes: The graph presents the government spending multipliers for output (top panel) and capital (bottom panel) calculated on impact and cumulative. We report the values of the multipliers as functions of parameter λ, that captures the share of local spending used in the production of the local public good that we take it captures the degree of local autonomy. The top panel presents aggregate (circled-lines) and regional (crossed-lines) output multipliers, while the bottom panel presents only regional impact and cumulative multipliers compatible with the ones calculated in our empirical exercise.

Figure 8 Sensitivity analysis A

Output Multipliers	**Capital multipliers**
Region size	
	
Home bias	
	
Productivity of public good	
	

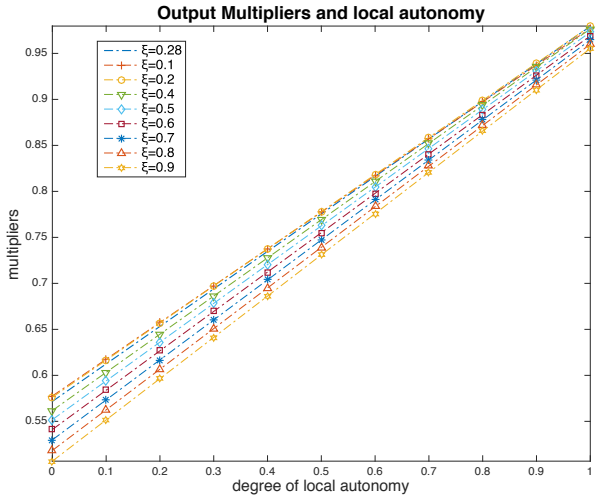
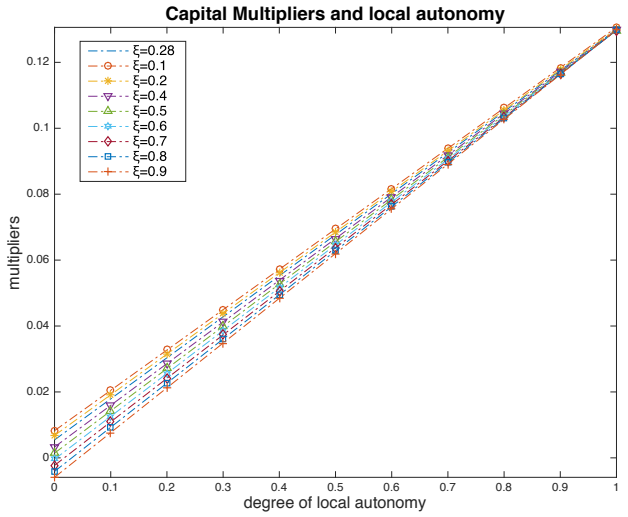
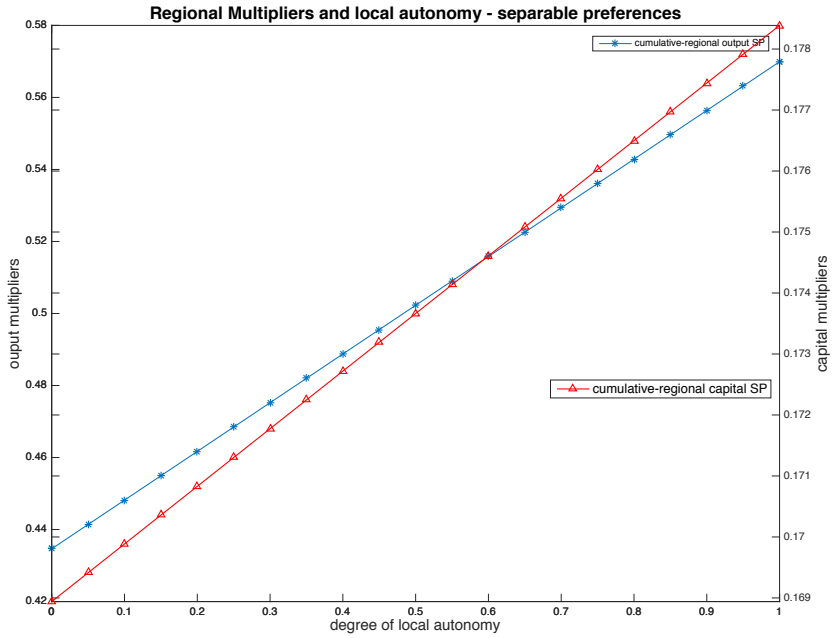
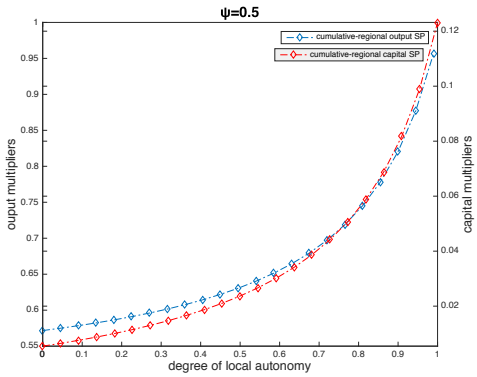
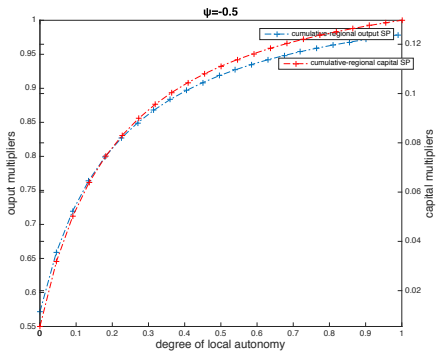
Share of spending attributed to local government	
	
Notes: The graphs present cumulative regional government spending multipliers for output when we vary simultaneously λ, and the size of the home region, the home bias, the productivity of the public good and the share of regional spending absorbed by the central government.	

Figure 9 Sensitivity analysis B



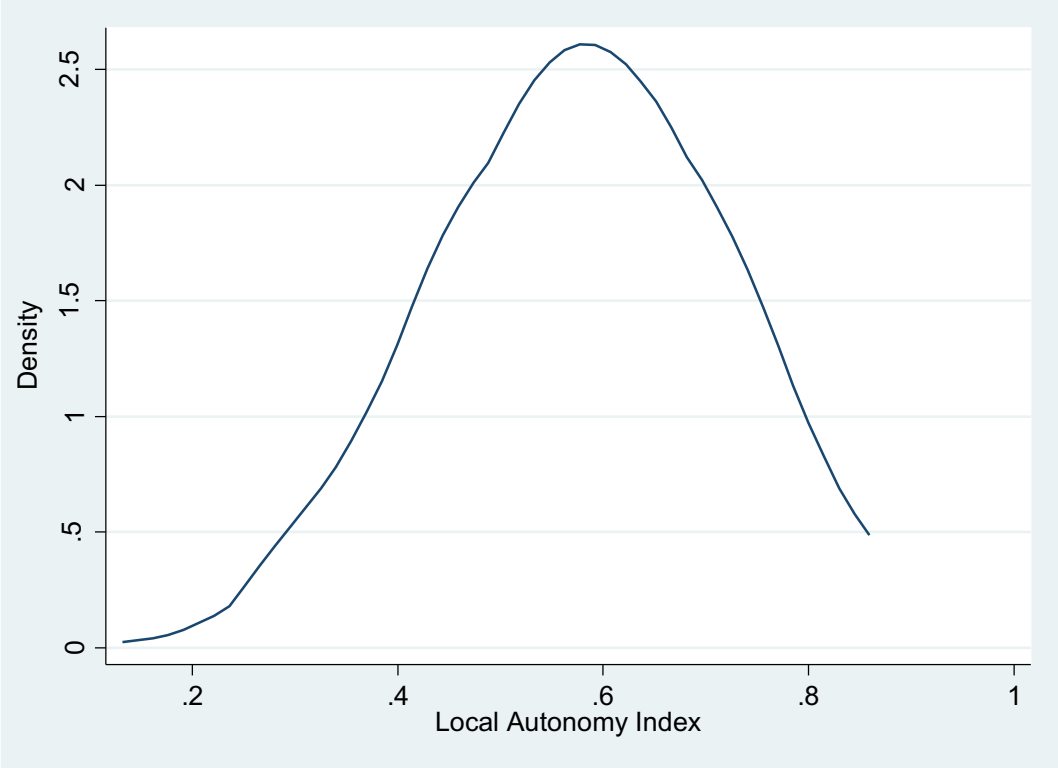




Notes: The graphs present cumulative regional government spending multipliers for output and capital when we vary λ and we assume separable preferences in utility between consumption and leisure

Appendix Figure 1

Panel A: Distribution of Local Autonomy Index



Panel B: Distribution of Share of Regional Government Expenditures in Regional GVA