Health expenditure in the US States. Convergence and partisan behaviour

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Abstract

This paper studies the evolution of the US state health expenditure. Our results provide evidence against the existence of a unique pattern of behavior. Rather, we can observe the existence of different clubs. These are quite similar when we consider total health expenditure or the Medicare expenditure. By contrast, Medicare expenditure exhibits a rather different behavior. We also verify that neither the number of clubs nor their composition has been affected by the recent worldwide crisis. Finally, the use of partisan variables helps to understand the forces that drive the different clubs. Those states with lower levels of health expenditure tend to adopt health policy decisions under the influence of the Republican Party. By contrast, the larger the coincidence of the Democratic Party in both US federal and state Government, the larger the health expenditure of this State.

Keywords

Convergence analysis, Phillips-Sul; Health expenditure; Partisan behaviour; Crisis

JEL Classification.

C22

1. INTRODUCTION

Health care expenditure (HCE) has been rising sharply in most developed countries for at least the last three decades. This process has been accomplished by the economists' efforts to identify the driving factors behind the level and the rapid growth of total health care expenditures across countries. Since the seminal paper of Newhouse (1977) until the recent paper of Hartwig and Sturm (2014) -review of determinants of health care expenditure suggested in the literature for 33 OECD countries over the period 1970–2010-, national income or Gross Domestic Product has been identified as the most important determinant of health expenditure.

Given the central role of income, it could be expected that as income converges among territories, so does the closely related health care expenditure. In addition, technological advancement is a major contributor to health care expenditure and this tends to be common among territories (Newhouse, 1992). As countries grow over time, consumers may demand for new medical services and procedures and contribute to the convergence of health expenditure (Pekkurnaz, 2015).

But, as have been emphasized, surprisingly enough, it has not been until recent years that researchers have begun to examine the issue of health care expenditure convergence/divergence (Villaverde *et al.* (2014, p. 29). These studies have been developed in the sphere of international comparisons. Either between OECD countries (Barros, 1998; Alcalde-Unzu *et al*., 2009; Fallahi, 2011; Panopoulou and Pantelidis, 2011; Pekkurnaz, 2015), or between the UE members (Hitiris, 1997; Nixon, 2000), Hitiris y Nixon, 2001; Hofmarcher *et al*., 2004; Kerem *et al*., 2008; Villaverde *et al.*, 2014, Lau *et al*., 2014). In this later case, European policies aimed to reduce income inequality among countries may also lead to convergence in HCE.

The findings of these studies are mixed. Some papers found convergence (Hitiris y Nixon, 2001; Alcalde-Unzu *et al*., 2009), whereas others show non-convergence or weak convergence (Lau, 2014, Montarani and Nelson, 2013). After a detailed review of the literature, Lau (2014, p.137) concludes that the extant literature is contradictory, inconclusive and potentially misleading characterised as a 'mixed bag'.

Giving the elevate degree of heterogeneity among the countries, with different health systems due to law, financing or management, this result is not unexpected. This heterogeneity limits the data comparability and the interpretation of empirical results (Clemente *et al*., 2004, Costa-Font and Pons-Novell, 2007). Another practical problem could be the definition of some key variables, quite different among countries, or the dissimilar choice of conversion factors, for instance exchange rates or purchasing power parities. In contrast, we should expect state/provincial level data do not suffer these problems (Wang, 2009b).

That is to say, convergence of health care expenditure is more probable that occur across regions within a country than across countries. Unfortunately, there is hardly anything across regions within a country (Aspergis *et al*. 2016). In this regard, the study of United States is particularly attractive. There are at least three reasons for this election.

First of all, US health spending is significantly higher than other developed countries. The share of gross domestic product devoted to health care was around 11,9% in 1991, increasing until 16,4% in 2009, which means that one every 6 dollar is devoted to health. Within the last fifty years, the total health care expenditures as share of GDP has more than tripped (Bosem, 2015). For the same dates, Canada spent 9,1% to 10,6% (Canada represents the second country in terms of health expenditure) or, among the European countries, United Kingdom spent 5,5% and 8,7% of his GDP in health. On a per capita basis (constant dollar) health spending ranged from 4.277,9 to 7.778,6. Meanwhile, HCE per capita was 2.714,7 and 4.167,6 in Canada. These figures went from 1.426,1 to 3.085,4 for United Kingdom (OECD Indicators 2015). Further, financing of health care in those countries is more centralized than in the United States. In summary, the United States spends twice as much per capita on health care as any other advanced nation in the world (Rugy, 2013).

Secondly, one might expect that convergence is likely to have occurred more rapidly amongst American states that between the EU or OECD countries, because states are more homogeneous regarding medical technology, consumer preferences, health policies or the structure and general characteristics of the health care system (Wang, 2009b).

Finally, the American health care system presents some peculiarities. Despite the high health spending, in 2014 $3,0 billons was spent on health care, $9,523 per person or 17,5 as a share of the nation's Gross Domestic Product, US does not have universal health insurance coverage. Private health insurance paid for 33%, out-of-pocket 11% and other third payers and programs 11%.The two largest government health care programs, Medicare and Medicaid, purchased $1,1 billion in health care, which means 37% of total health care spending (Martin *et al*., 2016) coexist with an extensive system of private insurance. This picture gives to health care system a segmented character, which can introduce some kind of divergence among states. Big differences exist as well with respect to public programs.

As it is well known, Medicare counts for the total amount spent to treat people age 65 or older, people under the age of 65 with certain disabilities, and people of all ages with end stage renal disease. This federal program reflects a consistent design across the country. While Medicaid represents a joint state and federal program just available to certain low income individuals and families who fit into eligibility group, which is recognised by federal and state low. The design of this program varies state to state in their rules, eligibility or benefits offered (Cucker *et al*., 2011, p. E11). In other terms, Medicaid represents a mix of policy, economic and demographic factors that varies from one state to other (Centers for National Health Expenditure Accounts Methodology Paper, 2014). Thus, public health expenditure also introduces heterogeneity elements that may condition convergence among states.

In latest years, a handful of economists have examined the convergence of health expending in the American states. Wang (2009a) makes a first analysis of convergence for per capita personal health expenditure and its nine components for 1980-2004. He finds moderate evidence of convergence with respect total expenditure (health care expenditures in 30 states have converged around 16 different steady states of size 2 or 3, with the remaining 12 states did not converge) and diverse results for its components. It concludes that hospital costs are responsible for the observed convergence. Panopoulou and Pantelidis (2013), applying a new technique to the same database used by Wong (2009a), conclude that there is no full convergence in HCEs among the US states. But states form two groups that converge to two different equilibria (clubs). At the same time, they find no convergence for the main components of HCEs. Recently, Arpegis *et al*., (2016) studies

the convergence of health expenditures in all US states for the period 1966-2009 (data by State of Residence instead of by State of Providers). According to the authors, the empirical analysis provides overwhelming evidence for convergence in per capita real health care expenditure through the 50 United States. This convergence is possibly due to convergence of personal disposable income among states.

We can conclude that this reduced empirical evidence is inconclusive and that little is known about the convergence of health spending in US. And the same can be said about the main factors that explain this topic. In this context, our paper has tried to contribute to fill this gap.

The structure of the paper is as follows. The next section presents the data. Section 3 introduces the methodology and test for convergence. Section 4 analyzes the determinants of the clubs of convergence, including institutional factors. Section 5 concludes.

2. HEALTH EXPENDITURES IN THE US STATES

In December 2011, the Office of Actuary (OACT) in the Centers for Medicare and Medicaid Services' (CMS) released updated estimates of the state health care expenditure data for 1991-2009. We built on this database, that is to say, we adopt the state as the unity of the analysis. Specifically, we assume the Personal Health Expenditures (PHCE) by State of Residence (CMS. Office of the Actuary's NHE Account data series). Although some of previous research on health care spending in US has used state-of-provider expenditure data (Wang, 2009; Panapoulou and Pantelidis, 2013), recent works adopt the more appropriate measure Personal Health Care Expenditure by state-of-residence (Cuckler, *et al.*, 2011; Apergis *et al.* 2015). Because people are able to cross state borders to receive health care services, using state-of-provider expenditure data is neither an accurate reflection of spending on behalf of persons residing in this state, nor an appropriate metric for per capita health expenditures. Thus, these estimates should not be used to calculate estimates of spending per person in a state.

Personal HCE includes the total amount spent to treat individuals with specific medical conditions, except expenditures resulting from government administration, net cost of health insurance, government public health activity, non-commercial research and investment in

structures and equipment (CMS, 2012). We calculate per capita personal spending using population for state (population estimates from the US Bureau of Economic Analysis, Bureau of the Census, 2011). Given that dates are provided in nominal amounts, we then deflect Personal HC Expenditures by the deflector of each state.

For graphical analysis only, we exclude state District of Columbia (for instance, in 1991 it only accounts for 0,41% of the total personal HCE). Figure 1 shows in the first panel the maximum and minimum values of personal health expenditure per capita by states as percentage of the national average, and its evolution over time. As can be seen there it is a large geographic variation in personal health care spending, which lasts over time. In 1991, the state with the lowest spending was Idaho with 28 percentage points below the average, while the highest spending is found in Connecticut, with 30 points above the average. This gap between states, around 59 points, remains almost identical in 2009. In this date, Utah and Alaska were thee states less and more spenders, respectively.

[Figure 1]

Although it seems that this gap appears close in time, if we look at the five states with the highest and lowest spending, the composition of the groups varies, so there is also a big variation in the patterns of expenditure growth between states. Only Utah and Idaho remain among the five least spenders and Massachusetts and Connecticut among the biggest.

The Total PHCE amounted to 669,2 billion dollar in 1991, while it grew until 2.115,9 in 2009. Among these figures, we are interested in the behaviour of the two largest government health care programs, Medicare and Medicaid. In 1991 Medicare accounted for 17,5% of total PHCE, while Medicaid for 13,3%. At the end of the period, those percentages have risen to 22,2% and 16,4% respectively, representing a significant portion of total spending in the country (Centers for Medicare and Medicaid Services' (CMS) Office of the Actuary's NHE Account data series).

Medicaid is a government insurance program for persons of all ages whose income and resources are insufficient to pay for health care (Health Insurance Association of America). It's a program jointly funded by the state and federal governments and managed by states, which determine the eligibility of people. Unlike Medicaid, Medicare is a program funded at

the federal level and focuses mainly on the older population. This federal program reflects a consistent design across the country (Cucker *et al*., 2011, p. E11), whereas Medicaid represents a mix pf policy, economic and demographic factors that varies from one state to other (Centers for National Health Expenditure Accounts Methodology Paper, 2014).

We replicate this previous table for Medicare spending in the second panel of Figure 1. Alaska and Utah are kept as the states with lower per capita Medicare spending over the period, with values between 40-50% below the average. While among the most spenders, Pennsylvania spent 62% more than the average at the beginning of the period gives way to Florida with her 37%. So this reduction in the differential range from 111 to 74 points indicates that of some approximation has taken place in Medicare expenditure among states.

Regarding State Medicaid Spending Per Capita (third panel), this variable represents the greatest variation between more than 155 points above the average in 1991 for New York to 45 below for Arizona. These are the largest differences between the three series analyzed, up more than 200 points of divergence between extreme states. One can expect that Medicaid programs specific by states help to explain some differences in personal HCE among the US states.

New York maintains the higher spending on the Medicaid program throughout the period, with 116% more than the media at the end, Nevada represents the other extreme with 44%. So, we can conclude that variation in Medicaid personal health care spending is much broader than variation observed in Personal and Medicare health care expending and that despite the huge divergence between states in Medicaid expenditure is the tonic, both series are reduced his maximum spread in more than 30 points.

Given that it appears in the two public programs that a certain degree of convergence is observed at the end of the series, we calculate the Lorenz's curve for Medicare and Medicaid spending per capita from 1991 to 2009.

[Figures 2 and 3]

In Figure 2, the x-axis represents cumulative proportion of states, while y-axis indicates cumulative proportion of personal Medicare spending per capita. As it is shown, in the period under consideration, Medicare health care spending exhibits a certain tendency to line of

equality or, in other words, some convergence occurs. And, this result is clearer for Medicaid spending, as can be seen in Figure 3. And this is true, especially in states with bigger spending.

Finally, in 2009 US health spending grew 4.0 percent, which means a historically low rate of annual increase, to $2.5 billion, or $8,086 per person. This represents the slowest rate of growth in the fifty-year history of the National Health Expenditure Accounts. This rate followed growth of 4.7 percent in 2008 (the second-slowest rate during the past fifty years) (Martin *et al.* 2001). Given the period of recession lived in US, developed from late 2007 to 2009 (the growth rate of the overall economy, which experienced its largest drop since 1938), is in our interest to deepen the analysis of convergence of health expenditure among states having in mind the potential effects of the recent crises.

To do this, we first take a period for the whole sample (1991-2009) and a second one, excluding the years of the crisis (1991-2007). Our analysis uses the 50 states plus District of Columbia.

3. TESTING FOR CONVERGENCE IN US HEALTH EXPENDITURE

The previous analysis has shown the disparities that exist between the behaviors of the health expenditure in the different US states. In order to statistically verify the possible existence of multiple patterns of behavior, we can test for the presence of a convergence process in US regional health expenditures. To do so, we have followed the recent papers of Phillips and Sul (2007, 2009) (PS hereafter) where they develop a framework that allows us to, first, test for the convergence hypothesis and, if this hypothesis is reject, estimate the number of different clubs that group the US state health expenditure behavior.

Following these authors, let us consider that X_{it} represents the variable of interest (in the present case, the health expenditure either total or its two major components: Medicare and Medicaid) with i=1, 2, …, 51 (the 50 US states plus the District of Columbia) and t= 1991, …, 2009. This variable can be decomposed as $X_{it} = \delta_{it}\ \mu_t$, where μ_t is a common component and δ_{it} is the idiosyncratic one. PS suggest testing for convergence by analyzing whether δ_{it} converges towards δ. To do so, they first define the relative transition component:

$$h_{it} = \frac{X_{it}}{N^{-1}\sum_{i=1}^{N} X_{it}} = \frac{\delta_{it}}{N^{-1}\sum_{i=1}^{N} \delta_{it}} \quad (3)$$

In the presence of convergence, h_{it} should converge towards unity, whilst its cross-sectional variation (H_{it}) should go to 0 when T moves toward infinity,

$$H_{it} = N^{-1}\sum_{i=1}^{N}(h_{it} - 1)^2 \overset{As}{\rightarrow} 0, as\ T \overset{as}{\rightarrow} \infty \quad (4)$$

PS test for convergence by estimating the following equation:

$$log\frac{H_1}{H_t} - 2log[\log(t)] = \alpha + \beta \log(t) + u_t,\ t = [rT] + 1, \dots, T \quad (5)$$

with r taking values in the (0.2, 0.3) interval, following the results of PS. Equation (5) is commonly known as the log-t regression. The null of convergence is tested by way of a standard t-statistic and, according to PS, the null hypothesis is rejected whenever this t-statistic takes values lower than -1.65. If we reject convergence, we can use the PS algorithm to consider the existence of clubs[2].

The results that we have obtained are presented in Table 1. As we can easily observe, the convergence null hypothesis is always rejected. However, it is possible the existence of convergence clubs, which leads us to use the PS algorithm in order to detect its existence. Table 2 presents the estimated clubs for the two samples considered, once the PS methodology is employed, including their recommendation of analyzing whether the initial adjacent clubs may be grouped. Furthermore, Figures 4 and 5 reflects the colored map of the USA and the average values of the personal care for the states included in both club.

The analysis of the previous tables and figures allows us to draw some very interesting insights. If we begin by the case of the total care health expenditure, we can observe the existence of two different clubs. Figure 4a. shows that there exists a clear geographical division between the states included in these clubs, give that club 2 is almost only composed by States placed in the South and the West Regions. Figure 5 reflects the evolution of the average values of the personal care expenditures. We can observe that the average expenditure of the states included in club 1 is always greater that the one of club 2. The

[2] See Phillips and Sul (2007, 2009) or Panopoulou and Pantelidis (2013) for a description of the use of this algorithm.

distance between these average values continually grows up to 2009, in that it takes an initial value of 331$ per capita and a final value of 1,373$. However, the growth speed is not homogenous. Rather, it grows very fast up to 2001, when it almost reaches the 1,000$ per capita, which implies an increase of 66.8% with respect to the initial value. By contrast, the distance increases less than 400$ during the 2002-2009 period, which involves a clear slowdown in the growth, but not a stabilization, given that the distance does not cease increasing.

We can also study two very important components of the total personal care health expenditure, as it is the case of the Medicare and Medicaid health expenditures. The values of the PS statistics, which are also reported in Table 1, lead us to reject the convergence null hypothesis for both variables. But, we can observe the presence of different clubs of convergence. They are mapped in Figures 5 and 6. A simple glance at these figures suggests that the estimated clubs are quite different for the three cases we have considered. This first insight is verified by the values of the Wilcoxon signed-rank statistic, which takes the value 5.1 when the estimated clubs of the Medicare and Medicaid health expenditure. Similarly, when these estimated clubs are compared to the ones previously obtained for the total personal care health expenditure, the values of this statistic are 0.89 and 4.78. Then, we can conclude that the estimated clubs of the Medicare and Medicaid are statistically different, as well as the club estimation of Medicaid and total personal care health expenditure. By contrast, we cannot reject that the composition of the estimated clubs of Medicare and total personal care health expenditure are statistically different.

Figure 5.b and 5.c respectively reflects the average values of the Medicare and the Medicaid health expenditure of the states included into the estimated clubs, as well as the one of the respective divergent states. As we can see in Figure 5.b, club 1 shows higher values than the rest of the clubs, with the distance between them increasing across time. By contrast, the differences between clubs 2 and 3 are relatively small until 2000. Since then, their distance has increased, although both clubs are quite close when comparing with club 1. The divergent states can be separated in two groups. Kansas and Illinois exhibit expenditure close to the average values of club 1. By contrast, Alaska, Colorado and Utah shows very low expenditure levels, which are even lower than those of the club 3.

If we now consider the case of Medicaid expenditures, Figure 5.c reports the average value of the health expenditure of the states included in clubs 1-4, as well as that of the divergent states (Nevada and Utah). The Medicaid expenditures of the members of club 1 grow at a rate around 5.0 which is higher that the growth rate of the rest of the clubs. Consequently, the distance between this club and the rest increases across time. Something similar occurs with clubs 2 and 3, which show growth rates of 4.8 and 3.8, respectively. As a consequence, the final distance between the average health expenditure of these clubs almost multiplies by ten the initial distance. Meanwhile, the distance between average values of club 3 and 4 has slightly increased across the sample. Finally, the two divergent states are Nevada and Utah. As we can see in figure 5c. their values are the lower as can be expected, given that these states has been showing very low health expenditure values in all the analysis previously carried out.

Finally, it is of interest to test whether the crisis have affected to the convergence and to the cluster results. To that end, we have repeated the previous analysis but now just considering the pre-crisis period (1991-2007). The results are also presented in Tables 1 and 2. As we can see, we can reject the convergence null hypothesis for the pre-crisis period. Furthermore, the estimated clusters are quite similar to that obtained for the full sample. In this regard, we should additionally note that the Wilcoxon signed-ranks statistic takes the values 0.00, 0.39 and 1.02 for the estimated clubs of total health, Medicare and Medicaid expenditure, respectively. Thus, we should conclude that there are not significant changes in the result of the cluster estimation and, consequently, the crisis has not affected to the joint evolution of these US state health expenditures.

4. Do institutional factors help us to understand the clubs?

The previous section has shown that the health expenditure of the US regional health expenditure exhibits different patterns of behaviour. It is now of interest to investigate the sources of these differences. We should bear in mind that these differences can be explained by several factors, including geographical factors, socio-economic factors and, amongst others, partisan behaviours. In order to capture these effects, we have selected the following variables.

- Geographical factors may be useful because the geomorphological characteristics of a region may condition its public health expenditure. For instance, if the population is disseminated over a large area, the regional government may need to increase expenditure to cover the whole population. By contrast, if the population is concentrated, the control and optimization of the expenditure is clearly easier and, consequently, this should imply a reduction in health expenditure. Thus, variables such the population density (DEN) or the rate of population who lives in urban areas (URB) may help us to explain the creation of the clubs.

- Education: it is generally admitted that increases in the education level of a particular area can lead to increments in the health level of this area. This variable is proxied by the percentage of population older than 25 with, at least, bachelor studies (BACHELOR) and the percentage of population older than 25 without High School studies (ILLIT).

- Climate Factors: health may be influenced by some climatic factors, in the sense that mild climate may involve a better health status than that of colder and rainy climates. We use the annual average temperature (TEMP) and the number of rainy days (RAIN).

- Population structure: the structure of the population is also important in determining the volume of public health expenditure. A high proportion of dependent population may lead to an increase in expenditure given that this part of the population tends to be more exposed to epidemic episodes and also is more susceptible to chronic diseases. To cover this possibility, we use the percentage of population over 65 years old (OLD65) and under 15 years old (YOUNG15). IF we add these two variables up, we have the total percentage of dependent population (DEPEN).

- Economic characteristics: it has been appropriately documented that health expenditure can be explained by per capita GDP. It is possible, however, that the elasticity of the per capita GDP does not vary for the different regions and, consequently, this variable cannot help to explain the differences. To check this we use the average per capita GDP of each region (GDPpc).

- Partisan decisions: Health expenditure may depend on the decisions taken by the both the federal and the state government. If the government favours the private sector over the public sector, it will probably enact policies to reduce public spending and, consequently, public

health expenditure. The type of behaviour is closer to the postulates of the Republican Party, whilst Democratic Party exhibits much more expansive health policies. To measure this partisan characteristic, we will use two variables, CREP and CDEM, which reflects the percentage of the years (since 1980) that the federal and the state government belongs to the Republican and to the Democratic Party, respectively. We have also used the percentage of the years that the Democratic Party has governed the state (DEM).

- Dummy variables: we have also considered some dummy variables for states which do not have border with other US states (OUTER) and for those states that have border with México (MEX).

Prior to the use of these variables to estimate an appropriate model, we consider it useful to carry out a simple descriptive analysis of these data. Table 3 summarizes the average values of these variables for all the states included in each club, taking as reference the case of the total health expenditure.

[Table 3]

This Table shows some interesting insights. We can observe that the States included in club 2 exhibit significantly higher values of dependent population, both OLD65 and YOUNG15, population that lives in urban areas and also experience a milder climate. Then, these variables may play a very important role in order to explain why a particular state belongs to a particular club. Furthermore, we can also observe that the states included in club 2 present worse levels of education and poverty and, finally, the influence of the Democratic Party is larger. The mean of the rest of the explanative variables does not show different values, although this should not be interpreted as they will not be useful in the posterior model estimation.

Having determined and described the data set, we should analyse the interaction between the explanatory variables and club membership. To that end, an ordered probit model has been used to predict how regional characteristics affect the likelihood that any given region would be found to be a member of each convergence club. To explain the structure of the model, we should note that the values of the variable y_i depend on the number of estimated clubs. In general, we have that:

$$y_i = m \text{ for } m=1,...,M \quad (6)$$

with M being the number of clubs estimated by the PS methodology. These assigned values are assumed to be derived from some unobservable latent variable y_i^* where:

$$y_i^* = x_i'\beta + u_i, \; i=1,2,...,51 \quad (7)$$

where β is a $k \times 1$ parameter vector and u_i reflects the stochastic disturbance term.

We could interpret that the different m values imply an ordination of the clubs and, therefore, the observed variable y_i can be related to the latent variable by way of the following equation:

$$y_i = m, \text{ if } \alpha_{m-1} \leq y_i^* \leq \alpha_m \quad (8)$$

for a set of parameters α_0 to α_M , where $\alpha_o < \alpha_1 < \alpha_2 ... < \alpha_M$, with $\alpha_o = -\infty$ and $\alpha_M = \infty$.

The conditional probability of observing the m-th category can be written as:

$$Pr(y_i = m/x_i) = Pr(\alpha_{m-1} \leq y_i^* \leq \alpha_m) = Pr(\alpha_{m-1} \leq x_i'\beta + u_i \leq \alpha_m) =$$

$$= Pr(u_i \leq \alpha_m - x_i'\beta) - Pr(u_i \leq \alpha_{m-1} - x_i'\beta) \text{ for } m=1,..,4. \quad (9)$$

To evaluate the conditional probability, a distributional assumption for the disturbance term u_i is required. In the present case, we assume a normal distribution, yielding the ordered probit model[3]. Table 5 reports the results of the estimation of this model for total health expenditure, as well as for the functional components that reject the convergence null hypothesis. For all these models, the final specification has been selected by, first, selecting these variables that show the highest explanation power and, subsequently, using a general-to- particular strategy where the non-significant variables have been iteratively removed. The results that we have obtained are presented in Table 4.

[Insert Table 4]

As we can observe, the estimated model for total health expenditures and the Medicare expenditure are similar and, additionally, quite different for the Medicaid expenditure. The formers show a high explanative power and lie on a relatively small number of explanative

[3] The ordered logit model leads us to similar results, although with a slightly lower explanatory power.

variables, whilst the latter exhibit a poorer explanative power, in the spite of using a relatively high number of explanative variables. However, the interpretation of the results is quite similar, in the sense that the explanative variables show a similar effect of the three types of health expenditure.

The model for the total health expenditures depends on the percentage of population older than 65, the percentage of population older than 24 with a bachelor degree (BACHELOR), the per capita GDP (GDP), the urbanity rate (URB), the average temperature of the sate (TEMP), a dummy variable that takes the value 1 if the state borders with Mexico (MEX) and, the most important for our purpose, the number of years that the governor of the states and the US president belongs to the Republican party (CREP). According to the estimated sign of the corresponding parameters, those states with better education level, per capita GDP and a border with Mexico tends to exhibit higher levels of health expenditure. By contrast, a high concentration of the population in cities, a mild climate and a large influence of the Republican Party implies comparatively lower levels of health expenditure.

The model for the Medicare expenditures is similar. The only difference affects to the education variable included in the final model. In this case, the per capita GDP disappear from the model, whilst BACHELOR variable is accompanied by the percentage of population older than 25 that has not completed High School studies (ILET). The parameters of both education variables show negative sign, implying greater levels of expenditure. We should finally note that the partisan variable (CREP) again appears in the estimated model. Thus, the higher the influence of the Republican Party in the health policy decisions, the lower the Medicare expenditure.

Finally, the estimated model for Medicaid expenditure is clearly different from the previous ones. As we have earlier commented, it needs more explanative variables and, in spite of this, its explanative power and classification capacity is lower than the precedent models. The explanative variables are the following ones: two climate variables (TEMP and RAIN), the per capita GDP, an education variable (ILET), the percentage of dependent population (DEPEN), a dummy variable for the states that border with Mexico and, finally, a partisan variable (CDEM). Thus, a state with a cold and rainy climate, with a high per capita GDP, a poor level of education, a high percentage of dependent population and bordering Mexico exhibits lower levels of Medicaid expenditure. Additionally, if the state health policy

decisions are taken under the influence of the Democratic Party, the Medicaid expenditure is even greater.

Thus, once again, our results confirm the existence of partisan behaviours in the determination of the health expenditure in the sense that Republican Party tends to adopt restrictive health policies, whilst these health policies are much more expansive if are taken by the Democratic Party.

5. CONCLUSIONS

There is relatively scare literature that analyzes differences in health expenditure between territories as well as the main factors that explain it. This kind of study is especially relevant for the US given the dimension of health care expenditure in this country, significantly higher than other country and the peculiarities of the health system without universal coverage. In this vein, the main public programs Medicare and Medicare coexist with an extensive system of private insurance.

Our paper focuses the evolution and convergence of the US state health expenditure. We test for the presence of a convergence process in US regional health expenditures following the recent papers of Phillips and Sul (2007, 2009). Our results provide evidence against the existence of a unique pattern convergence. Rather, we can observe the existence of different clubs. Given that a part of previous literature have adopted as unity of the analysis personal HCE by state of providers (Wang, 2009a; Panoppoulou and Pantelidis, 2013), our results are just comparable with those of Apergis *et al*. (2016). These authors conclude that convergence in one club occur for HCE per capita in each of the 50 states, although this being the case for a period from 1966-2009.

Also our work which has been done for total HCE per capita and for Medicare and Medicaid HCE per capita, for the first time, allows us to indicate that clubs are quite similar when we consider total health expenditure or the Medicare expenditure but Medicare expenditure exhibits a rather different behavior. In other terms, the number of club depends on the type of expenditure, so when it is specific (Medicaid) the number of clubs is higher. Additionally, our analysis also has verified that neither the number of clubs nor their composition has been affected by the recent worldwide crisis (only two years).

We have investigated the characteristics of states that explain their membership to the clubs. In the earlier literature researchers have studied health expenditure by states trying to discover their determinants in Di Mateo (2005), Wang (2009b) or Matin *et al.* (2007), in Medicare (Rettenmaier and Wang, 2012), or of for Medicare and Medicaid (Cuckler and Sisko, 2013), or analyzing whether the great recession or structural changes in the American health system could explain recent patterns of health expenditure (Herring and Trish, 2015).

Only Wang (2009) incorporates variables of a political nature in its analysis. He examines whether the balance of political power in a state government has any impact on state HCE. In 2003, *ceteris paribus*, those states whose executive and legislative bodies were both controlled by Democrats tended to have lower expenditures relative to those whose two branches were controlled by different parties. In contrast, the dominance of Republicans in a state government has a positive impact on health expenditures. Given that these effects are marginal or not change the estimations, no further mention is made.

We have included in our analysis among other variables, one reflecting the partisan decisions taken by the both the federal and the state government. One reflects the percentage of the years that the federal and the state government belong to the Republican and to the Democratic Party. The other reflects the percentage of years governed by Democratic Party in the state.

As a result of our analysis, Total health expenditures and Medicare depends on better education level, per capita GDP and a border with Mexico. This tends to higher levels of health expenditure. A high concentration of the population and mild climate affect in the opposite direction. Also, large influence of the Republican Party implies comparatively lower levels of health expenditure.

Results are less intuitive for Medicaid expenditures perhaps because this program is more state specific so belonging to a club is more difficult and because more variables are needed to this kind of expenditures. Anyway, the state health policy decisions are taken under the influence of the Democratic Party, the Medicaid expenditure is even greater.

In conclusion, there is a partisan behaviour in the American health expenditure by states. Republican Party tends to adopt restrictive health policies, whilst these health policies are

much more expansive if are taken by the Democratic Party. This main conclusion can be framed in the economic approach known as "the partisan approach". This approach focuses on the influence of party ideology, showing to what extent left-wing and right-wing politicians will provide policies that reflects the preferences of their partisans (Potrake, 2010). More concretely, this theoretical approach predicts that the left-right party promotes expansionary politics, and this is expected to increase the growth of public health expenditure as compared to right-wing governments. In this context, our results can be interpreted as empirical support to the partisan approach.

Our novel result partially contradicts those obtained by Potrake (2010) in the international context comparisons, 18 OCDE countries over the 1971-2004 periods where the government ideology did not have any influence in the growth of public health expenditures in. Or those by Costa-Font (2007) for Spain, where a left-wing composition of regional Government was overall less likely to increase health expenditure. Only Herwartz and Theilen (2014) found similar results. The authors conclude about the influence of partisan ideology that if governments are sufficiently long in power, right-wing governments spend less on public health than their left-wing counterparts.

6. BIBLIOGRAPHY

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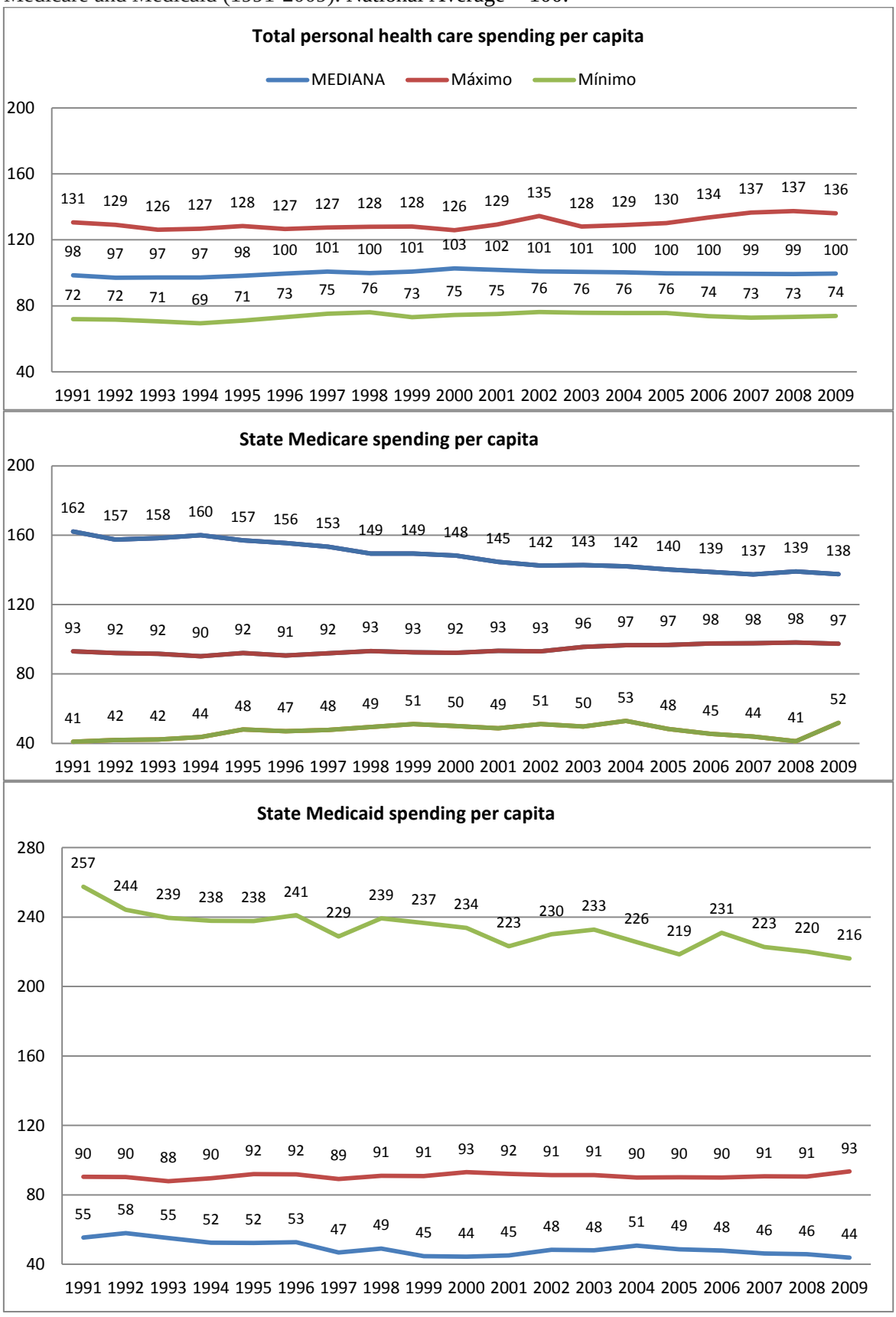
Figure 1. State PHC Spending per papita as a percent of US PHC Spending by Sate of Residence, Medicare and Medicaid (1991-2009). National Average = 100.



Source: Centers for Medicare & Medicaid Services (2011). *Health Expenditures by State of Residence.*

Figure 2. Lorenz Curve for Medicare Health Expenditure per capita from 1991 to 2009.

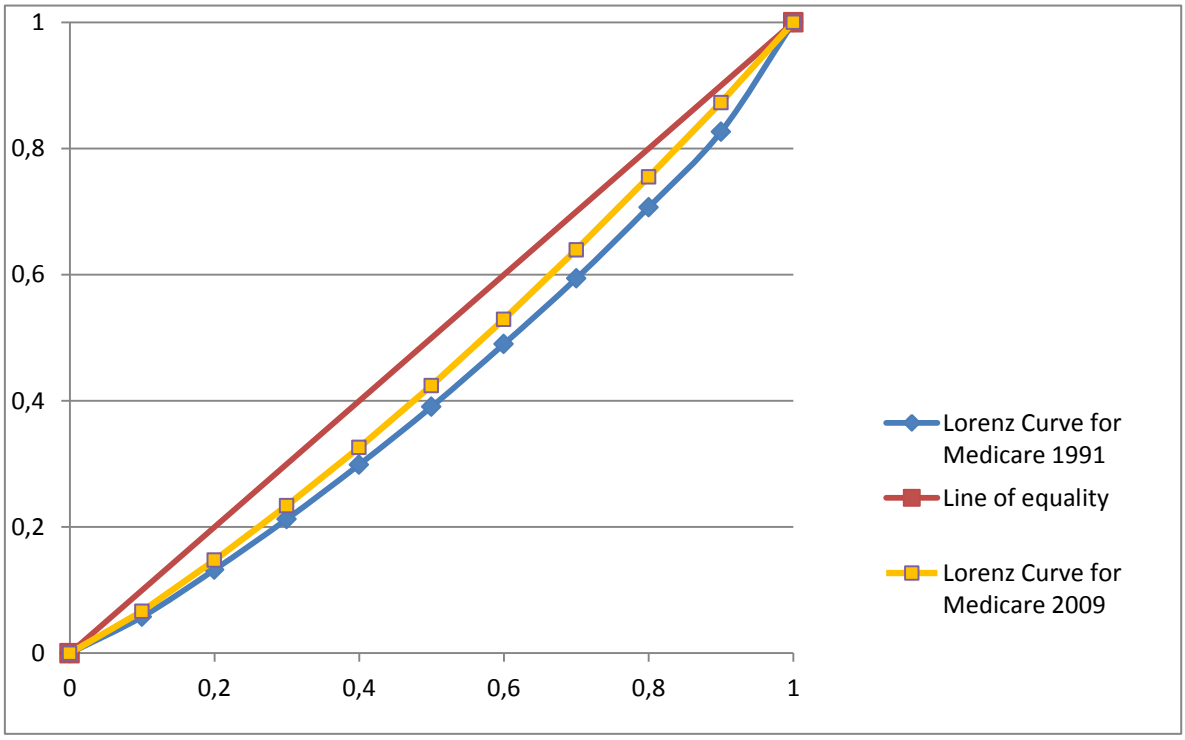


Figure 3. Lorenz Curve for Medicaid Health Expenditure per capita from 1991 to 2009.

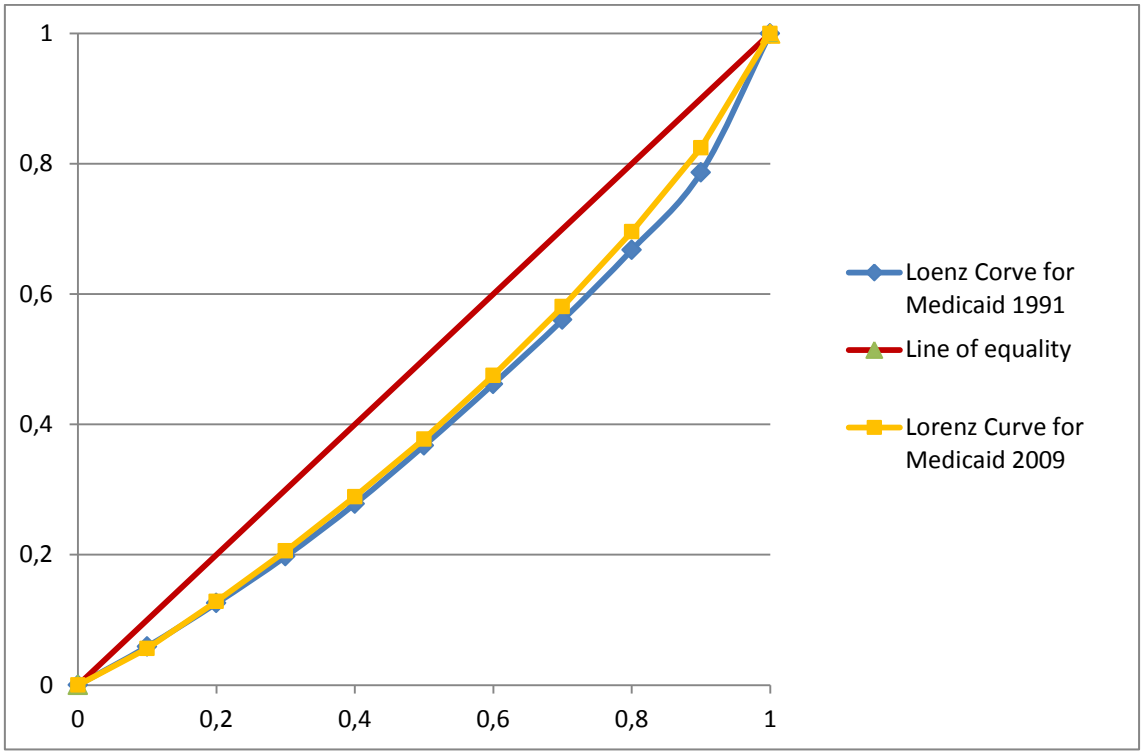


Table 1. Testing for convergence

	Sample. 1991-2009		Sample. 1991-2007	
	log-t	t-stat	log-t	t-stat
Total	-0.65	-61.38*	-0.62	-56.60*
Medicare	-0.50	-23.35*	-0.50	-18.79*
Medicaid	-0.74	-62.83*	-0.76	-62.36*

This table reports the statistic proposed by Phillips and Sul (2007) to test for convergence. The term log-t stands for a parameter which is twice the speed of convergence of this club towards the average. t-stat is the convergence test statistic, which is distributed as a simple one-sided t-test with a critical value of −1.65 (see Phillips and Sul, 2007 for further details).

* means the rejection of the convergence null hypothesis.

Table 2. Estimated Clubs

Variable	Club1	Club 2	Club3	Club4	Divergent States
		Panel I. Sample 1991-2009			
Total	AL AK CT DE DC FL IL IN IA KS KY ME MD MA MN MS MO MT ne NH NJ NM NY NC ND OH or PA RI SC SD TN VT WV WI WY	AZ AR CA CO GA HI ID LA MI NV OK TX UT VA WA			
Medicare	AL AR CT DE DC FL ID IL IN IA KS KY LA ME MD MA MI MN MS MO MT ne NH NJ NM NY NC ND OH OK or PA RI SC SD TN TX VT WV WI	AZ CA HI NV VA WY	GA WA		AK CO UT
Medicaid	AK AZ CT DC ME MA MS MO NM NY NC PA RI TN VT WV	AL AR CA DE GA HI ID IL IN IA KY LA MD MI MN ne NH NJ OH OK or SC WA WI WY	FL KS MT ND SD TX	CO VA	NV UT
		Panel II. Sample 1991-2007			
Total	AK CT DE DC FL IL IN IA KS Y ME MD MA MN MS MO MT ne NH NJ NM NY NC ND OH or PA RI SC SD TN VT WA WV WI WY	AL AZ AR CA CO GA HI ID LA MI NV OK TX UT VA			
Medicare	AL AR CA CT DE DC FL ID IN IA KY LA ME MD MA MI MN MS MO NE NH NJ NM NY NC ND OH OK OR PA RI SC SD TN VT WV WI	AZ HI MT NV TX VA	GA WA WY		AK CO IL KS UT
Medicaid	AK AZ CT DE DC ME MA MS MO NM NY PA RI VT	AL AR CA ID IL IA KY LA MD MN NE NH NJ NC OH OK OR SC TN WV WI	FL GA HI IN KS MI MT ND SD TX WA WY	CO VA	NV UT

The clubs reported have been obtained by applying the algorithm proposed by Phillips and Sul (2007) which aims to find groups of regions with similar convergence speeds to the average. Adjacent clubs have been joined if suggested by the PS statistic.

Table 3. Descriptive Analysis of the explanative variables

Variable	Club1	Club2
DEN	186.6*	35.4
URB	69.0*	76.2*
BACHELOR	24.3	23.0
ILLIT	17.8	19.6*
TEMP	10.0*	13.9*
RAIN	973.8	877.4
OLD65	13.7*	12.3*
YOUNG15	20.5*	22.7*
GDPpc	42,655*	38,028
POVERTY	12.7	14.3*
CDEM	24.3	18.7*
CREP	36.9	38.4
DEM	52.0	52.4

This table reflects the mean values of the different explanative variables when these are classified according to the values of the estimated clubs for total health expenditure (see Table 2).

* means that the value does not belong to the 95% confidence interval of the counterpart club.

Table 4. Estimated models

	Total	Medicare	Medicaid
OLD65	-1.44 (-3.36)	-1.23 (-2.38)	
DEPEN			-1.41 (-4.38)
TEMP	0.21 (2.18)	0.20 (2.60)	0.65 (5.33)
RAIN			$-7.97x10^{-2}$ (-5.89)
URB	0.17 (2.83)		
CREP	0.06 (2.37)	0.08 (3.27)	
CDEM			-0.03 (-1.61)
BACHELOR	-0.27 (-1.87)*	-0.24 (-2.52)	-0.19 (-2.77)
ILLIT		-0.54 (-3.58)	
GDPpc	-2.32x10-4 (-2.18)		-6.2×10^{-5} (-3.28)
POVERTY			-0.29 (-4.06)
MEX	-1.88 (-1.69)*	1.36 (2.61)	-5.27 (-3.89)
Pseudo R2	0.57	0.56	0.39
%corrected class.	88.2	93.5	69.4

Figure 4. Estimated clubs.

Figure 4a. Personal Care Expenditure

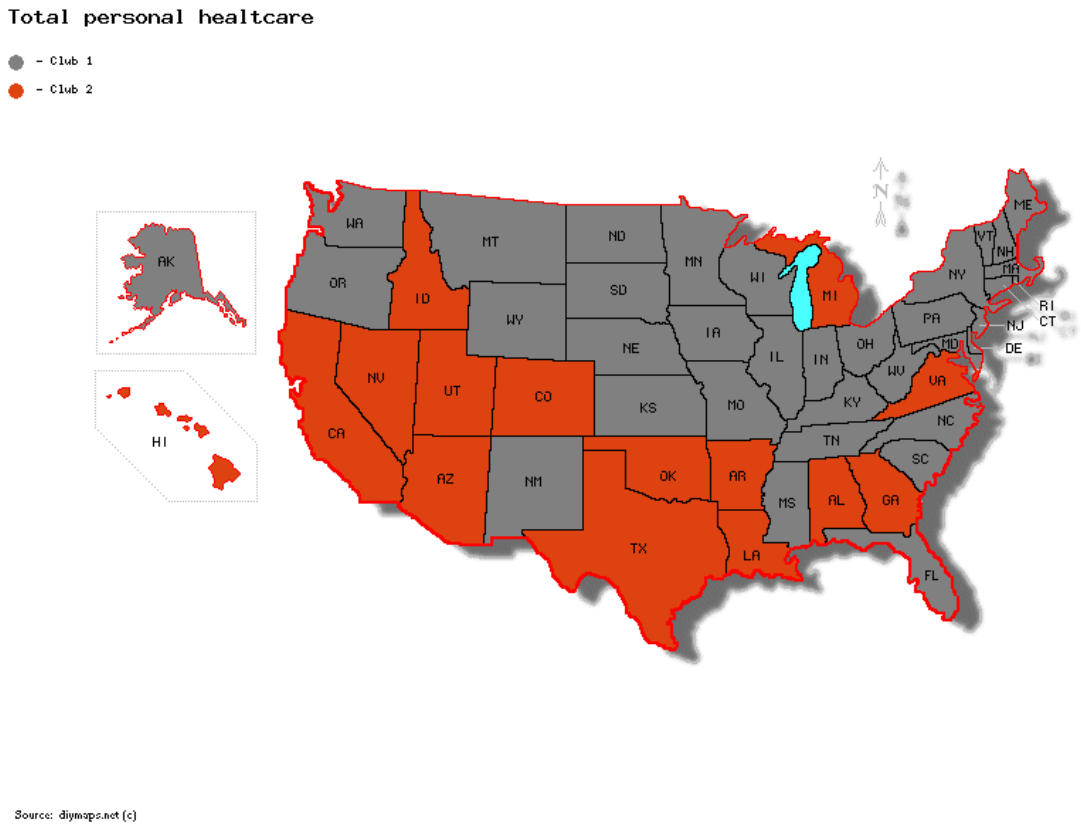


Figure 4b. Estimated clubs for Medicare

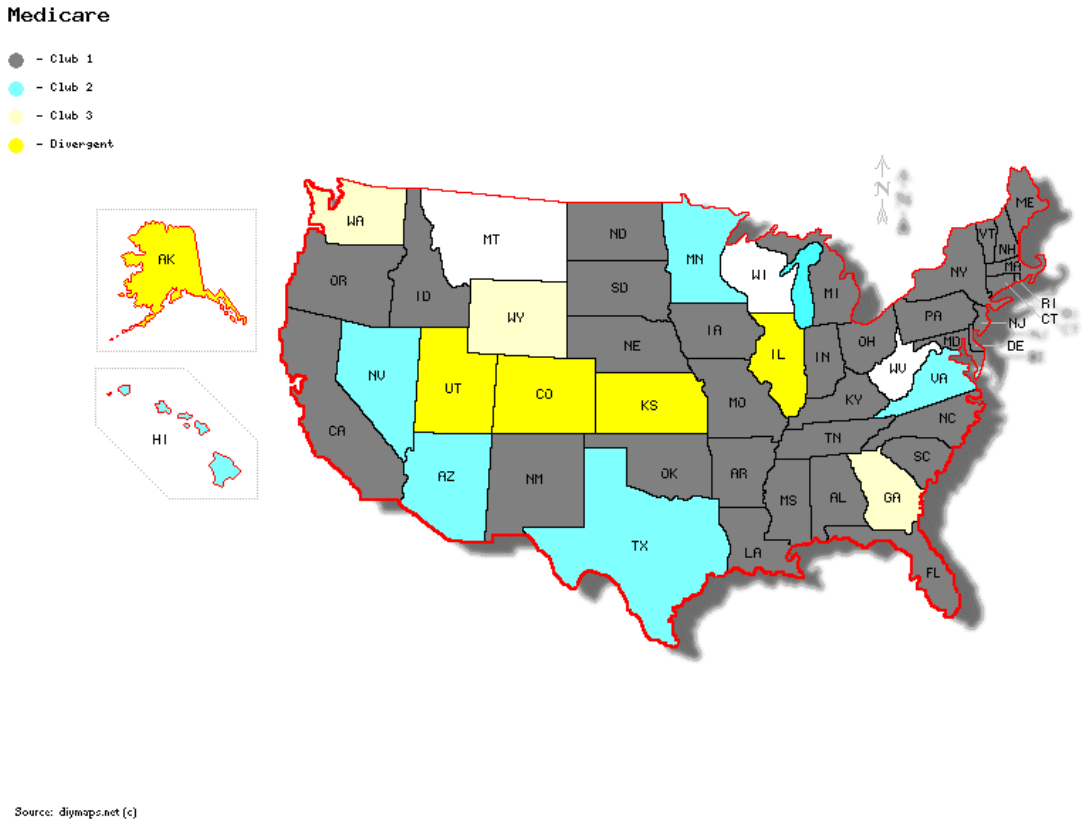


Figure 4c. Estimated clubs for Medicaid

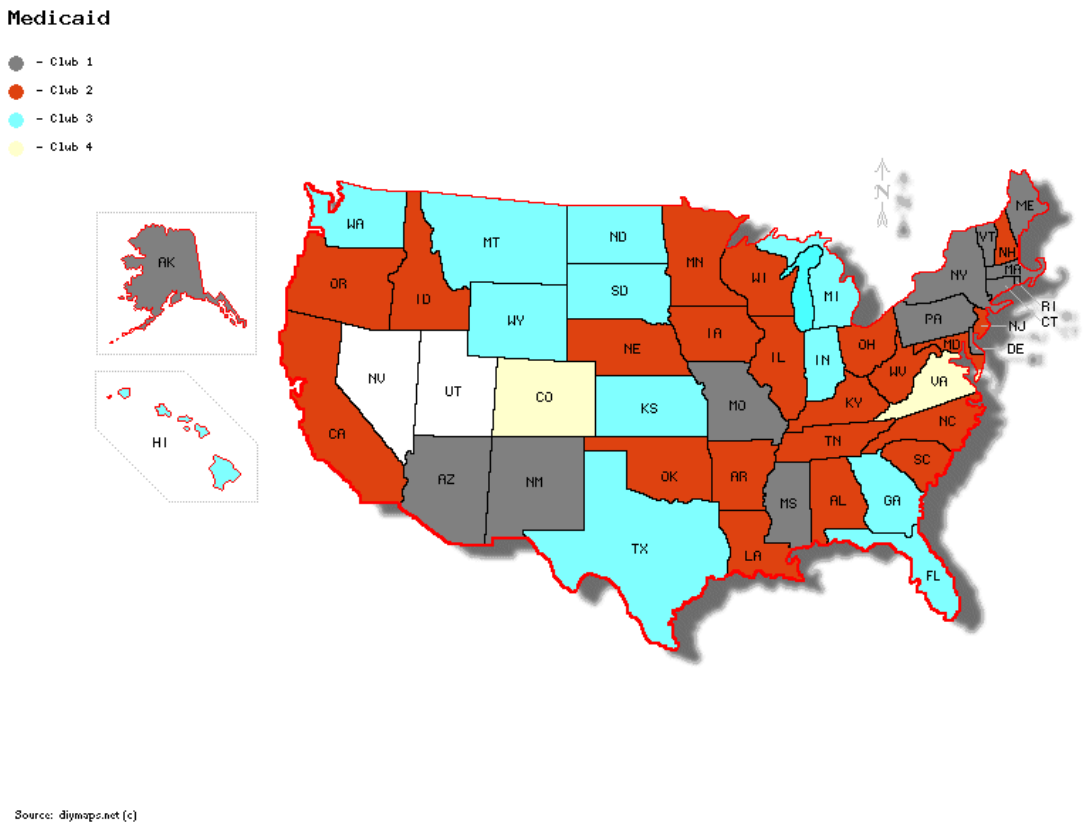
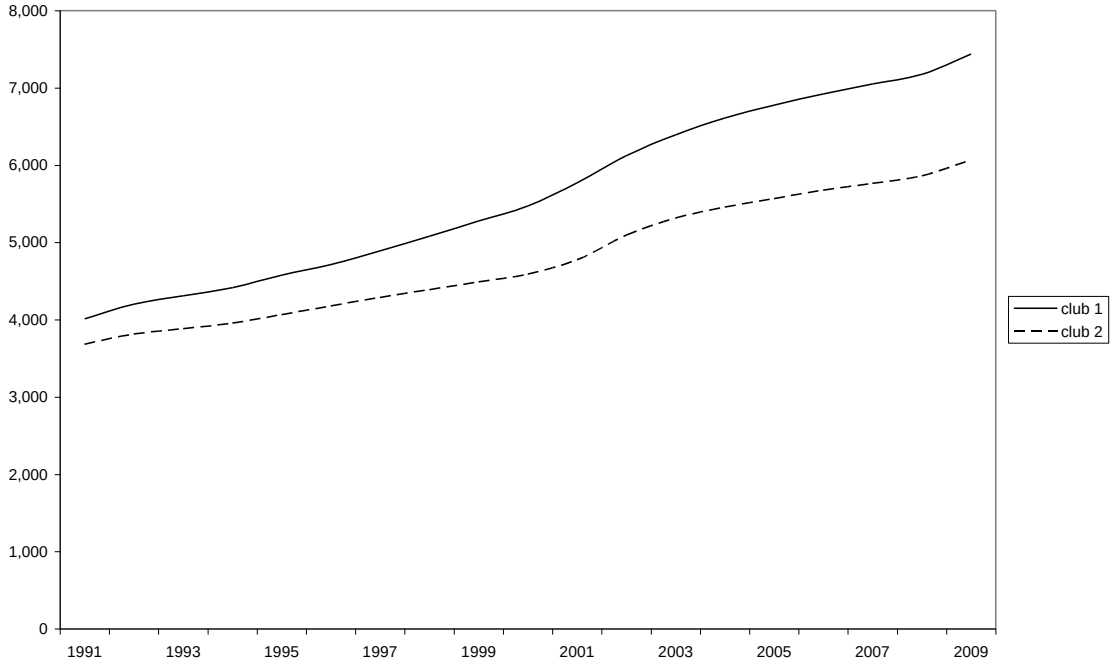


Figure 5. Average value of the estimated clubs

Figure 5a. Total personal health care.



This figure presents the average values of the Personal care expenditure of the states include in clubs 1 and 2 when the 1991-2009 sample is considered.

Figure 5b. Medicare health expenditure

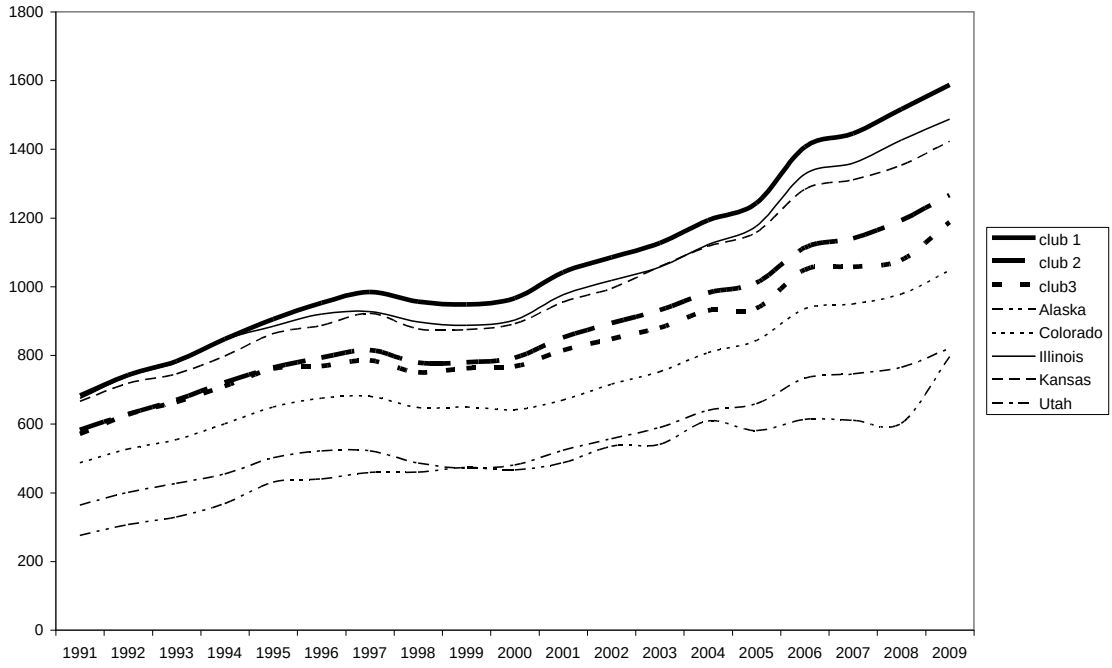
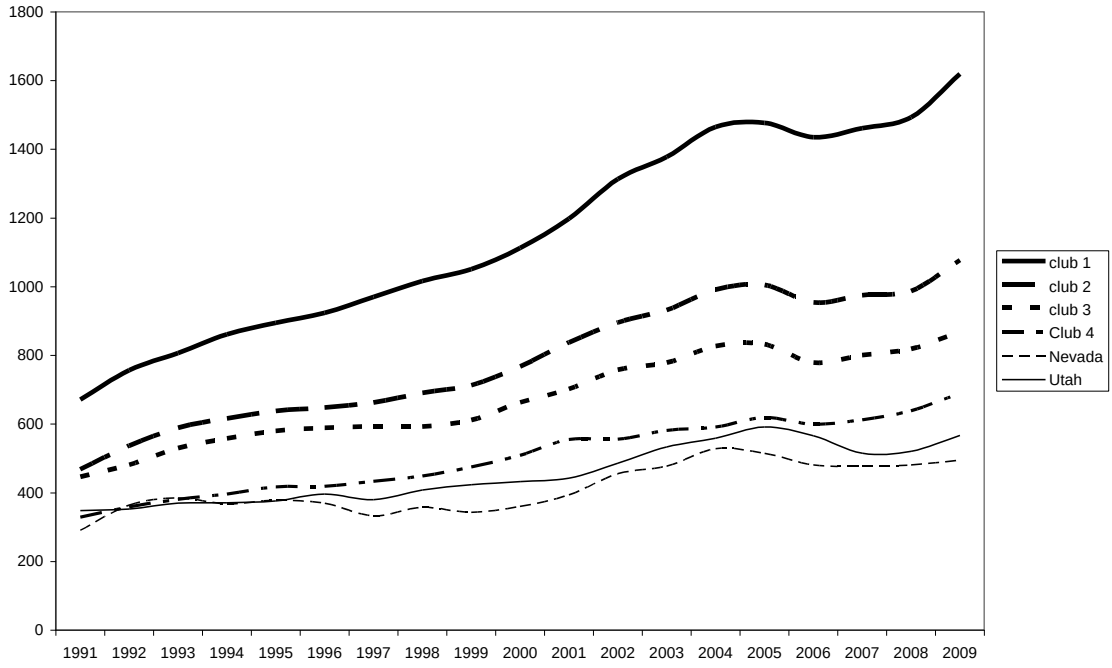


Figure 5c. Medicaid health expenditure



Over	Mean	Std. Err.	[95% Conf.	Interval]
pibpc				
0	42654.95	3160.233	36307.44	49002.47
1	38028.1	1508.063	34999.06	41057.13
densidad				
0	186.5928	105.2053	-24.7182	397.9038
1	35.35844	6.625325	22.05108	48.6658
temperature				
0	9.951389	.729866	8.48541	11.41737
1	13.86667	1.218729	11.41878	16.31456
rain				
0	973.8333	52.42886	868.5269	1079.14
1	877.4	124.2852	627.7658	1127.034
hum				
0	67.05556	.9162938	65.21513	68.89599
1	61.76667	2.588374	56.56776	66.96557
old65				
0	13.65052	.2572769	13.13376	14.16728
1	12.32586	.4177635	11.48676	13.16496
democr				
0	.5203704	.034331	.4514144	.5893263
1	.5244444	.046968	.4301064	.6187825
l15				
0	20.52066	.2474617	20.02362	21.0177
1	22.68493	.526361	21.6277	23.74216
mex				
0	.0277778	.0277778	-.0280155	.0835711
1	.2	.1069045	-.014724	.414724
cd				
0	24.25972	2.634785	18.9676	29.55184
1	18.66667	3.575194	11.48568	25.84766
cr				
0	36.945	2.30165	32.322	41.568
1	38.44533	3.501723	31.41191	45.47875
turb				
0	69.02222	2.656532	63.68642	74.35802
1	76.16	3.266683	69.59867	82.72133
poverty				
0	12.74444	.5716093	11.59633	13.89256
1	14.28667	.8140356	12.65163	15.92171
bachelor				
0	24.28889	.8283257	22.62515	25.95263
1	22.96	1.122234	20.70593	25.21407
hschool				
0	82.17	.7088877	80.74616	83.59384
1	80.43044	1.124884	78.17105	82.68984
ilet				
0	17.83	.7088877	16.40616	19.25384
1	19.56956	1.124884	17.31016	21.82895