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# PUBLIC EMPLOYMENT AND REDISTRIBUTION

JOSÉ MANUEL MARQUÉS-SEVILLANO and JOAN ROSSELLÓ-VILLALONGA

## Abstract

In this paper we try to shed some light on the determinants of the regional allocation of public employees by the Central Government. We also estudy the variables that may have an influence on the decision of the number of public employees by the Regional Governments.

We provide some evidence that public employment might have been used by the Central Government as a instrument to favour those regions with lower levels of GDP per capita and higher unemployment rates. Also we find that the number of public employees is larger in those regions in which there is a coincidence between the colors of the ruling parties in the Regional and Central Governments.

However, we do not find strong empirical evidence on the determinants of public employment by the Regional Governments, other that the process of decentralization and the level of GDP per capita.

JEL classification: H0; h1; R7

Keywords: Public employment; Regional Redistribution; Fiscal Policy Instruments.

# Public Employment and Redistribution.

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# 1  Introduction

The last decade has been characterized by a significant reduction in the shape and size of public sector in most western economies. This trend could be interpreted as a consequence of the mainstream theories that claim for efficiency criteria in the provision of public goods and links these arguments with the privatization process and the reduction of public sector. Some authors ( see Martínez- Mongay et al. 2002) have pointed out recently that there may be some problems with this process: these authors find some threshold level such that if the size of the public sector is below that level then the public target of smoothing the business cycle could be compromised. Other authors, like Alesina et al. (2000), show that for some countries, like Italy, this process of reshaping public sector could be simultaneous to a phenomenon of regional redistribution via the consolidation of regions with a high dependency on public employment. Our paper analyses the evolution of public employment in Spain, where the recent evolution of public employment coincides with a complex process of political decentralization.

In the last ten years there has been a significant increase in the number of public employees in Spain[1]. During the period 1990-1999 total public employment in Spain has increased a 17.2%. Spain has experienced an important process of socio-economic convergence towards the European Union and simultaneously there have been several significant changes in his jurisdictional organization. These changes provide several arguments that may help explaining the increase in public employment. First, the provision of public services, such as Education, Social Security and Health, has been extended to all the population. In a framework in which the population is becoming older and in which the flow of immigrants is increasing significantly, the demand of those services has augmented a lot.

Second, the increase might be due to the process of decentralization that started in Spain early in the 80s. Regional Governments have been created and public employment needs have not been entirely covered with employees transferred, together with the new responsibilities, from the Central Government. It is interesting to observe that while the number of public employees at the Central Government and Social Security has decreased by 57.000 people (during the period 90-99), the number of workers at the Regional Governments has increased by 165.000 (see the first graph). If we agree with the usual assumption that there are economies of scale in the provision of public services, this result should not be surprising because 17 new administrations have been created and it seems obvious that there are some important fixed costs.

The process of decentralization has had an impact on the number of public employees in the municipalities also. They have received more responsibilities

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[1]It is difficult to compute the real number of public workers because the previous data is not considering people in the army, in the administration of justice, those related to security and those that are not civil servants but temporary workers in the Administration.
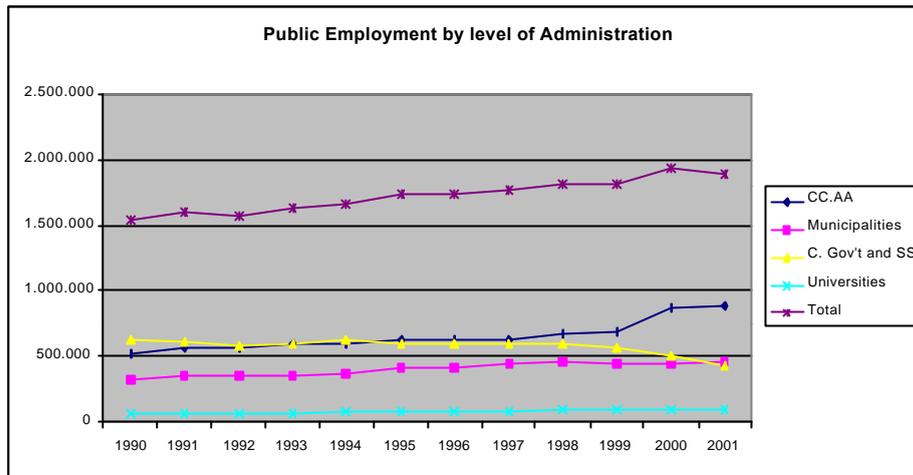
Figure 1:

from the Central Government and this transfer has been simultaneous to a process of enlargement of the cities (the population is moving from the small villages to the medium-size and big cities). The number of inhabitants in a city is precisely what determines the level of public services to be provided by municipalities (water treatment, sewerage, transportation, urban development, etc.)

Finally, we argue that some public jobs might have been created on a basis of political as well as redistribution arguments. The argument of public employment as a redistributive device has to do with the fact that the European Union fixes some constraints to the Regional and Central Governments on the fiscal policy instruments that can be implemented in order to foster economic growth and employment. National Governments cannot make use of public transfers to subsidize private or public firms, they cannot use tax deductions or tax credits to favor local private firms in their territory, they cannot discriminate among private agents (efficient versus inefficient firms), etc. Those constraints imply that the fiscal policy instruments that the Central Governments can use in order to reduce regional disparities in output levels are quite limited. Moreover, although Regional Governments hold responsibilities on R&D, Education and Infrastructures, that may have an impact on growth in the long-run, there is a lack of instruments to fight unemployment in the short-middle run because the EU fixes the same constraints to the regional authorities.

In this framework, both Central and Regional Governments have an incentive to use public employment as an alternative instrument to foster regional economic growth and employment. Even that national public administrations are constrained by the Stability Pact which means that the instrument of public employment cannot be used with no limit, there is a still an open debate, similar to that on public debt, on the terms and conditions to assign the use of fiscal

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policy instruments across the different levels of government. This debate could be enriched if the agents could identify the criteria on which public authorities have based their decisions to increase public employment. In this paper we argue that such decisions may have not been based on economic arguments only.
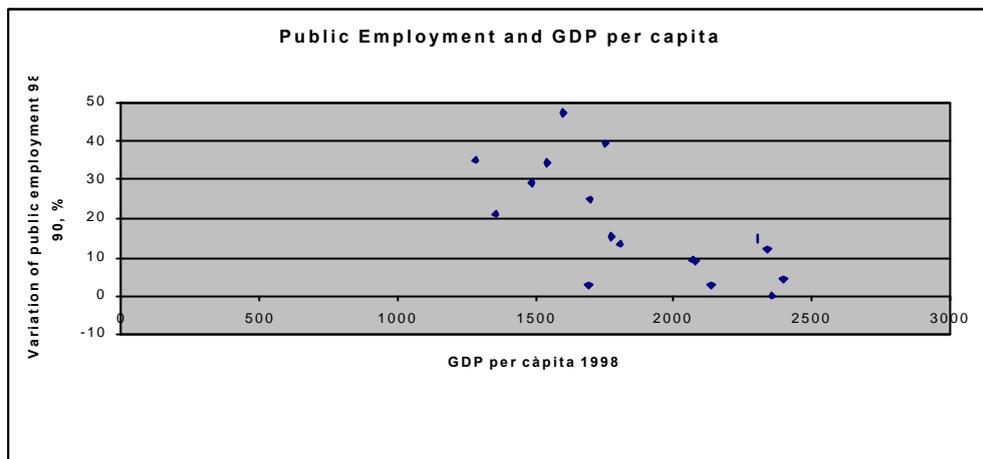


Figure 2:

In the previous graph we can observe that there might be a negative relationship between the regional level of GDP per capita and the variation in the aggregate number of public employees for the period 1990-1998. Although we should control for the level of responsibilities that have been transferred to the Regional Governments, it seems that data shows that in those regions with lower levels of GDP per capita the number of public employees has increased at higher rates. Needless to say that regions have received more or less responsibilities regardless of their GPD per capita or any other measure of wealth but as a result of a process of political bargaining instead. In fact, it is very significant that in one of the poorest regions, Andalucia, the number of public employees (188.000) is larger than in Cataluña, the Basque Country and Madrid (altogether, 187.000). Even that those regions have similar levels of responsibilities, Andalusia has 3 millions of inhabitants less than the other three, in 1999. This data rises some doubts on the validity of the argument of economies of scale in the provision of public goods that one may use in order to explain the increase in the number of public employees due to the process of decentralization and allows us to introduce the possibility of inefficiencies in the decisions on public employment.

Policy makers could argue that public employment has some positive effects on the economy when used as a instrument to fight regional unemployment. One of these effects might be that a permanent position in the Administration guarantees a permanent source of income to the workers. If the number of public employees is very large compared to the number of private workers we might observe that

the business cycle in that region is smoother than in those regions in which public employment is not so significant[2]. Another positive effect could be on the level of Human Capital. Due to the procedure followed by the Administration to hire its workers, public employees have a higher level of education compared to the average level of education of a worker in the private sector.

However, if the number of public employees is very high, relative to the number of workers in the private sector, this may have some negative impacts on the economy: i) low motivation for entrepreneurs to develop market activities, ii) high differentials between public and private wages, iii) rigidities in the functional mobility of workers within the region, iv) dependency of workers and families on public activity, which has negative consequences on the interregional mobility of workers, etc.

Public employment presents advantages also from the political point of view. On the one hand, public employment, as an instrument for redistribution, has lower costs in political terms compared to the costs of redistributing through personal transfers or public investment. These instruments are easy to monitor through the budgetary process; this control relates to which region or which agents will receive the transfers, the type of programs that are financed and the degree of achievement of the goals of any policy. This is not the case with public employment: is it possible to control the number of public workers needed to provide some public services or public goods? is not it better having as many workers as possible so that the Administration is closer to the tax-payers?. On the other hand, we must point out also the interest of politicians and bureaucrats in increasing the number of public employees, which have been described in the literature of Public Choice already: social power, maximization of budgets under their control, etc.

## 1.1   The literature

The idea of public employment as a instrument of redistribution is not new in the literature. There are several papers that deal with this issue. Alesina, Baqir and  Easterly (2000) present a theoretical model in which politicians use public employment as an instrument for redistribution in order to circumvent political opposition to explicit tax-transfer schemes. They provide empirical evidence that in US cities politicians use employment as a redistributive device. They find that city public employment is significantly higher in cities where income inequality and ethnic fragmentation are higher.

In a different paper, Alesina, Danninger and Rostagno (1999) have shown that the number of public employees in the poorer regions in Italy is -after controlling for variables such as population, dependent population, urbanization, etc.-

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[2]However, one may argue that public employment is not evenly spread across the territory in a region but it is concentrate in the capital. Therefore, public employment may foster differences bewteen cities in the same region.

significantly larger than in the richer regions. They compute the amount of expenditure on public employment due to redistribution by estimating the excess of public employees in the poorer regions compared to a benchmark economy. They calculate that about half of the wage bill in the South of Italy can be identified as a subsidy. Additionally, they show that both the size of public employment and the level of wages are used as a redistributive device.

However, even that the results of the paper and the methodology are quite interesting, we think that the paper presents several shortcomings. The authors, for instance, do not consider the role that decentralization may have played in the expansion of public employment in Italy[3]. They only compare North vs. South (as two different groups of regions) based on the total number of public employees in both areas. Another shortcoming of their analysis is that although its is based on political arguments, the authors do not introduce any variable to test their significance (idiosyncracy of the party in power, political turnovers, income inequality, unemployment rates, etc.).

In spite of the relevance of these studies into the debate through Europe on how to allocate the margins fixed in the Stability Pact across regional and central authorities, we did not find more contributions, neither empirical nor theoretical, in the literature. Additionally, in Spain, a country with a high degree of decentralization, this type of studies have not been developed yet. Even that there are several studies[4] that estimate the impact of public expenditure and taxation on redistribution, public employment has never been the object of study in any of those papers. In this paper we try to fill this gap and we provide some data to properly assess the implementation of public policies through public employment.

We would like to run the same exercise as that in Alesina et al. (1999) for Spain introducing political variables and considering the role of decentralization. However, the lack of data available, specially that related to the socioeconomic characteristics of public workers at the Central and Regional Governments, limits the scope of our analysis.

We will focus our analysis to estimate to what extend the amount of public employment at the regional level can be explained according to political rather than economic arguments. The problem with some of the political arguments, from an empirical point of view, is that the political behavior in the short run is very difficult to capture. For instance, in the short run politicians can increase public employment with "temporary" workers [5]. However, there is no data available on temporary public employees but on public employees that are civil servants (they have a life-time job).

In spite of such difficulties we will try to test whether the color of the party in

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[3]They only control for those regions with a special status.

[4]See Argimón et al. (1999) for a good survey on this literature.

[5]Public firms can hire people following a procedure that is more flexible than that followed to hire civil cervants.

power or the coincidence of the color of the parties in power in the Central and Regional Governments may have any impact on the number of public employees.

We argue that the Central Government may use public employment to fight regional unemployment and to favor the regional authorities in some regions. Additionally we test whether Regional Governments have increased the number of public employees due to the new responsibilities, as a instrument to fight unemployment or as a political device.

The paper is organized as follows. In section two we present the model to be estimated. In section three we provide the main results of our estimations and in section four we conclude.

# 2   The model: the determinants of public employment.

We are interested in determining the variables that may explain the number of public employees in different regions. Our dependent variable will be the number of public employees over total employment in a region. We estimate two equations depending on the level of government. On the one hand we gather Central Government and Social Security workers and on the other we consider workers at the Regional Government and the Municipalities. Additionally, we estimate an equation based on the aggregate number of public employees, for each region.

Our benchmark equation is

$$Public \quad Employment_{ti} = f(.) + g(.) + \varepsilon_{it}$$

based on a panel of $i$ regions (i=17) and $t$ periods available (t=1990-1999). In f(.) and g(.) we have different types of variables: time-invariant and time-variant variables as well as region-specific variables.

In our analysis **g(.)** contains those variables that may explain the redistributive role of public employment as well as the role of politics:

- Unemployment rate,

- Income per capita,

- Coincidence between the color of the party in power in the Regional and Central Executives.

- The color of the party in power at the Regional Government

**f(.)** contains those variables that could be related with differences in regional necessities of public services and public employment. These variables are similar to those which are regularly used to estimate the Wagner's law[6]:

- Number of Jurisdictional Units -local and provincial-

- Population

- Level of responsibilities of Regional Governments on public expenditure[7]

- Dependency rate of the population, that is defined as : $\frac{65 < Pop_i < 16}{Total\ employment}$

It is important to stress that it is not our goal testing any theoretical model derived from the modelisation of the behavior of governments. We just try to provide some hints on the determinants of public employment in an environment of a process of decentralization in which different levels of governments may use public employment to fight unemployment or as a instrument to achieve political goals.

**Error Term**

The procedure followed by the Administration to hire public employees introduces a bias in the temporal path of the dependent variable. Mostly, public employees become permanent workers until retirement, after passing an exam. The number of civil servants does not fluctuate according to the needs of the Administration, not even the number of temporary workers, as a consequence. Therefore, there is a lot of rigidity when a reduction in the number of public employees is needed and this may cause that the dependent variable follows a path that is autocorrelated.

Additionally, Regional Governments have been receiving new responsibilities during the period 1981-2001 and they have been increasing the number of public employees continuously. Some of them have been transferred from the Central Government, while some others have been hired by the Regional Governments directly. Even that we control for the process of decentralization by introducing a variable that takes into account the level of responsibilities of each region, this variable does not allow us to capture the increase of public employment due to decentralization correctly. In spite of the fact that we control for the most important groups of responsibilities such as Education, Health and Social Security, we do not know exactly the transfer of public employees that correspond to those responsibilities.

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[6]Other variables that might be considered but which will not be used in our analysis: Crime, Tax evasion, Urbanization rate, etc.

[7]The distinction between special and regular regions will be essential. This distinction corresponds to regions with competencies on Education and Public Health, basically: Andalucia, Cataluña, Basc Country, Canary Islands, Navarre, Valencia, Galicia do have them. Asturias, Balearic Islands and Castilla-la-Mancha have accepted the transfer on education, in 1998, the rest will receive Education by 2001. Finally, all regions have received Health Services by 2002.

As a consequence, we have to correct for this dynamic bias. In order to do so, we assume that the error term, $\varepsilon_{it}$, follows $\varepsilon_{it} = \rho\varepsilon_{it-1} + u_{it}$, where $\rho$ denotes the autocorrelation coefficient and $u_{it}$ is i.i.d. Therefore, the equation to be estimated is

$$y_{it} = \beta x_{it} + \delta z_i + \eta_i + \lambda_t + \varepsilon_{it}$$

where $z_i$ denotes time-invariant variables, while $\eta_i$ and $\lambda_t$ refer to fixed individual and fixed time effects respectively.

The autocorrelation in the error term introduces several difficulties in the estimation of the coefficients. The expansion of the error term implies that we should estimate the equation

$$y_{it} = \rho y_{it-1} + \beta x_{it} - \beta\rho x_{it-1} + \delta(1-\rho)z_i + (1-\rho)\eta_i + \lambda_t - \rho\lambda_{t-1} + u_{it}$$

However, in order to run the estimation, we should introduce several restrictions on the coefficients. The estimation would provide

$$y_{it} = a y_{it-1} + b x_{it} - c x_{it-1} + d z_i + \lambda_t^* + +\eta_i^* + u_{it}$$

where $\lambda_t^* = \lambda_t - \rho\lambda_{t-1}$ and $\eta_i^* = (1-\rho)\eta_i$ and these coefficients should satisfy:

$$c = a * b$$

The problem is that by introducing those restrictions we are reducing the degrees of freedom significantly. Given that the data available is very short, the introduction of those restrictions is not harmless. Moreover, due to the lack of data available it is very likely that we would accept the restrictions because the test would not be powerful enough so as to reject them. If we imposed the restrictions we would estimate

$$y_{it} = \beta x_{it} + \delta z_i + \eta_i + \lambda_t + \frac{u_{it}}{1 - \rho L} \tag{1}$$

where L denotes the lag operator. In this paper we run a regression on equation (1) using OLS assuming an autocorrelated error term.

Alternatively, we could run our estimations considering an error term that follows a random walk. However three considerations should be introduced. First, due to the short length of the data available estimating an ADF or a Dickey-Fuller test does not seem appropriate. Second, if we differentiate a stationary variable (although highly autocorrelated) we could be introducing non-invertible moving average processes which may cause problems in the estimates. Third, estimating

the equations using variables in first differences introduces heteroskedasticity in the standard errors. In short, we follow: i) we estimate equation (1) using OLS and an autocorrelated error term, ii) when the estimated coefficient for $\rho$ is very high we estimate an equation in which we use variables in first-differences and we control for heteroskedasticity.

# 3 Results

## 3.1 The regional distribution of public employment by the Central Government

In this section we study the variables that might be considered by the Central Government when deciding the distribution of public employees (Central Government and Social Security workers) across the regions. We estimate a model in which we introduce several explanatory variables: i) the dependency ratio, which measures the population whose age is lower to 16 and larger to 65 over regional aggregate employment, ii) the unemployment rate, iii) GDP per capita, iv) the level of decentralization, and finally, v) the coincidence between the colors of the ruling parties in the Central and Regional Executives.

On the one hand, we expect to find a positive relationship between the number of public employees and the dependency ratio, the unemployment rate and the variable of political coincidence (we have argued that the Central Government might be favoring those regions in which the color of the ruling party is the same to that in the Central Government). On the other hand, we expect a negative sign for the variable that measures the level of decentralization of the regions. The transfer of responsibilities from the Central to the Regional Governments reduces the number of public employees in the Central Government because they are transferred to the Regional Government. Finally, the expected sign for GDP per capita is ambiguous. Even that we argued that the Central Government could favor those regions with lower GDP per capita (therefore the expected sign would be negative), it is also true that the demand of some of the public services that are labor intensive are positively related to GDP per capita (we think of Health and Education basically).

We must emphasize that in all the regressions there are two variables that are always significant and they have the expected sign. First, not surprisingly, we observe that the Central Government allocates a lower number of public employees in those regions whose Regional Governments have received more responsibilities. Second, and more interesting, our regressions show that the Central Government has allocated a large number of public employees in those regions in which there is a coincidence between the color of the ruling party in the Regional Government and that in the Central Government. This result suggest that politicians at the Central Government may have favored those regions in which the color of the

ruling party is the same. We present these results in Table I.

In the first column we present the results that correspond to the estimation of an equation in which both individual and time fixed effects are considered. In this column we show that: i) the allocation of public workers across regions depends positively on the regional unemployment rates, ii) regional public employment is negatively related to regional GDP per capita, therefore suggesting that those regions with lower levels of income are the ones that have received larger levels of public employment. Only the dependency ratio presents a coefficient that is non-significant. Finally, we must note that the estimated coefficient for $\rho$ is not very high.

| Table I . Dependent Variable: log of Central Gov't Employees per worker | | | | | | |
|---|---|---|---|---|---|---|
| Model (AR1) | (1) | | (2) | | (3) | |
| Explanatory Variables | Coeff | T-St | Coeff | T-St | Coeff | T-St |
| Constant | 27.26 | 2.501 | 2.246 | 1.538 | 14.968 | 2.533 |
| Dependency ratio | 0.484 | 1.092 | 1.342 | 4.160 | 0.386 | 0.939 |
| Unemployment rate | 0.480 | 2.568 | -0.175 | -1.389 | 0.137 | 0.899 |
| GDP per capita | -3.116 | -2.158 | 0.383 | 2.115 | -1.406 | -1.782 |
| Decentralization | -1.088 | -3.790 | -.6122 | -16.465 | -.661 | -3.455 |
| Political coincidence | 0.297 | 5.164 | 0.267 | 5.060 | 0.236 | 4.498 |
| | | | | | | |
| Fixed Time Effects | yes | | yes | | trend | |
| Fixed Individual Effects | yes | | no | | yes | |
| | | | | | | |
| Rho | 0.688 | | 0.883 | | 0.806 | |
| R-squared | 0.917 | | 0.817 | | 0.891 | |
| F-value | | | F(16,107)=8.208 | | F(7,107)=4.749 | |

In order to test for the robustness of the previous results, in column (2) we introduce the restriction that there is a common individual effect. This is equivalent to estimating a regression in which we do not take into account regional differences. Therefore, it is like if we were studying the determinants of aggregate public employment at the Central Government. This restriction introduces two important modifications in the results and in the expected signs of the variables. On the one hand the value of the rho coefficient is larger, which might be explained by the fact that under the null hypothesis the aggregate level of employment has a temporal component that is very strong: although it is not difficult to reallocate public employees across regions, reducing the aggregate number of public employees is almost impossible (we are controlling for the process of decentralization). On the other hand, the sign of the variable GDP per capita takes the positive sign which might be due to the fact that the demand of public services such as Education and Health are positively related to the level of income. In

spite of those results, when we test the restriction of common intercepts we reject it.

Finally, we test whether fixed time effects are relevant or not. The results in column (3) correspond to an estimation where we substitute fixed time effects by a trend. As we can observe, the results in (3) are very similar to those in (1), except to what refers to the signification of the coefficient of the unemployment rate. Anyhow, we reject the null hypothesis, which suggests that the model in equation (1) is the preferred one.

Therefore, the previous results indicate that the Central Government might have been using public employment as a instrument to fight unemployment and to favor the poorer regions and also that the Central Government might have been favoring those regions whose Regional Government's ruling parties were of the same color as that of the Central Government.

## 3.2 The determinants of public employment by the Regional Governments

In this section we try to determine the variables that might be considered by the Regional Governments when deciding on the number of public employees. This decision will depend largely on the level of responsibilities received by Regional Governments from the Central Government. In fact, we think that this argument is quite relevant for the results of our estimates because in those regions with lower levels of responsibilities the number of public employees is not endogenously decided but it depends largely on the Central Government's decision to transfer more responsibilities[8]. For those regions (all but 5) the temporal component of the dependent variable is quite important because they have been receiving responsibilities continuously. Even that we try to control for this temporal path by introducing a temporal dummy variable and a variable that takes into account the process of decentralization, the temporal component is still present and it is reflected in the autocorrelation term, which is very large and which might introduce too much noise in the estimations.

One may argue that we should test for unit roots in the variables to check whether we should work with variables in first-differences instead. However, there are two problems with this approach. First, due to the short length of the data, there is a lag of power in the test and it is very likely that the test would be biased towards accepting the hypothesis that $\rho=1$. Second, when we differentiate we eliminate all those variables that are time invariant which means that we should run our estimations without any of the individual-specific variables. When we do so we observe that although we control for autocorrelation, we introduce the problem of heteroskedasticity and the estimations with heteroskedastic-consistent

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[8] The transfer of some responsibilities may represent that the Regional Government's number of employees two or threefolds.

errors are rather unsatisfactory.

In Table II we present the estimations considering the variables in levels and introducing an autocorrelated error term. As in the previous section, in column (1) we present the estimation considering both fixed time and individual effects, while in columns (2) and (3) we test the null hypothesis of a common intercept and the presence of a trend in the time fixed effects respectively. In all of the estimations we observe that the $\rho$ coefficient is very high ($\rho > 0.84$), which might indicate that the estimates are non consistent.

In spite of the large value of that coefficient, it is interesting to note that there are four variables that have the same sign and level of signification regardless of the specification that we use. According to these results we could say that: i) public employment in the regional governments depends positively on the level of reponsibilities of the regional governments, ii) the number of public employees is larger in those regions in which regional parties are in power, compared to those regions with right-wing ruling parties, iii) there is no relationship between public employment and regional unemployment rates, iv) public employment is negatively related to the number of municipalities in the regions. Even that we expected a positive sign of this variable, the negative sign might be due to the fact that the larger the number of municipalities in one region the lower the number of inhabitants (the population is more disperse), which is what determines the level of public services to be offered and thus the number of public workers in the municipality.

In column (1) the results correspond to an estimation in which both time and individual fixed effects are considered. A part from the results that we mentioned in the previous paragraph, the other variables are non significant and the rho coefficient is very high (0.944), as we already mentioned.

| Table II. Dependent Variable: log of Regional Gov't Employees per worker | | | | | | |
|---|---|---|---|---|---|---|
| Model (AR1) | (1) | | (2) | | (3) | |
| Explanatory Variables | Coeff | T-St | Coeff | T-St | Coeff | T-St |
| Constant | -4.050 | -1.149 | 3.649 | 3.299 | -4.399 | -1.76 |
| Dependency ratio | 0.361 | 1.302 | 0.288 | 1.140 | 0.542 | 2.226 |
| Unemployment rate | -.022 | -.175 | 0.092 | 0.801 | -.024 | -.258 |
| GDP per capita | 0.349 | 1.008 | -.393 | -2.978 | 0.523 | 2.010 |
| Decentralization | 0.355 | 3.149 | 0.190 | 7.850 | 0.296 | 2.960 |
| Left wing party | 0.006 | 0.134 | 0.093 | 2.506 | -.023 | -.640 |
| Regional Party | 0.285 | 3.076 | 0.143 | 2.102 | .256 | 2.931 |
| Number of local gov'ts | -.128 | -2.548 | -.066 | -2.148 | -.124 | -2.607 |
| | | | | | | |
| Fixed Time Effects | yes | | yes | | trend | |
| Fixed Individual Effects | yes | | no | | yes | |
| | | | | | | |
| Rho | 0.944 | | 0.840 | | 0.929 | |
| R-squared | 0.905 | | 0.723 | | 0.894 | |
| F-value | | | F(16,104)=4.446 | | F(7,104)=1.596 | |

In column (2) we estimate an equation in which we introduce the restriction that there is a single individual effect. Even that under this specification the $\rho$ coefficient is smaller, when we test the null hypothesis of common individual effects, we reject it.

In column (3) we estimate the first equation but we substitute the fixed time variable by a trend. Under this assumption the estimates are very similar to those in column (1), the main differences being that the number of public employees is positively related to the dependency ratio and that the GDP per capita affects positively public employment (we have provided intuition for this result). When we test the null hypothesis, we cannot reject it. Therefore it seems that this model is preferred to that in column (1).

Nevertheless, due the high coefficient for $\rho$ (0.929) we decided to estimate the previous equation considering variables in first differences. There are two differences with the previous equation. First, when we take first differences we cannot use the variables that are related to the color of the party in power (with this specification they do not have any interpretation). We substituted those variables by a new one that collects the shift in the ruling parties in the Regional Governments. Second, we have to omit the variable related to the number of municipalities, because it is time invariant.

The results are presented in Table III. The differences between the estimates in column (1) and (2) depend on the consideration or not of heteroskedastic-consistent standard errors. The value of the coefficients is the same, but not the size of the standard errors, which affects the value of the T-Statistics. We must notice also that the $R^2$ has decreased significantly. Even that some of the results in

column (1) are very interesting, when we use heteroskedastic-consistent standard errors, the signification of the coefficients decreases significantly. None of the variables, except the level of decentralization and GDP (which has a negative sign), are significant. These results suggest again that regional public employment is larger in those regions with lower levels of GDP per capita.

| Table III. Estimations with variables in first-differences | | | | |
|---|---|---|---|---|
| | (1) | | (2) | |
| Explanatory Variables | Coeff | T-St | Coeff | T-St |
| Constant | 0.233 | 2.349 | 0.233 | 1.859 |
| Dependency ratio | 0.334 | 1.232 | 0.334 | 1.444 |
| Unemployment | -0.054 | -0.459 | -0.054 | -0.446 |
| GDP per capita | -2.530 | -2.414 | -2.530 | -1.904 |
| Decentralization | 0.589 | 5.461 | 0.589 | 2.137 |
| Political turnover | 0.034 | 1.854 | 0.034 | 0.971 |
| | | | | |
| Fixed Time Effects | yes | | yes | |
| Heteroskedastic-consistent errors | no | | yes | |
| | | | | |
| R-squared | 0.372 | | 0.372 | |

Therefore, we cannot provide strong evidence that Regional Governments, when deciding their number of public employees, take into consideration variables such as unemployment or the ratio of dependent population even that there is some evidence regarding the GDP per capita. However, there is strong evidence that the levels of public employment at the Regional Governments are strongly determined by the process of decentralization.

## 3.3 The aggregate level of public employment

Once we have analyzed the determinants of the regional allocation of public employment by the Central Government as well as the determinants of public employment by the Regional Governments, in this section we study the variables that may explain the aggregate level of public employment in each of the regions.

Two important considerations should be taken into account prior to the analysis. On the one hand, we have already mentioned that the increase in the number of public employees at the Regional Government has been significantly larger than the reduction of employees at the Central Government. This might indicate that there is a large number of public employees in the Central Administration that have not been transferred to the Regional Governments together with the new responsibilities. These workers might have been reallocated, inefficiently, in those regions in which the role of the Central Government is still predominant. This

argument might explain the negative relationship that we find between aggregate public employment and the level of decentralization.

On the other hand, there is still a problem of autocorrelation. The temporal component of public employment is still rather important due to the rigidities in the fluctuation of aggregate public employment. Even that we run our estimates controlling for autocorrelation in the error term, the results must be taken with some care due to the high coefficient for $\rho$. In the next tables we present our results considering: i) an autocorrelated error term, ii) taking variables in first differences.

In Table IV, we provide the results when we run our estimates considering an autocorrelated error term. In both columns we find that the level of public employment decided by the Regional Governments depends positively on the dependency ratio and negatively on the level of decentralization. This last result suggests, unexpectedly, that those regions with a lower level of responsibilities have larger levels of public employment. In the previous paragraph we argued that this result might be due to the fact that the Central Government reallocates part of those workers that have not been transferred to the Regional Governments together with the new responsibilities across those regions in which the Central Government provides most of the public goods.

The other variables present different signs and degrees of signification that depend on the specification. In column (1) we estimate a AR(1) in which both individual and time effects are considered. The first thing to be mentioned is that the coefficient $\rho$ is very closed to 1, which indicates that the estimates might be non-consistent, although most of the variables have the expected sign. The results indicate that, once controlling for the level of responsibilities transferred to the Regional Governments, those regions with lower GDP per capita have higher levels of public employment. The results also show that those regions with a larger number of municipalities have less public employment due to the fact that the dispersion of the population across many municipalities reduces the provision of public services to be provided by this level of administration. In this estimation we do not find any relationship between public employment and any of the variables that refer to politics.

In column (2) we run the same exercise introducing the restriction of common individual effects. However, the F-Test rejects the null hypothesis of common intercepts[9].

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[9]We have also tested for common fixed time effects. However, results are not provided because in that regression the iteration procedure stops before rho converges.

| Table IV. Dependent Variable: log of Total Public Employees per worker | | | | |
|---|---|---|---|---|
| Model (AR1) | (1) | | (2) | |
| Explanatory Variables | Coeff | T-St | Coeff | T-St |
| Constant | 48.821 | 3.152 | 3.334 | 4.874 |
| Dependency ratio | 0.350 | 2.873 | 0.306 | 2.119 |
| Unemployment rate | 0.091 | 1.642 | 0.332 | 5.502 |
| GDP per capita | -1.208 | -2.625 | 0.087 | 1.024 |
| Decentralization | -9.177 | -2.903 | -.115 | -6.454 |
| Left wing party | 0.111 | 1.804 | 0.044 | 0.558 |
| Regional Party | 0.084 | 1.820 | -.063 | -1.315 |
| Number of local gov'ts | -3.984 | -2.888 | 0.016 | 0.979 |
| Political Coincidence | -.080 | -1.317 | 0.051 | 0.613 |
| | | | | |
| Fixed Time Effects | yes | | yes | |
| Fixed Individual Effects | yes | | no | |
| | | | | |
| Rho | .967 | | .765 | |
| R-squared | .959 | | .898 | |
| F-value | | | 9.570 | |

Given that the estimated coefficient for autocorrelation is very closed to 1, this result might indicate that we should take variables in first differences. This forces us to avoid using the variable related to the number of municipalities and also that we modify the variables that try to capture the political arguments. We used a variable that collects the shift in the color of the ruling parties in the Regional Governments during our period of analysis.

Additionally, the variable that relates to the coincidence between the color of the ruling parties in the Central and Regional Governments is modified so as to capture changes in this coincidence (from non-coincidence to coincidence and vice-versa). In the previous section we mentioned already that this procedure could introduce the problem of heteroskedasticity, even that we could avoid the inconsistency of the estimated coefficients due to autocorrelation.

In Table V, column (2) we present the estimations considering heteroskedastic-consistent standard errors. We can observe that the aggregate level of public employment at the regional level depends positively on the dependency ratio. Unfortunately, none of the variables are significant, including the variable that relates to the process of decentralization (which might be due to the fact that the impact of decentralization on the level of public employment at the Central Government might compensate the increase of public employment in the Regional Government). Only the variable that represents the variation of the coincidence of the color of the ruling parties in the Central and Regional Governments is significant. The negative sign of this variable suggests that the more changes there

are in the coincidence between the ruling parties in both levels of government the lower the level of aggregate public employment.

| Table V. Estimations with variables in first-differences | | | | |
|---|---|---|---|---|
| | (1) | | (2) | |
| Explanatory Variables | Coeff | T-St | Coeff | T-St |
| Constant | 0.146 | 3.275 | 0.146 | 2.396 |
| Dependency ratio | 0.376 | 3.126 | 0.376 | 3.351 |
| Unemployment | 0.063 | 1.218 | 0.063 | 1.428 |
| GDP per capita | -1.251 | -2.635 | -1.251 | -1.796 |
| Decentralization | 0.031 | 0.064 | 0.031 | 0.514 |
| Political turnover | 0.013 | 0.602 | 0.013 | 1.523 |
| Political Coincidence | -0.049 | -1.129 | -0.049 | -2.671 |
| | | | | |
| Fixed Time Effects | yes | | yes | |
| Heteroskedastic-consistent errors | no | | yes | |
| | | | | |
| R-squared | 0.435 | | 0.435 | |

# 4    Conclusions

It is very important that we stress that in our estimates we differentiate whether the dependent variable is the level of public employment at the Central Government or the Regional Governments instead. The reason for this differentiation is that we think that, once controlling for the process of decentralization and for the temporal component of the dependent variable, we can isolate some of the determinants of the regional allocation of public employees by the Central Government. However, this is not the case with the level of public employment decided by the Regional Governments. In this case we think that the decision is not endogenous to the Regions, but it depends on the Central Government's decisions to transfer more or less responsibilities and the amount of public employees managed or provided them. This will introduce some noise in our estimates.

Once we made those considerations we think that we derive some interesting results from our analysis

First, we tried to shed some light on the determinants of the regional allocation of public employment by the Central Government. Our results confirm the role played by the decentralization process and we observe that those regions that have received a larger amount of responsibilities have a lower level of public employees that depend from the Central Government. These results suggest also that the Central Government has taken into account the color of the party in power at the Regional Government. This is what indicates the positive sign (and significance) of the variable that collects the coincidence of the color of the ruling parties in both the Regional and the Central Governments.

Although the results concerning the previous variables were quite robust, the other variables present some variation in both the significance and the signs, depending on the final specification of the model. However, after running some tests, the results of the preferred specification (that considering both time and individual fixed effects) seem to indicate that the Central Government may have allocated public employees favoring those regions with larger unemployment rates as well as lower levels in per capita income. In this specification, the level of autocorrelation indicated that it was running the estimations using variables in first differences was not necessary.

Second, we studied the variables that might be considered by the Regional Governments when deciding the level of public employment in their regions. We have devoted special attention to deal with the problem of autocorrelation. As expected, the variable that has played the most relevant role, in any of the specifications, is the one that controls for the process of decentralization: we obtain that the regions that have received larger levels of responsibilities are the ones that have larger levels of public employees. Again, the other variables that we considered present different signs and degrees of significance depending on the specification of the model.

On the one hand we run a regression with the variables in levels, considering both individual and fixed time effects and introducing an autocorrelated error term. The specification that has been chosen presents several interesting results. First, it seems that the level of public employment depends positively on the level of per capita income. Even that it seems that this result contradicts our argument, we already mentioned that this variable could also take a positive sign, because the demand of some public services (e.g. Health and Education) depends positively on the level of regional income. Second, we show that those regions with regional ruling parties, compared to those regions with right-wing oriented parties, present larger levels of public employment. Finally, we have also observed that the variable that represents the number of municipalities is significant and it has a negative sign, which indicates that those regions with a larger number of municipalities present lower levels of public employment. Although the intuition may suggest an opposite sign, this result might be due to the fact that the larger the number of municipalities the lower the size of the local governments, for a given population, because the level of public services to be provided by the municipalities depends on the size of the population.

In spite of those interesting results, it is important to stress that the coefficient of autocorrelation was very high and that the results may be inconsistent. When this occurs, the researchers estimate the regressions using variables in first differences. By doing so we avoid the problem of autocorrelation and also the problem to determine whether individual effects are fixed or random. However, even that in time series analysis this is the right procedure, in case of panel data we introduce the problem of heteroskedasticity. Even that our estimations considering first differences are very interesting, these results are not robust to

heteroskedasticity. Once we control for heteroskedasticity we obtain: a) the variable that controls for the process of decentralization is significant and has the expected sign, b) The GDP per capita is significant, with a negative sign, suggesting that those regions with lower GDP per capita have larger levels of public employment.

Finally, we estimated a third regression with total public employment at the regional level as the dependent variable. As expected, the dependent variable still presented the problem of autocorrelation. The results of the estimation in first differences and controlling for heteroskedasticity showed that the aggregate level of public employment depends positively on the dependency ratio and that the shift of the colors of the ruling parties in both executives favored lower levels of aggregate public employment.

Summarizing, in this paper we showed that, at least to what refers to the regional allocation of public employment by the Central Government, the Central Government may have used public employment as a instrument to favor those regions with: i) larger levels of unemployment, ii) lower levels of income per capita, iii) a coincidence of the color of the parties in power in both levels of Government. The results were not so robust to what concerns the determinants of public employment by the Regional Governments. Unfortunately, we did not find strong empirical evidence on the role that variables such as unemployment or the dependency ratio might have played. However, we showed that the path of the dependent variable is strongly determined by the process of decentralization even that it seems that Regional Governments in those regions with lower levels of GDP per capita tend to have a large number of public employees.

We think that once all responsibilities have been transferred to the regional governments (by 2002) the results of our estimates will improve considerably because: i) the decision on the level of employment at the Regional Government will be endogenous, ii) we will be able to isolate the variables that might be considered by the Regional Governments when deciding the level of public employment.

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## 5.1 Data

a) Data on the number of **Public Employees** is available at the Registro Central de Personal (Source: Ministry of Public Affairs) for the period 1990-99 for all regions. Data corresponds to:

- Public Employees at the Central Administration, includes all public employees except those in:

    -Justice

    -Armed Forces (except civil employees at the Ministry of Defense)

    -National Security (Police)

    -Employees in Public Firms and Public Agencies

- Public Employees in the Regional Administrations (except Police, Justice and employees in Public Firms and Public Agencies)

- Public Employees in the Local Administration.

- Universities.

b) **Expenditure in Public Employment** (this corresponds to Chapter I in the Budget): this data was collected from the Executed Budget considering all agents at any level of administration. This means that data includes wages and salaries of all Public Employees, including those in Justice, Police, Public Firms and Public Agencies.

c) Regarding the other variables:

- **Population**. Source BBV.

- **Dependency rate of the population.** Source BBV.

- **Unemployment Rate**. Source BBV

- **Income levels**. Source: INE, Contabilidad Regional de España.

- **Political turnover and political idiosincracy of goverments.** Source: Ministry of Internal Affairs.