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The Regional Impact of Health Care Expenditure: the Case of Italy

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THE REGIONAL IMPACT OF HEALTH CARE EXPENDITURE:

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Abstract

Decentralisation invests the sub-central authorities of a country with autonomy in political and economic power the exercise of which may widen interregional divergence and inequality. This paper provides evidence demonstrating that in the case of Italy the central government's policies for rationalisation and containment of the growth of health care expenditure in combination with decentralisation in the administration and provision of health care have resulted in interregional inequality, aggravating the existing regional divergence.

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THE REGIONAL IMPACT OF HEALTH CARE EXPENDITURE: THE CASE OF ITALY

1. Introduction

Recent advancements in democratisation by *devolution* and *subsidiarity*, which delegate some of the central government's allocating goals to local and regional authorities, often result in inequality in the provisions of the welfare state. In principle, decentralisation aims at public sector efficiency in the production and distribution of services, improved decision making with the use of local information, greater accountability and improved responsiveness to local needs and conditions. However, decentralisation also ushers a split in the responsibilities of the relevant actors in the field of policy, which enables them to attach more weight to their preferences, perceptions, strategic options and degree of compliance with the general policies of the central government. Therefore, decentralisation can also have negative repercussions on equality by propagating interregional divergence in the volume and allocation of both budgetary revenues and expenditures.

Decentralisation and local autonomy also leave their mark in the sector of health care expenditures by both regional expansion and retrenchment. National Health Service (NHS) is a system of the welfare state which aims at the same standard health care to the citizens of a country, wherever they live. But this declared aim has led the public health care expenditure of most developed countries (such as the members of the OECD) to a long period of escalating growth and therefore to the adoption of policies for rationalisation and control. In many countries, the policies for containment of health care spending are applied at the same time as they are also moving ahead with their plans for devolution and decentralisation. As a

result, significant differences in regional public spending on health care are occurring which add another facet to the already existing regional inequality problem. Italy is an example of such a country.

In Italy, the share of health care expenditure on national income has been increasing steadily over time, from 3.9% in 1960 to 6.6% in 1978 - when its NHS was established- and to 7.7% in 1990. Therefore, the central government has lately introduced reforms aiming at control the growth of national health spending. But Italy's NHS is also becoming intensely decentralised, thus reflecting closer the political and administrative division of Italy into twenty regions. But regional authorities do in general allocate the available resources according to local needs and often interpret the central government's directives for control of their health care budgets in their own differential ways. As a result, profound interregional differences in health care expenditure occur which may aggravate the already existing inequalities between the Italian regions. The objective of this study, therefore, is to examine the determinants of health care expenditure, to identify their geographic pattern and to analyse the significance of the emerging differences between Italy's regions. These objectives will be pursued by developing and estimating an econometric model using pooled regional time-series cross-section data of the period 1980-1995. The rest of the paper is organised as follows: Section 2 presents an overview of Italy's NHS structure and its reforms, outlining the diverse evolution of regional health expenditure. The methodology and the data used in the quantitative analysis are presented in Section 3. In Section 4, we estimate the model and discuss the results. Policy issues and concluding remarks are outlined in Section 5.

2. **An Overview of the Italian National Health Care System and its Reforms**

Italy's NHS (the *Servizio Sanitario Nazionale, SSN),* was established in 1978 to provide comprehensive health insurance coverage and standard health care to all citizens and legal residents wherever they live. The NHS is partially financed by contributions from workers and their employers, while the self-employed, farmers, elderly and retired people pay a health tax. These contributions cover about 41 percent of the total health care costs, with an additional 26 percent contributed by regional, provincial and district taxes and the remaining 33 percent by patient copayments and private health insurance. About 16 percent of the population has some type of private health insurance, consisting of group policies provided to workers through employers or purchased by the affluent to supplement public care.

The NHS is structured at three levels. At the top level, the Ministry of Health is responsible for national health planning, budgeting, general administration and health standards. The Ministry allocates funds to 20 Regional Health Authorities (RHAs) according to a procedure based on a complex formula involving population size, average age, mortality rates and other regional characteristics, among which there are the historical spending levels. These sums are disbursed by the RHA to 200 local health agencies (LHAs). This decentralised structure of the NHS, combined with frequent deviations from the agreed regional allocation of central government funds and the right of local authorities to decide the expenditure side of their budgets, often results in significant deviations from the agreed allocation formula, which cause inequalities in the provision of health care expenditure among Italy's 20 regions. Consequently, Italy's NHS displays both notable accomplishments and serious shortcomings. The accomplishments include the provision of universal comprehensive health care with access to a wide range of health services. But this gain was achieved at the cost of

overextending the NHS. As a result, the main shortcomings were in the inadequacy of funding right from the beginning: HOFFMEYER and McCARTHY, 1995. Moreover, superimposing the NHS on a country still imbued with regional socioeconomic disparities has led to major regional differences in the quality and efficiency of health care services provided across the country, particularly in the south the high concentration of the poor is found: PIPERNO and DI ORIO, 1990; DIRINDIN, 1996.

These problems continued despite the fast growth of public spending on national health care which peaked at 6.6 per cent of GDP in 1991. This high share of spending on national health at a time of large public deficits (and, lately, the need for drastic reductions in the public debt to comply with the Maastricht criteria for participation in the European Monetary Union, EMU) precipitated two major reforms which have sought to reverse the trend by guaranteeing only a limited but interregionally equal state provided health care funds. However, the reduction of the centrally provided funds raised the weight of the other sources of financing health expenditure in the regional budgets and provided the regional authorities with more power in running their economic affairs. Thus, the divergence between the better from the worst off regions in matters of social policy and welfare widened.

Starting from 1992, a first set of reforms was specifically designed to increase the autonomy of RHAs in both the financing and delivery of health care. The National Health Fund continued to be allocated among regions on a capitation formula, with a lagged compensation for in-patient transfers between regions. But the share of the regional contribution was gradually increased by expanding the financial autonomy of the regions in matters of taxation. The RHAs also became directly responsible for planning health care expenditure and will be increasingly free to manage their own funds. Since the Italian regions are still characterised by deep economic disparities, increasing decentralisation could in

principle widen the interregional divergence in both funding and spending on health care. These reforms were combined with several cost containment policies which have also been undertaken at central level, such as wage freeze and budget cuts for drugs, employment and equipment. As a result the rate of growth of public per capita health care expenditure was reduced from about 2.0 per cent a year during 1980-91 to less than 0.5 per cent in 1992-95. However, once again, the spending pattern of the regions remained highly diverse with increased variation around the national average.

Table 1 shows the evolution of per capita regional health care expenditure at 1990 prices. In 1980, the range of interregional differences in per capita health care expenditure was 78 (Emilia Romagna vs. Basilicata), the mean 655.4 and the standard deviation 119.9. In 1995, the range increased to 118 (Emilia Romagna vs. Puglia), the mean to 826.0 and the standard deviation to 157.1. In the period 1980-1991, that is before the start of the NHS reform process, the average expenditure increased by more than 22% but with significant interregional deviations, most notably between the Northern and Central regions and those of the South which display a more heterogeneous pattern (e.g., Basilicata=50.42%, Calabria=44.23% and Sicily=29.53% vs. Campania= 2.82%). Overall, before the reforms, there were deep inequalities in the distribution of public health care expenditure among the regions which, following historical patterns, favoured the richest regions of North and Centre. The 1992 reforms attempted to contain the growth of national health care expenditure while observing the declared objective of NHS to provide equality in health care in all citizens whenever they happen to live. It is, therefore, worth exploring further whether the latest reforms have guided the NHS towards the intended directions by checking the growth of health spending and ameliorating the interregional inequality in the provision of public health care.

3. Methodology and Estimation

The demand for health care would presumably depend on the conditions of an individual's health, medical costs and income. However, if public or private insurance meets the medical costs, the patient does not pay these costs which are shifted to others. If this is the case, a person's demand for health care is not limited by price, private budgetary considerations or ability to pay: PAULY, 1986. In countries providing centrally national health care, only supply constraints would determine the size of public health care expenditure. It is argued, therefore, that for several economic and political reasons, such countries display relative incapacity to deal with demand pressures[1]. Similar considerations would presumably apply to the analysis of health care expenditure at the interregional level with the impact of interregional differences added as an additional quest[2].

We propose to identify the determinants of health expenditure among the Italian regions using a large sample of pooled time-series and cross-section data. Since Italy has a national health service which includes the interregional equality of health care among its objectives, it is reasonable to begin by assuming that our parameter estimates are constant across regions[3]. However, Italy suffers from deep regional economic divergence which may have affected the regional patterns of health care expenditure. Moreover, the drastic reforms of the last few years may have affected differentially the regions. Therefore, to take account of these features of Italy's NHS, we follow a three-stage estimation procedure. In the *first stage*, we identify the factors that determine the volume of health care expenditure in an industrialised country such as Italy. In the *second stage*, we show that with respect to health care expenditure the regions of Italy do not constitute a homogeneous group and introduce region-specific dummy variables to account for the disclosed differences. Finally, in the *third*

stage, we introduce regional, time-specific dummy variables to take account of each region's response to the policies for containment of the growth of national health expenditure.

First stage: The health expenditure literature has suggested several socioeconomic, demographic and lifestyle determinants of per capita health care expenditure: HITIRIS and POSNETT, 1992. However, in empirical research the choice of explanatory variables is often constrained by the availability and quality of data[4]. Following previous practice, we use a parsimonious empirical model, in which real per capita public health care expenditure (H) is regressed against: per capita real GDP (Y); the ageing population (A); and structural characteristics of the health care supply, such as: (i) the total number of beds per hospital (BH), as a measure of economies of scale: other things being equal, the more the beds per hospital, the larger the hospital, the lower the expenditure; and (ii) the number of medical and non medical personnel per hospital (SH), as a measure of productivity improvement: the more the staff per hospital, the higher the expenditure, and vice versa[5]. Therefore, our empirical model takes the form:

$$H_{nt} = b_0 + b_1 Y_{nt} + b_2 A_{nt} + b_3 HB_{nt} + b_4 HS_{nt} + u_t \qquad (1)$$

where the subscript **n** stands for region and **t** for time and the estimated coefficients are expected to have the following signs: $b_1 > 0$, $b_2 > 0$, $b_3 < 0$, and $b_4 > 0$.

For the estimation, we pooled the t=16 time-series observations, 1980-95, of the n=20 regions to form a sample of 320 observations, thus making use of both cross-section/long-run and time-series/short-run information[6].

The regional subdivision of a country is a specific non-random set and, therefore, the estimation concerns a *fixed effects model* subject to stochastic disturbances. Consequently, we

applied an estimation method that takes account of the openness and interdependence of the regional economies within a country and corrects econometric problems arising from the nature of the data in the sample by postulating that the pooled set of regional data is cross-sectionally correlated and time-wise autoregressive: KMENTA, 1986. Consistent estimates are derived by subjecting the pooled observations to ordinary least squares (OLS) estimation to calculate the corresponding residuals. These are used to transform the variables, remove the autocorrelation and by applying generalised least squares (GLS) obtain asymptotically efficient estimates of the regression coefficients and their variances[7].

An issue which must be examined before proceeding with the estimation is the functional form of the suggested relationship. Previous research in this field has invariably shown preference for the log-linear rather than the linear functional form. There are two reasons, however, why this is incorrect: (a) Many of the explanatory variables (in our case A, HB and HS are expressed as percentages and it is therefore inappropriate to convert them into logs; (b) Expenditure on health care is one of the components of total national expenditure and thus it is subject to the 'adding up' constraint. This means that, if the functional form of the health care expenditure is set as log-linear, then the functional form of rest of the expenditure would necessarily be nonlinear so that the two add up to give the total expenditure. Since there is no reason to assume that health expenditure is different from other expenditures, it is incorrect to impose on it the log-linear functional form: ANDERTON et al., 1992. Therefore, the functional form of the model is a priori linear but, to be on the safe side, we subjected the data to the Box-Cox estimation to test whether the model is linear ($\lambda=1$) or log-linear ($\lambda=0$). The test statistic for $\lambda=0$ provided $2[-346.581 + 343.230]= 6.702$, while for $\lambda=1$ provided $2[-346.581+ 345.922]=1.318$, which for $\chi^2(1)=3.841$ confirm that the linear model is accepted and the log-linear model is rejected[8].

The estimation provided the equation 1 in Table 3 which displays high goodness-of-fit statistics[9] and coefficients which are statistically significant and have the expected signs in accordance with the *a priori* economic and statistical criteria. However, the estimated equation displays both heteroskedasticity and autocorrelation: Harvey test=21.111 and Clejer test=14.940, confirming heteroskedasticity at $\chi^2(4)=9.4886$; and DW=0.930, confirming positive serial correlation. These problems could be caused by misspecification arising from unaccounted interregional differences and, therefore, we proceeded to re-specification of the model.

Second stage: To examine whether the regions in the sample constitute a homogeneous group we introduced in equation (1) a set of dummy variables for each of the regions to test for cross-section specific effects: JUDGE et al., 1988. Therefore, in our estimation we assume that the slope coefficients of the explanatory variables remain constant while the intercept term, which accounts for the fixed effects, is allowed to vary across regions in accordance with regional heterogeneity. Consequently, the dependent variable is influenced by three types of factors: (i) those we know about and explicitly specify in the equation (such as income, age structure etc.); (ii) those for which no recorded information is available and their influence is captured by the constant term, b_0; (iii) those which are latent variables, not directly quantifiable (such as political influences and lobbying activities), with influence recorded by categorical or dummy variables. Therefore, in addition to the explanatory variables and the constant term, our model includes a dummy variable for each region, REG_i, where i = 1-19 regions (region 20 being the constant term), and the model is specified as:

$$H_{nt} = b_0 + b_1 Y_{nt} + b_2 A_{nt} + b_3 HB_{nt} + b_4 HS_{nt} + b_5 REG_i + u_t \qquad (2)$$

where $b_5>0$ or $b_5<0$ depending on whether a region allocates to health care more or less than the average expenditure (when $b_5=0$). The preliminary estimation yielded strong evidence of clustering of the 20 regions into seven distinct groups ($REG_i \rightarrow AREA_j$, j= 0-6) classified under three broad categories according to the pattern of their health expenditure, as shown in Table 2. Therefore, in addition to the constant term, which represents the cluster of average spending regions, AREA 0, we introduced six dummy variables (AREA 1-6) to represent the regional clusters. The results of the estimates are presented in Table 3, equation 2. Once again, the estimates satisfy the standard economic and statistical criteria. The estimated coefficients of the explanatory variables, including the AREA 1-6 clusters are statistically significant and posses the expected sign. Estimation of equation (2) without the AREA dummies provided SSE=219.5. Consequently, the Chow test for the joint significance of the AREA dummies yielded F=18.68 which, against tabulated F(19, 294)=1.65 at the 0.05 level, confirms the statistical significance of the identified regional clusters[10]. These results show that there are statistically significant differences among regional areas. For example, the highest expenditure cluster (AREA4 = Friuli Venezia Giulia and Liguria) spends on health twice as much as and the lowest one (AREA2 = Lombardia), that is [Constant + AREA4 = 0.519] : [Constant - AREA2 = 0.258] = 2.01. This is a quantitatively important finding.

Overall, these results suggest that our specification of the health care expenditure function is admissible and therefore the estimation results are reliable. The estimated income elasticity confirms the predominance of GDP in the determination of health spending. The point estimate of income elasticity at sample means is 0.33, well below the “luxury good” designation. Figure 1 shows the association between health care expenditure, H, and its main explanatory variable, GDP per head, and the differences between the identified regional clusters. AREA 0 is spot average; AREAS 3, 4 and 5 are above average in both GDP and

health spending; AREAS 1 and 2 are above average in GDP and below average in health spending; and AREA 6 is below average in both GDP and health spending.

Ageing, A, with elasticity 0.16, shows that an increase in dependancy would raise health expenditure. This accords with our expectations and stylized facts and contrasts with previous research[11] which has concluded that ageing "can only account directly for a tiny fraction of the increase in expenditure" and that "on balance, neither the direct nor the indirect effects of aging on expenditure appear to account for most of the sustained rise in medical expenditure" (in the US: NEWHOUSE, 1992, p. 6). This has important implications for Italy because of predicted rapid changes in the population structure. In 1990, 14 per cent of the Italian population were 65 years old or over. This is forecasted by the OECD to rise to 20 per cent by 2020, increasing the pressures on Italy's the health care expenditure to grow. The estimated coefficients for the variables directly related to the supply of health care are also significant. As expected, the beds per hospital, BH, has a negative coefficient and elasticity -0.07 which could be interpreted as an indicator of economies of scale at regional level. The supply of personnel per hospital, SH is also significant with elasticity 0.05, suggesting that in this labour-intensive sector where labour cost accounts for the largest share of current costs, further increases in the employment of labour have a positive impact on the growth of health care expenditure.

Third stage: In order to take into account the reform process of the health care system and to assess how it has affected the regional health care expenditure, we re-estimated the model after inserting for each region a time-dummy variable, RD_i, (where i =1-19), for the years after the start of the reforms, 1993-95:

$$H_{nt} = b_0 + b_1 Y_{nt} + b_2 A_{nt} + b_3 HB_{nt} + b_4 HS_{nt} + b_5 AREAi + b_6 RD_i, + u_t \qquad (3)$$

This procedure assumes that the regions vary in their compliance with the central governments reforms and thus delivered different end results. In other words, the time-series of each region might have displayed a breaking point and discontinuity after the introduction of the reforms, which we account for by introducing region-specific time-dummy variables. The empirical model obtained, after eliminating the statistically non significant dummies, is in Table 3, equation 3. The significant regional time-dummy variables, RD_i (i=2, 3, 9, 13, 15, 16, 20), specify the regions which differ from the rest by expenditure patterns above or below the average. Estimation of equation (3) with the AREA dummies only provided SSE=99.682, while with the addition of the regional time-dummies for the reforms, RD, it provided SSE=318.78. Consequently, the Chow test for the joint significance of the regional time-dummy variables yielded F=6.78, which against tabulated F(19, 293)=1.62 at the 0.05 level confirms the validity of the specification chosen[12]. All estimated coefficients are statistically significant and on the whole similar to those of equation (2). Thus the income elasticity at sample means is 0.35 and that of the ageing population 0.12. Therefore, both equations (2) and (3) of Table 3 confirm that health care is not a luxury good, a result which is consistent with both stylised facts and economic theory[13].

Equation (3) confirms that, in the framework of the interregional inequalities detected by the area clusters, certain regions with expenditures below average reduced it further (e.g., Lombardia and Sicilia), while others increased it towards the average (e.g., Campania) or above the national average (e.g., Abruzzo and Sardenia). But overall, the regions which were below the average in 1980 continue to remain below the average in 1995. Consequently, the reforms have not removed the interregional inequalities of health care expenditure.

4. Summary and Conclusions

The aim of this study was to analyse the determinants of regional health care expenditure in Italy and provide answers to two pressing questions: (1) whether in Italy there is regionalism in health care expenditure; (2) whether the reforms recently introduced in Italy's NHS have moved the health care towards interregional equality. Our empirical results show that the most important determinant of the volume of regional health care expenditure is regional income. Among the factors of lesser importance are: (i) the ageing population; and (ii) structural characteristics, relating to economies of scale and productivity. Of these factors, per capita income and the ageing population are not under the direct control of policy makers. Economies of scale and productivity, which are associated with supply-side variables, are potentially controllable but their influence in the determination of the growth of expenditures is weak and may be subject to political considerations and constraints.

Our analysis of health care expenditure has found conspicuous and statistically significant differences among the regions of Italy. These geographical components in the determination of health care expenditure patterns most probably reflect the existence of latent variables associated with regionally specific socio-historical, institutional and political factors and trends, local government power echelons and vested interests, and regional economic disparities: see DIRINDIN, 1996. The latter means disparities in per capita income which is the main determinant of health care expenditure. Therefore, interregional equality in the provision of health care would require the allocation of the central government's contribution to regional health care budgets according to national equalisation criteria. But this is not what is happening in Italy. Moreover, following their own targets and, presumably, their electors' wishes, the regional and local authorities have the ability to vary the allocation of their

budgets.

As a result, the regional health care expenditure and provision of health care are unequal. Therefore, health care inequality is one of the factors contributing to Italy's regional economic problem. High spending regions are not only those which have high per capita income and therefore can afford it, but also those which for mostly political reasons rank health care expenditure among the top priorities of government. HOFFMEYER and McCARTHY, 1995, p.512, have identified this problem succinctly: "In common of much of Italy's public sector, constitutionally mandated decentralisation of (expenditure not revenue-raising) powers combines with a lack of decisive national political leadership to create weak vertical lines of control" … "The importance of patronage in Italian politics has led to power-holders doing their best to incorporate in legislation as many opportunities as possible for the exercise of discretionary administrative decisions. Political interference in the USL [Local health Units] is also a problem… unsurprisingly given that health is the largest expenditure item in the regional governments' budgets."

Our results show that, up to 1995, the reform process managed to contain the growth of health care expenditure at the national level while preserving the regional inequalities. The regions which habitually spent on health more than the national average continued to do so after the reforms, whilst many of the regions which spend the least on health care managed to contain the growth of health care expenditure. Therefore, the existing inequalities continued and in some cases worsened.

References

ANDERTON, B., PESARAN, B. and WREN-LEWIS, S. (1992), 'Imports, Output and the Demand for Manufactures', *Oxford Economic Papers*, **44**, 175-86.

BLOMQVIST, A.G. and CARTER, R.A.L. (1997), 'Is health care really a luxury ?', *Journal of Health Economics*, **16**, 207-29.

CUTLER, D. M., and MEARA, E. (1997), The Medical Costs of Young and Old: A Forty Year Perspective, *NBER Working Paper* No. 6114.

DENTON, F. T., and SPENCER, B. G. (1975), 'Health-care Costs when the Population Changes', *Canadian Journal of Economics*, **8**, 34-48.

DI MATTEO, L. and DI MATTEO, R. (1998), 'Historical evidence on the determinants of Canadian Provincial Government health expenditure: 1965-1991', *Journal of Health Economics*, **17**, 211-228.

DIRINDIN, N. (1996), *Chi paga per la salute degli italiani?(Who pays for Italians Health?),* Bologna, Il Mulino.

HITIRIS, T. and POSNETT, J. (1992), The determinants and effects of health expenditure in developed countries, *Journal of Health Economics*, **11**, 173-181.

HOFFMEYER, U.K. and McCARTHY, T. (Eds.) (1994) *Financing Health Care*, Kluwer Academic Publishers.

ISTAT (1998) , *Contabilita' Regionale (Regional Accounts) 1980-1995*, Rome, Istat.

ISTAT , *Annuario Statistico Italiano*, Rome, various issues, Istat.

ISTAT, *Statistiche Sanitarie*, Rome, various issues, Istat.

JUDGE, G.C., GRIFFITHS, W.E., HILL, R.C. and LEE, T.C. (1985), *The Theory and*

Practice of Econometrics, New York, John Wiley & Sons.

KLEIMAN, E. (1974), The determinants of national Outlay on Health, in Perlman, M. (ed.) *The Economics of Health and Medical Care*, London, MacMillan.

KMENTA, J. (1986), *Elements of Econometrics*, 2nd edition, NY, MacMillan.

LEU, R. (1986), The public-private mix and international health care costs. In CULYER, A. J. and JOHNSSON, B. (Eds.) *Public and Private Health Services*, Oxford, Blackwell, p. 41-63.

MAPELLI, V. (1994), *La domanda di servizi sanitari. Un'indagine campionaria (Health Care Services Demand: a sample survey)*, P.F. CNR sull'organizzazione e sul funzionamento della Pubblica Amministrazione, Milano, IES.

McCOSKEY, S. K. and SELDEN, T. M. (1998), Health care expenditure and GDP: panel data unit root test results, *Journal of Health Economics*, 17, 369-76.

NEWHOUSE, J. P. (1992), "Medical Care Costs: How Much Welfare Loss", *Journal of Economic Perspectives*, 6/3, 3-21.

OECD (1985), *Measuring Health Care - 1960-83: Expenditure Costs and Performance*, Paris, OECD.

OECD (1990), *Health Care systems in transition*, Paris, OECD.

OECD (1997), *Aging in OECD Countries: A Critical Policy Challenge*, Social Policy Series, No. 20, OECD, Paris.

PAULY, M. (1986), 'Taxation, Health Insurance and Market failure in the Medical Economy', *Journal of Economic Literature*, **24**, 629-75.

PIPERNO, A. and DI ORIO, F. (1990), Social Differences in Health and Utilization of Health Services in Italy', *Social Science and Medicine*, **31**, 305-12.

SCHIEBER, G., POULLIER, J-P., and GREENWALD, L. (1994), 'Health System

Performance in OECD Countries, 1980-92', *Health Affairs*, **13**, 100-12.

TOKITA et al. (1997) On the determinants of medical expenditure across prefectures in Japan,

The present and future National Medical Expenditure in Japan, The Economic Analysis, No.152/ September, Economic Research Institute, Economic Planning Agency, Tokyo, Japan.

Table 1 - The evolution of regional public per capita health care expenditure in Italy (000 ITL, 1990 prices)

Regions	1980	1995	% change	
			1980-91	1992-95
North				
1. Valle D'Aosta	686.6	886.7	35.89	-6.71
2. Piemonte	615.7	785.7	28.59	-1.45
3. Lombardia	636.4	748.7	22.37	-2.89
4. Trentino Alto Adige	659.2	925.0	35.30	2.40
5. Veneto	781.4	974.1	17.64	2.90
6. Friuli Venezia Giulia	816.1	1035.4	24.02	2.68
7. Liguria	891.9	1075.8	23.09	-2.34
8. Emilia Romagna	790.5	1137.5	35.60	2.79
Centre				
9. Toscana	697.9	915.8	31.44	1.25
10. Umbria	775.7	1014.9	21.40	6.51
11. Marche	822.5	1059.4	27.34	-0.36
12. Lazio	625.8	786.8	19.05	6.32
South				
13. Abruzzo	695.3	855.9	10.72	9.03
14. Molise	671.5	895.5	19.93	8.23
15. Campania	622.5	749.0	2.82	12.37
16. Puglia	530.8	522.4	17.23	-12.76
17. Basilicata	443.5	737.5	50.42	6.53
18. Calabria	465.7	740.3	44.23	6.00
19. Sicilia	532.9	704.6	29.53	1.24
20. Sardegna	667.1	912.1	20.18	12.90
ITALY Mean	**655.4**	**826.0**	**22.62**	**1.92**
standard deviation	**119.9**	**157.1**	**11.07**	**4.01**

Data source: Istat (1998)

Table 2 - Clusters of Regions and Associated Dummies

Categories	**No. of clusters**	**Regions**	**Dummy**
1. Average	1	4, 8, 12, 13, 14, 19, 20	AREA0
2. Less than average	3		
2.1 lower		3	AREA2
2.2 medium		1, 2	AREA1
2.3 upper		15, 16, 17, 18	AREA6
3. More than average	3		
3.1 lower		5	AREA3
3.2 medium		9, 10, 11	AREA5
3.3 upper		6, 7	AREA4

Note: AREA0 comprises the regions under the constant term. The names of the regions are presented in Table 1.

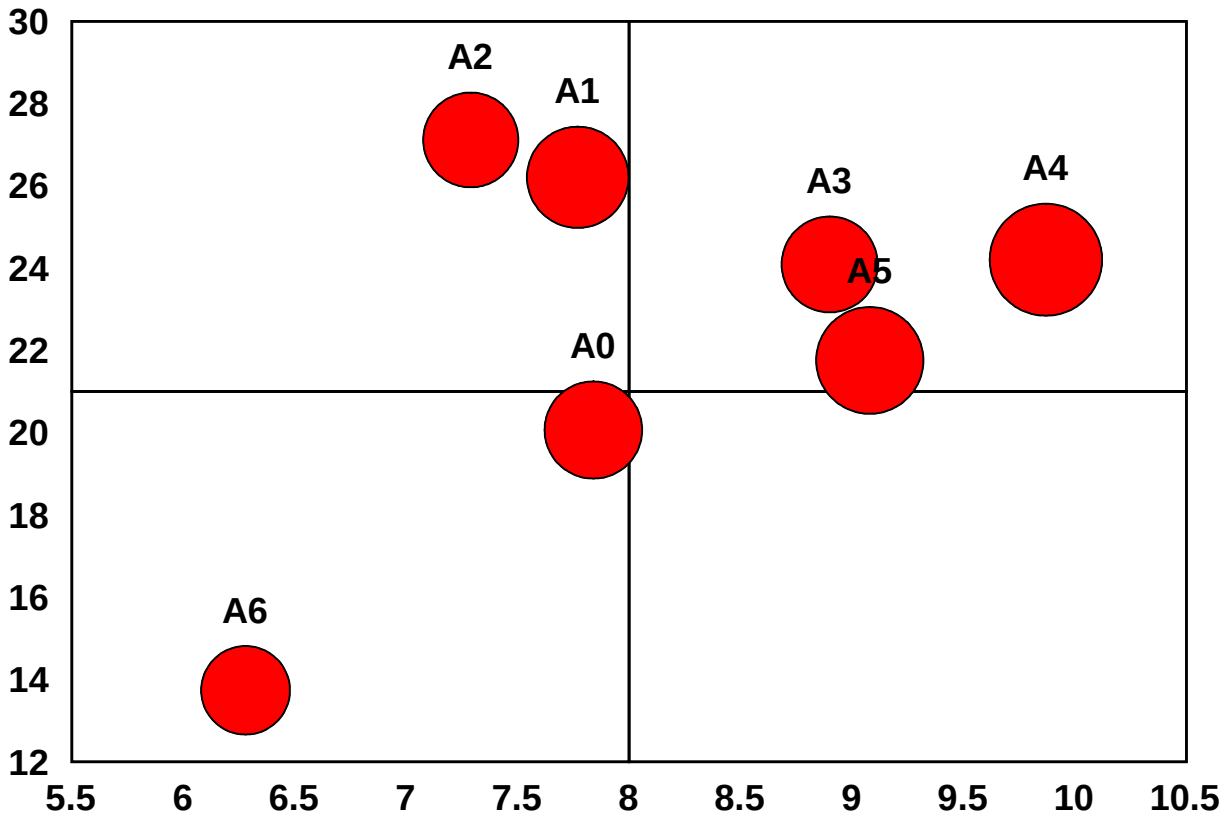

Figure 1: AREA clusters of the 20 Italian Regions

Legent: Vertical axis=GDP per head; Horizontal axis= Health care expenditure per head;

Area value= Aged.

Table 3: Estimation of Health Care Expenditure Functions

Explanatory Variables		Equation 1		Equation 2		Equation 3	
		Coefficient	**(t-ratio)**	**Coefficient**	**(t-ratio)**	**Coefficient**	**(t-ratio)**
interecept	**a**	0.405	(9.739)	0.419	(9.753)	0.438	(10.654)
Income	**Y**	0.011	(7.281)	0.013	(7.639)	0.014	(8.602)
Ageing	**A**	1.176	(5.204)	0.863	(3.494)	0.635	(2.816)
Hospital Beds	**HB**	- 0.023	(3.615)	- 0.021	(3.494)	- 0.021	(3.623)
Hospital Staff	**HS**	0.008	(3.069)	0.012	(4.870)	0.012	(4.699)
AREA	**1**			- 0.132	(6.733)	- 0.130	(6.716)
	2			- 0.161	(4.950)	- 0.136	(7.183)
	3			0.055	(2.396)	0.052	(2.215)
	4			0.100	(4.840)	0.109	(5.111)
	5			0.078	(2.800)	0.084	(2.898)
	6			- 0.061	(2.198)	- 0.064	(3.812)
Regional Dummy	**RD 3**					- 0.051	(3.683)
	13					0.024	(1.969)
	15					0.037	(1.942)
	16					- 0.097	(3.691)
	20					0.062	(3.762)
R^2 observed/predicted		0.900		0.973		0.984	
σ standard deviation		0.697		0.568		1.024	
SSE		219.54		99.682		318.78	

Notes

1. This is also holds for countries with sizeable private provision of health care since even there the public expenditure on health is high, more than 75 per cent of the total in the OECD countries: SCHIEBER et al., 1994.

2. The few previous studies that dealt with the geographic disaggregation of health care expenditure have invariably highlighted the observed interregional differences in spending which they attempted to explain. Thus DI MATTEO and DI MATTEO, 1998; have attributed the differences in health spending patterns across Canadian Provinces to the administrative and financial independence they enjoy which enables them to meet directly the demand of their own citizens. In contrast, a similar study across prefectures in Japan: TOKITA et al., 1997; has attributed the significant interregional variation in health spending to the different age structure of populations and to differences in adopting costly modern technology which in many instances is an extravagance and waste of resources with no positive effect on life expectancy.

3. The geographical equality of national health provision could also be achieved by the free migration of people from one region to another, including patients moving in search of specialised treatment, subject of course to regional health service approval.

4. An additional problem arises from the limited size of the times series sample which restricts the choice of explanatory variables for ‘degrees of freedom’ considerations.

5. The denominator ‘hospitals’ is taken as a reference point for comparisons and it does not imply that, e.g., the personnel is only that employed by hospitals. It is all NHF staff. As an alternative for

the last two variables, we also tested the variables 'beds per population' and 'personnel per population' and found comparable results. We also disaggregated the 'personnel per population' variable to doctors and other staff but found inconsistent results due to multicollinearities. Given the observed growth in private health care expenditure, we also tested the per capita private expenditure as an explanatory variable but the estimated coefficient was consistently statistically nonsignificant, indicating that in deciding the health care budget the Public Health Authorities do not regard the private expenditure as a substitute nor as a complement of the public health care expenditure.

6. Thus reducing the possibility of bias from fluctuations in the time-series data arising from regional transitory short-term factors and from the subjective choice of the year of cross section regressions. The panel data for the estimation come from the Italian National Institute of Statistics (ISTAT) and consists of 16 year time-series observations, 1980-1995, for the 20 Italian regions. Data on public health care expenditure and GDP come from Regional Accounts, while data on population size and age structure come from the Annual Yearbook of Statistics. Health care data (number of public/private beds, personnel etc.) come from the Annual Yearbook of Health Care Statistics.

7. Other methods of estimation are based on different assumptions about the structure of the cross section units and the disturbance terms. Thus we also tested whether the pooled model could be assumed to be cross-sectionally correlated and time-wise autoregressive: KMENTA, 1986; but obtained inconclusive results. In principle, time series must also be tested for cointegration. However, in our sample the limited number of observations (n=16) precludes any valid testing of this kind. Nevertheless, McCOSKEY and SELDEN, 1998; who have studied this problem for the OECD countries, have stated that with regard to cointegration there may be no problem: "researchers studying national health care expenditures need not be as concerned as previously thought about the

presence of unit roots in the data." (p. 375). For a discussion on stationarity and cointegration in health care spending and the emerging contradictory results see BLOMQVIST and CARTER, 1997, who conclude: "These contradictory results may well be the result of size distortions from applying these asymptotically based tests to such small samples" (p. 225). Therefore, although the question of stationarity of the data is an important problem, in general it cannot be answered satisfactorily with the currently available size of samples of health care statistics.

8. The form of the function is consistent with the micro-economic theory, since to exclude distributional effects from the analysis, for which, among other things, one must have that all Engel curves are linear for consumers.

9. For the estimation, the data are transformed and, therefore, the usual goodness of fit statistics are inappropriate. We have used instead the R-square between observed and predicted values of the dependent variable.

10. DI MATTEO and DI MATTEO, 1998; have specified 10dummies representing the Canadian Provinces but have not considered the possibility of regional clusters. Judging from the confidence intervals of the estimated coefficients and corresponding standard errors, their dummies seem to cluster into three groups. A side effect of the clustering of the regional dummies is that the number of independent variables is reduced, with savings in the degrees of freedom.

11. Such as KLEIMAN, 1974; LEU, 1986; and BLOMQVIST and CARTER, 1997. For the opposite views see DENTON and SPENCER, 1975; and CUTLER and MEARA, 1997. The OECD, 1997 reports that in a sample of eleven countries, the health spending of the 65-74 age group is on average 2.5 times the spending of the 0-64 age group; for the 75+ age group, the ratio is almost 5.0. For a

discussion on the role of ageing population in explaining the evolution of expenditure in Italy see DIRINDIN, 1996; and MAPELLI, 1994.

12. Similar results are obtained when testing the significance of the entire set of dummy variables, AREA and RD, with F=39.97 vs. F(19,287)=1.64.

13. We know that if the Engel curve has a linear functional form, the income elasticity will be one only if it passes through the origin. If the coefficient for income is positive and the intercept term is either positive, as it is in our case, or negative, the elasticity will be respectively, lower or greater than one. Therefore, the intercept term is crucial in determining the size of the elasticity and, when there is a misspecification problem, it may contain the unpredictable effects of omitted variables. As reported above, we tested for model for functional form misspecification and found that a linear model was accepted.