The Determinants of Health Expenditure in Italian Regions

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Abstract

The health care expenditure in Italian regions is examined, applying the model selection procedure and panel methodologies to identify the determinants of health expenditure at the state level. After a brief introduction and a survey of the economic literature on this issue, we discuss the data and briefly introduce the methodologies. Empirical results suggest that the real Gross State Product, the unemployment rate, the number of beds in community hospitals, the urbanization degree and the percentage of the population with at least the junior high school degree had a direct impact on the real health care outlay. Furthermore, the income elasticity is below the unity (0.83-0.88 according to the static panel estimates, 0.43-0.48 for the dynamic methods), implying that health expenditure is a necessity rather than a luxury good at the state level.

Keywords: Health policies, Households' expenditure, GSP, Panel data, Italian regions

1. Introduction

Health is one of essential factors for any country's economic development and therefore plays an important role in economy activities.

Over the past three decades, a lot of studies – using the concepts of cointegration and Granger causality – focused on several countries and time periods. Since the pioneering studies by Kleiman (1974), Newhouse (1977) and Cullis and West (1979), empirical findings are mixed and, for some countries, controversial (Devlin and Hansen, 2001). The results differ even on the direction of causality and the short-term versus long-term effects on health policies. Depending upon what kind of causal relationship exists, its policy implications may be significant.

Moreover, multiple causality studies have been done for many countries in the world; however, few studies have been devoted to the analysis of this nexus for the Italian case (Piperno and Di Orio, 1990; Devlin and Hansen, 2001; Giannoni and Hitiris, 2002; Erdil and Yetkiner, 2009; Romagnoli, 2009; Magazzino, 2011b; Magazzino and Mele, 2011).

This study examines the determinants of health care households' expenditure in Italian regions for the period 1980-2009, using panel methodologies, at a time when the country is intensely re-examining the structure of its health care system. The results might help to define and implement the appropriate health development policies in these regions. The data used are obtained by ISTAT.

Besides the Introduction, the outline of this paper is organized as follows. Section 2 discusses the determinants of health care expenditure. In section 3 we illustrate the empirical methodology and the data; afterwards, we show and comment the empirical findings. The last section concludes with some interpretation of our main findings.

2. The Determinants of Health Expenditure

In Italy, starting from 1992, a set of reforms was specifically designed to increase the autonomy of Regional Health Authorities in both the financing and delivery of health care. Regions have thus carried out differentiated policies. Therefore we should expect some strategic interaction, especially after the decentralization process was deepened during the last decade in order to appoint regions with exclusive health care responsibilities.

The impact of health expenditure on public finance is becoming a usual topic of recent comments and analysis. Textbook economic theory suggests that demand for a good/service by a utility-maximizing consumer depends on two factors: income and relative price. Most of the studies report an income elasticity exceeding unit, implying that health care is a luxury good. (In contrast, Wang (2009) found a cross-section income elasticity of health care around 0.7, implying that health care is a necessity rather than a luxury good at the state level.)

A point of debate among economists is whether the public sector should intervene or not in the short-term fluctuations in economic activity. If classical economists have always opposed such a kind of public action, the Keynesian school of thought invoked fiscal policies to support the economy during recessions. In fact, the classical economists believed that market forces were able to quickly bring economies to a long-run equilibrium, through adjustments in the labor market. Instead, the Keynesians took the fallibility of such self-regulatory mechanisms, precisely because of rigidities in the labor market. To this end, the school has prescribed Keynesian expansionary fiscal policies in order to avoid long slumps.

The first model on the determinants of public expenditure is "Wagner's Law" (Wagner, 1883). According this theory, public expenditure is essentially explained with the evolution of GDP. As confirmed by CEIS analyses (CEIS, 2009), GDP remains the most "important" determinant of health expenditure, as a proxy of earned economic conditions (for analyses and discussions on Wagner's Law in the Italian and European cases see Magazzino (2009a, 2009b, 2011a)).

Newhouse (1977) found a positive effect of income on health expenditures at the national level, assuming no price effect. Gerdtham and Jönsson (1991a, 1991b, 2000) found a strong negative effect of relative prices on quantity demanded, with a price elasticity of -0.84; and Milne and Molana (1991) reached about a similar empirical results. So, as has been shown in Blomqvist and Carter (1997), Di Matteo and Di Matteo (1998), Freeman (2003), omitting relative price in regressors' set when its effect is significant clearly will carry out to biased estimations.

Hall and Jones (2007) argued that the optimal share of spending on health increases as incomes rise, since spending money on life extension allows individuals to escape diminishing marginal utility of consumption within a period.

Spinks and Hollingsworth (2009) has analyzed a number of theoretical questions in order to make some international comparisons of the technical efficiency of health production, enlarging their study to all social policy, and not just health policies.

Wang (2009) has examined the determinants of health expenditure using a homogeneous panel of data for the US states. As a result, gross state product, the proportion of the population over the age of 65 years, the degree of urbanization and the number of hospital beds are the four key determining factors.

Erdil and Yetkiner (2009) have investigated the Granger-causality relationship between real per-capita Gross Domestic Product and real per-capita health care expenditure. Their findings show that the relevant type of Granger-causality is the bidirectional one. The results show that one-way causality generally runs from income to health in low and middle-income countries, whereas the reverse holds for high-income countries.

Lin (2009) has studied the relationship between economic cycle and health expenditures. By using data obtained from eight Asia-Pacific countries over the period 1976 to 2003 and fixed-effects regression model, his results indicates that unemployment rate is negatively and significantly correlated with total mortality and mortality rates from cardiovascular diseases, motor vehicle accidents and infant mortality. According to this empirical evidence, health might improve during economic downturns. In addition, suicide is found to move counter-cyclically. The results also show that unemployment affected mortality rates in an immediate and contemporaneous way.

Narayan (2009) has examined the behaviour of per-capita health expenditures and per-capita GDP for 11 OECD countries, using a non-parametric test for two forms of asymmetries (deepness and steepness). The empirical evidence underlines as, for six out of the 11 countries (the USA, the UK, Japan, Spain, Finland and Iceland), either per-capita health expenditures or per-capita GDP are characterized by asymmetric behaviour.

As regards the relationship between aggregate income and health care for Italian regions, Magazzino (2011b) found the presence of a long-run relationship in fifteen out of twenty regions. Moreover, dividing the sample into three more homogeneous macro-regions (North, Centre and South), a long-run relationship between health expenditure and aggregate income has been found in two areas. Furthermore, the income elasticity is below the unity, implying that health expenditure is not a luxury good.

A lot of study – Kleiman (1974), Newhouse (1977), Leu (1986), Parkin *et al.* (1987), Posnett and Hitiris (1992), Gerdtham (1992), Pritchett and Summers (1996), Hansen and King (1996), Blomqvist and Carter (1997), Barros (1998), Roberts (1999), and Narayan (2009) – have shown that a significant percentage of variation in per capita health care expenditure (across countries and in time) could be explained by variations in per capita GDP. This is often dubbed "direct causation".

Yet, health expenditure also has an explanatory power on GDP, and this is dubbed "reverse causation" (Rivera and Currais, 1999).

Moreover, health determines school participation and learning and hence human capital accumulation (Galor and Mayer-Faulkes, 2003). Another crucial assumption is that health care expenditures must have positive effects on labour productivity (according to the "efficiency wages" hypothesis) (Barlow, 1979; Srinivasan, 1992; Strauss, 1993; Behrman and Deolalikar, 1988; Muysken *et al.*, 2003; Schultz and Tansel, 1997; Glick and Sahn, 1998; Rivera and Currais, 2005).

However, misspecification problem occurs if causality is simultaneous in both directions. Doing so, OLS estimation will produce biased and inconsistent estimates of the structural parameters given that there is an endogenous relationship between GDP and health care spending. Therefore, it is important to determine the direction of the causality relationship between health care expenditures and GDP.

Furthermore, there is the possibility that the economy may respond asymmetrically to positive shocks than to negative shocks (Beaudry and Koop, 1993).

Brenner conducted a series of studies (1971, 1975, 1979 and 1987) and found that recessions and economic instability have a potentially adverse effect on health, while subsequent studies wasn't able to find an analogous empirical evidence (Wagstaff, 1985; Cook and Zarkin, 1986; McAvinchey, 1988; Joyce and Mocan, 1993).

Certain other studies supported the view that recessions are often accompanied by a higher unemployment rate, increased psychosocial stress, declining income, reduced psychological well-being: these effects lead to deterioration in both mental and physical health. As a result, suicide was strongly associated with labour market conditions (Yang and Lester, 1995; Viren, 1996; Lewis and Sloggett, 1998).

Some recent works underline as the total mortality rates were pro-cyclical, showing the trade-off between unemployment rates and mortality rates. The main the findings of these researches provided evidence that health improves during economic downturns (Ruhm, 2000; Laporte, 2004; Neumayer, 2004; Ruhm, 2004; Tapia Granados, 2005a, 2005b; Gerdtham and Ruhm, 2006).

On the contrary, Gerdtham and Johannesson (2003) found that recessions increase the mortality rate for men, but don't have any effect in relation to women.

3. Data and Empirical Results

We consider the following nine variables in explaining real health expenditures (*HE*): real Gross State Product (*GSP*), unemployment rate (*U*), % of households who complains air pollution (*URBAN*), mortality rate (*M*), birth rate (*B*), the number of beds in community hospitals (*HPBED*), the resident population for generic physicians (*PHYSN*), % of the population with at least the junior high school degree (*EDUCATION*) and the ageing index (*AGEING*). In particular, the causal relationship between health care and aggregate income could be interpreted in two different ways: viewing the former as a cost or as a social-economic investment (CEIS, 2009). The fact that most other OECD countries have also experienced substantial growth in their health sector over the last half century makes the secular rise in incomes a natural candidate to explain the rise in the health share of GDP in Italy. As regards the nature of demographic variables, the model considers the ageing index (Note 1), as well as the general rate of mortality (the latter inserted as proxy of the so-called "cost of death"). The educational degree has been included in the model to capture the impact of social characteristics; while the number of public beds is introduced in the model in an attempt to analyze the impact of possible phenomena of supply induced demand, as an inappropriate spending generated on the supply side. Moreover, the resident/physicians ratio should be regarded as a proxy of the regional (in)efficiency. Finally, we expect that as industrialization goes up, environmental externalities increase, pushing up the health care expenditure.

Due to data availability, we focus on the sample period 1980-2009. We derived the data from *Health for All-Italy* database – a geographic information system on sanity and health – provided by ISTAT (Note 2) (Figure 1).

The empirical methodology used in this paper refers to the basic panel data models. In formal hypothesis testing, a variable is (not) included as an explanatory variable in the model if its coefficient is (not) significantly different from 0 by a *t*-test. More problematically, in large dimension problems two variables may be insignificant only because they are highly correlated. If insignificant variables are excluded sequentially (another practice in empirical studies), there is a problem of which one to exclude first. An alternative to the formal hypothesis testing is the model selection approach, which, based on information criteria, is more objective as it weighs in both model fit and complexity (relative to the sample size). Throughout the article, we focus on the application of Schwarz's (1978) Bayesian Information Criterion (BIC). In application, we minimize BIC over a domain of models with all possible combinations of explanatory variables. The model with the smallest loss is selected.

In this paper, static panel-type analyses were conducted through GLS-FE (Generalized Least Squares-Fixed Effects), while for the dynamic estimates we applied the GMM (Generalized Method of Moments) estimators (Note 3).

Following Buchanan (1965), Fraser (1978), Leu (1986), Cromwell and Mitchell (1986), Fuchs (1990), Karatzas (2000), CEIS (2009) and Wang (2009), we consider the following explanatory variables in explaining health expenditures (HCE):

$$HE_{i,t} = \beta_0 + \beta_1 GSP_{i,t} + \beta_2 U_{i,t} + \beta_3 URBAN_{i,t} + \beta_4 M_{i,t} + \beta_5 B_{i,t} + \beta_6 HPBED_{i,t} + \beta_7 PHYSN_{i,t} + \beta_8 EDUCATION_{i,t} + \beta_9 AGEING + \varepsilon_{i,t} \quad [1]$$

It is hypothesized that, of these variables, changes in the real GSP, in the unemployment, in the urbanization degree, in the birth rate, in the number of hospital beds, in the ratio of physicians and in the ageing will be positively associated with the dependent variable (*HE*); whereas a negative association between the mortality rate, or the educational level and the real health care expenditure would exist. We derived the logarithmic series of some independent variables (*HE*, *GSP*, *URBAN*, *HPBED*, *PHYSN*, *EDUCATION* and *AGEING*), causing the coefficients to be elasticities. Also, the logarithmic linear form reduces heteroskedasticity.

Correlation coefficients summarized in Table 1 below indicate, especially, a high positive correlation between health expenditure and aggregate income (r=0.98); moreover, the correlation between health expenditure and the number of beds in community hospitals, as well as that between the latter and *GSP* is very high (r=0.94).

Furthermore, it's relevant to underline the strong correlation between health expenditure and urbanization degree (r=0.71), *GSP* and *URBAN* (r=0.78), unemployment and the ageing index (r=-0.70), mortality and birth rates (r=-0.74), mortality and *AGEING* (r=0.86), and birth rate and *AGEING* (r=-0.79).

The results in Table 2 are consistent with the maintained hypotheses. In fact, the model provides a good of fit to the data, since R^2=0.98: therefore, about 98% of the variance of the real health expenditure is collectively explained by the regressors. More specifically, our empirical results suggest that real health care expenditure is income elastic. Further, the urbanization degree is positively elastic, mirroring the effect of different kinds of pollution. Moreover, the dependent variable is also positively related to the hospital beds, while negatively to the educational indicator, as hypothesized. For the sample period, the mortality rate, the birth rate and the resident population for generic physicians are all insignificant.

Since each of the 9 candidate variables may be either included in or excluded from model *[1]*, there are a total of 2^9=512 possible model specifications (a constant is always included). For each specification, we compute a loss function BIC, and which one with the smallest value of BIC has been selected (Note 4).

As shown in Table 3, income has the largest effect on *HE*, ranging from 0.62 to 0.83. It is noteworthy that a significant percentage of variation in health care expenditure (across countries and in time) could be explained by variations in GDP. The magnitude of the elasticity also appears to be reasonable. In fact, it is comparable to Di Matteo and Di Matteo's (1998) estimate of 0.77 based on Canada's provincial data, as well as to Wang (2009) of 0.71. Moreover, our income elasticity estimates are quite similar to that of Freeman (2003) estimates (from 0.82 to 0.84). It is widely observed that Italian health expenditure growth rate turned up in the 1990s. *URBAN* has the expected (positive) sign, since negative externalities due to urbanization degree push up health expenditures. The stock of hospital beds has a small but statistically significant positive effect on *HE*, consistent with the supply-induced demand theory, as shown in Evans (1984). The elasticity of *AGEING* is positive (0.34), meaning that older people tend to use more health care than the working age population. Finally, in contrast to the previous estimates in Table 2, the mortality rate seems to be highly significant and has the expected (negative) sign, even if its coefficient is close to zero.

Table 4 contains the results for the dynamic panel data estimates. In the second column, we applied the Arellano and Bond (1991) Difference GMM estimator, which treats the model as a system of equations, one for each time period; the equation differs only in their instrument/moment condition sets. The predetermined and endogenous variables in first differences are instrumented with suitable lags of their own levels. While, in the third column the GMM-System estimates are shown. GMM-Sys is the augmented version of GMM outlined in Arellano and Bover (1995) and fully developed in Blundell and Bond (1998). Since lagged levels are often poor instruments for first differences, the original equations in levels can be added to the system, so that the additional moment conditions could increase efficiency. In these equations, predetermined and endogenous variables in levels are instrumented with suitable lags of their own first differences.

The GMM-Sys estimator produces some intriguing results. In fact, what clearly emerges from these estimates is that the lags of dependent variable are significant. Moreover, past values of urbanization degree, birth rate, community hospitals' beds, educational degree, and ageing index affect the health expenditures; while current values of GSP, resident/physicians ratio and ageing index are statistically significant. In particular, an increase in GSP is associated with an average in health expenditure of 0.43 to 0.48 percent.

The elasticity of *AGEING* is positive, a result consistent with findings in earlier studies.

Regarding the diagnostic checks, as shown in Arellano and Bond (1991), only for a homoskedastic error term the Sargan test has an asymptotic chi-squared distribution. Here, we cannot reject the null hypothesis that the over-identifying restrictions are valid (at a 1% significance level). When the idiosyncratic errors are independently and identically distributed (i.i.d.), the first-differenced errors are first-order serially correlated. So, as expected, the output below presents strong evidence against the null hypothesis of zero autocorrelation in the first-differenced errors at order 1. Serial correlation in the first-differenced errors at an order higher than 1 implies that the moment conditions used by GMM are not valid. Yet, the Arellano and Bond test for second order serial correlation doesn't reject H_0.

4. Conclusions

In this paper, we used panel methodologies to estimate the determinants of health expenditure in Italian regions during the years 1980-2009, using state-level data. Empirical results show that a relatively simple model focusing on a key group of variables can explain the dynamic of real health expenditure. With the static panel data methods, it was found that the real Gross State Product, the unemployment rate, the number of beds in community hospitals, the urbanization degree, and the % of the population with at least the junior high school degree had a direct impact on the real health care outlay. On the contrary, the ageing index, the mortality rate, the birth rate and the resident population for generic physicians are insignificant.

The income elasticity is about 0.83 according to the static panel estimates, while it is of 0.43 to 0.48 as for the dynamic models, implying that health care can be characterized as a necessity at the state level. Yet, the dynamic estimates' elasticity is lower than 0.77 calculated by Di Matteo and Di Matteo (1998), 0.7 in Wang (2009), or from 0.817 to 0.844 found by Freeman (2003).

5. Suggestions for Future Researches

Further analysis may be conducted studying the nexus between different items of health care expenditure and aggregate income in Italy, both at central and at regional level.

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Notes

Note 1. The ageing index is constructed as a ratio between the percentage of the population in the elderly (65 years and over) and the population at a young age (less than 15 years).

Note 2. See, for more details: http://www.istat.it/dati/db_siti/.

Note 3. For an analysis dealing with panel stationarity, cointegration and Granger-causality on the relationship between health expenditure and GSP in Italian regions, see Magazzino (2011b).

Note 4. The endogeneity problem may arise in the estimated model, since HCE and GSP may cause each other contemporaneously. To address this issue, we used one-year lagged GSP as the instrument variable for the current GSP. The basic results reported in the paper still hold, which suggests that the endogeneity bias is likely to be small.

Table 1. Correlation matrix.

	1	2	3	4	5	6	7	8	9	10
1	1									
2	0.98	1								
3	0.02	-0.12	1							
4	0.71	0.78	-0.33	1						
5	-0.19	-0.11	-0.50	0.11	1					
6	0.15	-0.13	0.37	0.15	-0.74	1				
7	0.94	0.94	0.13	0.67	-0.24	0.21	1			
8	0.15	0.16	-0.09	0.12	-0.45	0.60	0.10	1		
9	0.24	0.22	-0.47	0.27	0.02	0.05	0.03	0.18	1	
10	-0.03	0.24	-0.70	0.14	0.86	-0.79	-0.19	-0.40	0.25	1

Notes: 1: HE, 2: GSP, 3: U, 4: URBAN, 5: M, 6: B, 7: HPBED, 8: PHYSN, 9: EDUCATION, 10: AGEING. Bonferroni adjustment applied.

Source: our calculations on ISTAT data.

Table 2. Determinants of the real health care expenditure in the Italian regions: 1980-2009 (static panel estimation results).

Dependent variable: HE	***POLS***	***C-S T-S FGLS***	***POLS Driscoll-Kraay SEs***
Constant	-7.7962 ***	-3.8015 ***	-7.7962 ***
	(1.4493)	(1.0872)	(2.0673)
GSP	0.8761 ***	0.8722 ***	0.8761 ***
	(0.0414)	(0.0402)	(0.0377)
U	0.0352 ***	0.0147 ***	0.0352 ***
	(0.0032)	(0.0024)	(0.0037)
URBAN	0.1495 *	0.0027	0.1495 **
	(0.0813)	(0.0285)	(0.0562)
M	-0.0034	-0.0028 **	-0.0034
	(0.0024)	(0.0012)	(0.0044)
B	0.0218	0.0232 **	0.0218
	(0.0289)	(0.0099)	(0.0238)
HPBED	0.1031 *	0.1244 ***	0.1031 *
	(0.0561)	(0.0438)	(0.0527)
PHYSN	0.0791	-0.0616	0.0791
	(0.1503)	(0.1413)	(0.1397)
EDUCATION	-0.7901 ***	-0.5810 ***	-0.7901 **
	(0.1338)	(0.1008)	(0.2797)
AGEING	0.3350 *	-0.0586	0.3350
	(0.1981)	(0.1057)	(0.3660)
Number of obs.	200	200	200
Number of groups	20	20	20
F/Wald χ^2	1143.08	15673.46	1.89e+07
	(0.0000)	(0.0000)	(0.0000)
RMSE	0.1362	-	0.1362
R^2	0.9840	-	0.9840

Notes: Numbers in parentheses are heteroskedasticity-consistent SEs. *, ** and *** indicate significance at the 10, 5 and 1% levels, respectively.

Source: our calculations on ISTAT data.

Table 3. Determinants of the real health care expenditure in the Italian regions: 1980-2009 (static panel estimation results, models selected via BIC).

Dependent variable: HE	*2004*	*2005*	*2006*	*Pooled*
Constant	-5.7267 ***	-1.8669 ***	-1.0324	-5.8671 ***
	(1.6935)	(0.1294)	(0.6575)	(0.5099)
GSP	0.6472 ***	0.6232 ***	0.6991 ***	0.8346 ***
	(0.1304)	(0.0790)	(0.1500)	(0.0493)
U	0.0423 ***	0.0334 ***	0.0396 ***	0.0310 ***
	(0.0051)	(0.0033)	(0.0102)	(0.0022)
URBAN	0.2323 **	0.2461 ***	-	0.1945 ***
	(0.0827)	(0.0767)		(0.0536)
M	-0.0047 ***	-0.0031 ***	-0.0083 ***	-
	(0.0011)	(0.0005)	(0.0020)	
B	-	-	-	-
HPBED	0.2393 *	0.5670 ***	0.2698 *	0.1455 ***
	(0.1199)	(0.0689)	(0.1540)	(0.0465)
PHYSN	0.4356 *	-	-	-
	(0.2253)			
EDUCATION	-	-	-	-0.8138 ***
				(0.1274)
AGEING	-	-	0.3711 **	-
			(0.1268)	
Number of obs.	20	20	20	200
F/Wald χ^2	936.72	3808.75	1732.48	1817.31
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
RMSE	0.0608	0.0408	0.0618	0.1360
R^2	0.9977	0.9989	0.9975	0.9837
BIC	-42.9198	-60.3506	-43.7625	-204.7481

Notes: Numbers in parentheses are heteroskedasticity-consistent SEs. *, ** and *** indicate significance at the 10, 5 and 1% levels, respectively.

Source: our calculations on ISTAT data.

Table 4. Dynamic panel data estimates.

Variable	*Econometric Method*	
	GMM-Dif	**GMM-Sys**
Constant		-0.6530 (1.0168)
$HE_{i,t-1}$	0.3960*** (0.0950)	0.4636*** (0.1052)
$HE_{i,t-2}$	0.0066 (0.0992)	0.3003*** (0.0844)
$GSP_{i,t}$	0.4261* (0.2291)	0.4847** (0.2367)
$GSP_{i,t-1}$	-0.1581 (0.2591)	-0.3116 (0.2818)
$GSP_{i,t-2}$	-0.2944 (0.2374)	-0.1101 (0.2933)
$U_{i,t}$	-0.0011 (0.0041)	-0.0021 (0.0046)
$U_{i,t-1}$	-0.0010 (0.0034)	-0.0002 (0.0029)
$U_{i,t-2}$	0.0024 (0.0021)	0.0034 (0.0035)
$URBAN_{i,t}$	0.0416 (0.0286)	0.0239 (0.0274)
$URBAN_{i,t-1}$	-0.0243 (0.0250)	-0.0226 (0.0275)
$URBAN_{i,t-2}$	0.0804*** (0.0307)	0.0469* (0.0273)
$M_{i,t}$	-0.0003 (0.0010)	0.0004 (0.0011)
$M_{i,t-1}$	-0.0001 (0.0014)	0.0012 (0.0013)
$M_{i,t-2}$	-0.0010 (0.0015)	-0.0005 (0.0011)
$B_{i,t}$	-0.0062 (0.0100)	0.0130 (0.0142)
$B_{i,t-1}$	-0.0202 (0.0184)	-0.0081 (0.0128)
$B_{i,t-2}$	0.0278** (0.0130)	0.0223* (0.0121)
$HPBED_{i,t}$	0.0297 (0.0461)	0.0404 (0.0467)
$HPBED_{i,t-1}$	-0.0460 (0.0600)	0.0281 (0.0537)
$HPBED_{i,t-2}$	-0.0008 (0.0472)	0.0870** (0.0410)
$PHYSN_{i,t}$	0.2801*** (0.0792)	0.1147* (0.0641)
$PHYSN_{i,t-1}$	-0.0995 (0.1077)	0.0340 (0.0897)
$PHYSN_{i,t-2}$	0.0207 (0.0985)	0.0701 (0.0898)
$EDUCATION_{i,t}$	-0.1505 (0.2595)	0.0086 (0.3014)
$EDUCATION_{i,t-1}$	0.3611 (0.3747)	0.2367 (0.3657)
$EDUCATION_{i,t-2}$	-0.5536** (0.2483)	-0.3896 (0.2996)
$AGEING_{i,t}$	2.9689*** (0.8201)	-0.8480 (1.4681)
$AGEING_{i,t-1}$	2.6887 (1.8892)	3.6875* (2.0677)
$AGEING_{i,t-2}$	0.2972 (1.4633)	2.7458** (1.1068)
Wald	(0.0000)	(0.0000)
Sargan	(0.958)	(0.827)
A.-Bond AR(2)	(0.070)	(0.728)

Notes: Number of groups=20. Asymptotic standard errors in parentheses. For the diagnostic tests P-Values are shown. Significance levels: * 10%, ** 5%, *** 1%.

Source: our calculations on ISTAT data.

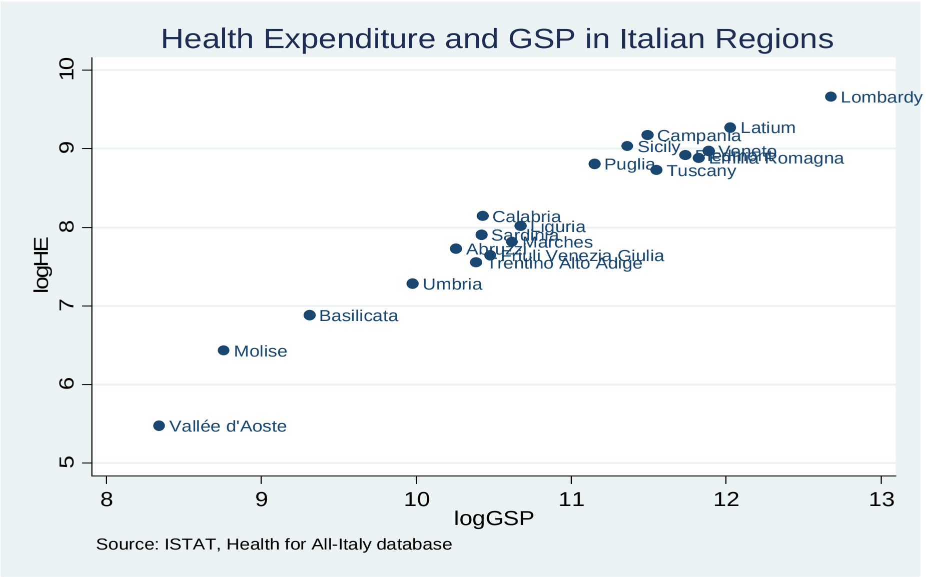

Figure 1. Health Expenditure and Gross State Product in Italian Regions (2007).