THE DETERMINANTS OF HEALTH CARE EXPENDITURES IN OECD COUNTRIES

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ABSTRACT

Health care expenditure has increased substantially in all Western industrialised countries in the last decades. The necessity to contain the increase in health care expenditure has motivated the analysis of its determinants to explain differences across countries and health systems. In this paper the most attention is paid to the differences across countries in growth of health care expenditures. Estimation is made for 24 OECD countries. Analysis is based on pooled cross section data and time series. Eventually, health systems characteristics usually believed to influence health expenditures growth, like population ageing, public financing, the type of health system (public reimbursement, public contract or integrated) and existence of gatekeepers, are found to be non-significant. Nowadays health care dynamics become more and more country specific thus indicating divergence of health systems and the growing importance of country-specific effects in the explanation differences in health care expenditure.

KEYWORDS: health care spending; health expenditures growth

1. INTRODUCTION

THE RELATIONSHIP BETWEEN HEALTH and development is fundamental, and the improvement of the health of the population must be a major objective of development. For poor countries, there is a clear relation between GDP per capita and life expectancy.

While improved health measured in terms of life expectancy – is generally correlated with income per capita, there are many exceptions to this observation. There are poor countries with a relatively healthy population, and wealthy countries with a relatively unhealthy population. The complexity increases when income differentials within countries are added to the discussion, as there are poor groups within rich countries whose health is well below that of the populations of markedly poorer countries. Higher income is a positive factor in the determinants of the health of an individual. It appears that while GDP per head does have a significantly positive correlation with life expectancy, this relationship works mainly through the impact of GDP on the incomes of the poor and public expenditures, especially public expenditures on health care.

According to Cochrane et al. (1978), despite the spectacular increase in health expenditure, no corresponding improvement in the health level of the population has been identified in any of the industrial countries. According to some researchers, such as Cohen (2001), Herwartz (2003) there is no correlation between the level of spending on health and health indicators, such as the standardized mortality rates per age group. The absence of a positive correlation between health expenditures and the level of health of the population has been interpreted in various ways at different times. Cohen (2001) argued that health expenditures correlate not with real problems such as morbidity and real health needs, but with differences in per capita income, and also that a positive correlation is the result of artificial demand for health services or of diminishing returns on funds. Other researches have argued that in advanced industrial societies, the breakup of the nuclear family has caused a decline in the traditional form of family dependency and informal social support networks. Moreover, geographical and social mobility has increased and widened social gaps, which makes social relationships unstable. To deal with these changes, new services of social support are required; expenditures on health alone do not offer a complete solution to the health problems of the population.

Therefore, the relationship between national health care expenditures and gross domestic product has become the subject of numerous empirical studies. The necessity to contain the increase in health care expenditures has motivated the analysis of its determinants to explain differences across countries and health systems. International comparison is justified since it is particularly useful to compare organizational forms of health care systems and separate common and system-specific factors of health care expenditures. However, there are major methodological problems involved in international comparisons. Earlier studies for OECD economies were based on cross sectional approaches for particular years, which differ in the inclusion of the explanatory variables other than income, see, for example, Gerdtham and Anderson (1992), and Newhouse (1977). The available sample sizes are in no case greater than 25. Thus the power of statistical inference is presumably low. Instead of a cross sectional approach, some authors have formulated dynamic models to characterize health care expenditures. For instance, Murillo *et al.* (1993) analyzed the effect of price variations on health care expenditures for nine European countries. Some empirical studies, such as O'Connel (1996) and Hitiris (1997), relied on an analysis of panel data to uncover the determinants of health care expenditures. However, not enough attention has been devoted to

explaining the differences in health care expenditure growth across countries. This paper represents an attempt to fill part of this lacuna by formulating an econometric model to study determinants of the growth of aggregate health expenditures.

To explain the growth in health care expenditures, the paper focuses on cross-country and time-series variations. Estimation of the proposed model is made for 24 OECD countries. The results of the estimates indicate that health system characteristics, such as population ageing, the type of health system (public reimbursement, public contract or integrated), and the existence of gatekeepers, which are usually believed to influence health expenditure growth, are not significant.

The paper contains five sections. In Section 2, a description of performance measurements and improvements in the health systems of the OECD countries are given. Section 3 contains a discussion of the theories used to explain the health expenditure pattern in the OECD countries. Here methodological problems, the longitudinal development of health care expenditures, causes of health expenditures growth, and causes of the differences in health expenditures across countries are discussed. Section 4 presents an econometric model of the determinants of health care expenditures. The model is used to explain the variation as well as the relationship between GDP and the growth of health care expenditures across countries. Section 5 contains some concluding remarks.

2. PERFORMANCE MEASUREMENT AND IMPROVEMENT IN OECD HEALTH SYSTEMS

The OECD health systems are under stress, and the tension arises from well-known sources. There is buoyant demand for services from ageing populations. Furthermore, coverage is almost universal through public and private health insurance, and public expectations are always rising. On the other hand, there is controlled supply because public health expenditures are limited by the unpopularity of tax increases while private health expenditures are limited by resistance to premium and price increases. Waves of improvements in medical technology add to the pressure. Although they bring welcome advances in treatments, the new procedures are often more expensive than the old

procedures that they replace. In addition, although there have been widespread improvements in average health level in all OECD countries, there is everywhere evidence of persistent health inequalities.

The specific form in which these tensions reach the agendas of member governments differs between countries, partly because health care is organized and governed in varied ways in different countries. In some, it may be public criticism of the quality or the timeliness of services which is the main problem. For example, long waiting lists for elective surgery are a pressing problem in at least a third of OECD countries.[1] In some OECD countries, it may be rising health expenditures, sometimes accompanied by growing deficits in public insurance schemes, which are the leading issue. In other OECD countries, it may be difficulties with staff morale and recruitment that are the greatest challenge. In yet other OECD countries, inequities in health or in access to health services may be the chief matter for concern.

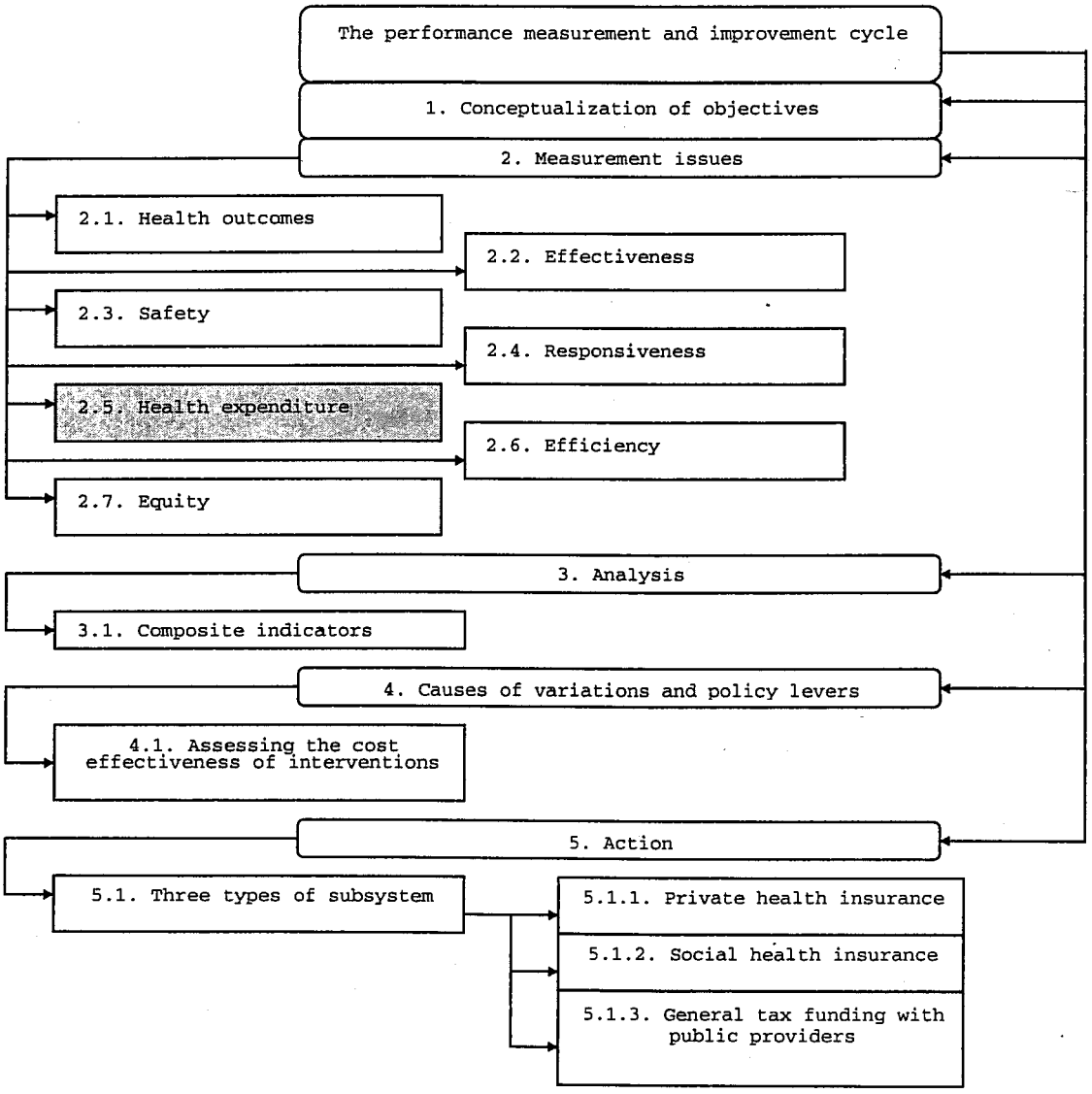
Such strains have stimulated interest among health policy makers in finding ways to improve the performance of health system, with performance being measured in terms of quality, efficiency, and equity. Improving performance has the potential of reducing the tensions between rising demand and limited resources and to make the system fairer. Rising productivity is now expected annually in OECD economies. Can similar expectations be realized in health systems?

To obtain an answer to this question, many OECD countries have been reviewing and reforming their arrangements for measuring and improving health system performance. In recent years, several countries have developed "performance measurement frameworks" and have encouraged or required public reporting of performance data. Such attempts to increase transparency and accountability have sometimes been linked to reassessments of the universal and long-standing division of labor between professional self-regulation (of clinical performance) and government regulation (of health systems in relation to broad matters of efficiency and equity). This division of labor arose because of the asymmetry of knowledge between professionals and patients (and other lay people) about the indicators for, and effectiveness of, medical interventions. In effect, because of

[1] OECD health data, 2002

the difficulty consumers have in judging quality of care, they have to trust health care professionals to act for them as "agents." And because of the difficulty governments have in regulating quality of care, they have given each health profession a monopoly of care in its respective field in exchange for "professional" behavior, including the profession's commitment to act in the interests of patients and to maintain high standards of care by suitable training, certification, and peer review of practice.

Figure 1 below represents an overview of the issues and the challenges facing new attempts to measure and improve health system performance in OECD countries.



In many cases, improvements to health systems are based on ideology and "experience," rather than on measurement and analysis. However, it is necessary to emphasize the important role of measurement and analysis in performance improvement.

According to Nutley and Smith (1998), the steps that should be taken, ideally, in any health system to improve performance with the help of performance measurement, can be described in terms of a performance measurement and improvement "cycle." Such a cycle is depicted in Figure 2.

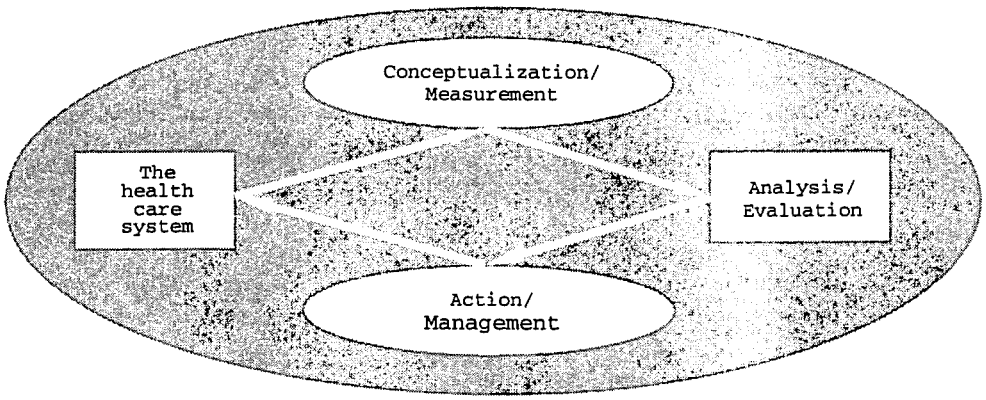


Figure 2.-The performance measurement and management cycle
Source: Adapted from Nutley and Smith (1998)

On the left of the diagram is the health system for which improvements in performance are sought. Weaknesses in performance identified by policy makers and managers will vary from system to system. At the top of the diagram is "conceptualization and measurement." It is necessary to be clear about the objectives if unambiguous actions to improve performance are to be taken. It is also desirable to measure the structure and process which give rise to differences in attainment if an understanding of the potential levels of change is to be obtained. On the right of the diagram is "analysis and evaluation." Evaluation is desirable, *ex ante*, to identify, for example, the causes of weaknesses in performance and the cost-effectiveness of steps which could be taken to tackle them. Evaluation is desirable, *ex post*, to monitor and to evaluate the result of action's taken action and to add to the "evidence-base" for future decisions. At the bottom of the diagram is "action." There are typically at least four key sets of actors in health systems: consumers, providers, managers, and governors. Depending on the

problem to be tackled, it will require actions or changes in behavior among some or all of these sets of actors for improvements in performance to be realized.

Measuring the performance of health care is still in its infancy. Various OECD countries are developing national performance measurement frameworks and are beginning to populate them with suitable performance indicators. Four such examples have been reviewed in Hurst and Jee-Hughes (2001). Smee (2000) provided further details of two of these examples. In all these cases, there is an emphasis on achieving a "balanced scorecard."

3. THEORY BEHIND HEALTH EXPENDITURE IN THE OECD COUNTRIES

3.1. *Methodological Problems*

There are serious difficulties involved in the measurement of health expenditure and in any attempt to make international comparisons. According to some sources, such as Levy (1982) and Schieber and Poullier (1989), these difficulties arise because:

- measurements differ from country to country and very often contain different components;
- the data are not measured in the same way, and generally tend not to be comparable;
- the effectiveness of health services cannot be assessed, given that it is impossible to measure the final results on the health level;
- measurement is made still more difficult by the significant social, medical, cultural, demographic and economic differences across countries;
- there are problems in transferring evaluations in terms of policies and conclusions from one country to another.

In this sense, international comparisons can be adequate and accurate to the extent to which they correspond to adequate, comparable, and accurate data. The data usually originate in the national accounts of the OECD member-states and are based on public and private consumption and/or on the fees received by those who contribute to the process of production; however, for the time being, there is no standardized method of recording or expressing the particulars. The question of the comparability of the data

taken in various countries has attracted the interest of researchers, such as Levy (1982), and is associated with the effort to produce a response to the results of the public health sector and, in particular, to the health indicators. In that sense, the comparability of data is a significant problem in any comparison between countries. There is no mechanism to record common particulars accepted in all countries. The health services have fluctuating boundaries: they may or may not include social services, school health, and environmental medicine, and there is not even a fully-accepted definition of the word "hospital."

The international comparison of health systems also involves significant theoretical difficulties. Even in countries whose economic levels are comparable, there are widespread differences in economic and demographic factors, which create difficulties in measuring and interpreting data. The most important of these factors are the age pyramid, the density and distribution of the population, differences in cultural behavior towards questions of health, family relationships, the birth, death, and morbidity rates, the influence of climatic and environmental factors, the industrial and occupational structures of the state, the coverage provided by state and private insurance organizations, social funding, absolute and relative rates, the structure of the practice of medicine, the existence of various types of medical techniques, effectiveness and productivity, management costs, and the legislative framework; see Folland, Goodman and Stano (1997) for a discussion of these issues.

The demographic structure of the population is one of the most significant determinants of health spending, since the economically active population shoulders the burden of spending on the dependent population. The overall dependency rate is the sum of the under-15 and over-65 age groups over the rate of the working population. There are, indeed, very considerable differences in demographic structure among the OECD countries.

Countries also vary widely in terms of medical practice - and there are even differences within the countries themselves that cannot be explained only by demographic characteristics, the economy, or the way the health system is organized and funded. In terms of theory and of public health policy, the most important factor is the difficulty in measuring the adequacy of medical care.

According to some researchers the differences in some medical practices - surgery, in particular - are connected more with uncertainty in diagnosis or treatment or with hypothetical professional uncertainty, and not at all with the way in which care is organized, with the characteristics of patients, with access to medical care, or with mortality rates. It also seems clear that factors which influence the supply of services, such as the number of surgeons per capita are directly related to the number of surgical interventions. This relationship is clearly visible in decentralized and liberal systems, such as those of the United States, and less so in highly-organized and uniform systems, such as the British National Health System.

Experts have arrived at the conclusion that differences in medical practice are acceptable when the following characteristics are inherent in them:

- medical science is uncertain as to the most appropriate treatment;
- the method of diagnosis or therapy is still in the process of development;
- the patient's state of health varies in such a way as to make permissible differing medical practices.

The international comparison of health expenditure becomes more difficult where the determination of general price levels is concerned, since the relative prices for various products vary from country to country. However, in order to use the same set of prices Purchasing power parities (PPPs) can be used.

According to Ward (1985) in the health sector, PPPs are the ratio of the national mean health prices in a given country to the corresponding international mean prices for all the OECD countries, and they give the measure of the volume reflecting the value of health services in each country in comparison with the mean international prices for those services.

Another factor which has a direct impact on the health systems of the various states, and thus on the international comparison of health expenditure, is the percentage of spending which is concentrated on elderly persons or on other individuals who have great need of medical care. On average, per capita expenditure on the elderly is four to six times greater than that for the rest of the population. This concentration of expenditures brings

about inequities in the distribution of resources among the various categories of the population and even among the systems of funding and providing care which have been adopted in the various countries. If it is true to say that in all cases some categories of the population are in a position of advantage *vis-à-vis* the provision of medical services by comparison with the "average citizen," then it is also true that the differences in spending from category to category, and the degrees to which that spending is concentrated, differ just as much from one system to the other in accordance with the special features of each.

According to Schieber and Poullier (1989) it is of the greatest importance that comparability should attempt to distinguish between items of expenditure and to approximate the quantities and prices of health services. The volume reflecting the value of health services can be calculated using the following formula:

(1) $$V = \frac{H}{P \times EHP \times POP},$$

where V = 1 + the annual rate of increase in the volume of health care,

H = 1 + the annual rate of increase in health expenditure,

POP = 1 + the annual rate of increase in the prices of health services,

P = 1 + the annual rate of inflation in GDP,

EHP = 1 + the annual rate of inflationary increase in the health sector.

3.2. *The Longitudinal Development of Health Expenditures*

Health spending occupies second place among items of social expenditure in terms of priority and represents about 15% of the total public spending of the OECD countries. Public spending on health accounts for some 6% of GDP, while total expenditure on health is in excess of 8.4%. The health sector is the largest single employer in the OECD countries, in many of which health services and products are an important contributor to foreign transactions.[2] OECD countries are spending record amounts on health care, largely due to the rising cost of pharmaceuticals and the diffusion of modern medical technologies.

Over the last thirty years, health expenditures have grown significantly and at a rate perceptibly higher than that of economic growth. As a result, the health sector consumes

[2] OECD Health Data, 1987, 2001

a large part of national resources, and the growth in health expenditures has resulted in many market inefficiencies in the production and consumption of medical care. In order to resolve these problems, which are faced by the industrial countries and in view of the parallel progress in medical technology, changes in the demographic model, and the problems in obtaining funds to meet the added expenditure, health policy planners predict that in the present economic situation the right of all citizens to equitable public health services will no longer be feasible unless the public health service is restructured. In taking the first steps towards applying common guidelines, the OECD countries have had to deal with numerous financial difficulties and problems, which stemmed from the determination of needs, from the calculation of costs, from the rational provision of medical care, and also from the choice among various alternative solutions with their side-effects of a moral and ethical nature.

Table 1 shows total health spending at the macro level and the significance of this spending, as a percentage of GDP, for each of the OECD countries.

The mean level of health spending in the OECD countries was 7.3% of GDP in 1990. The main burden of health spending was borne by the public sector, which accounted for an average 72% of total spending, the lowest level being 44% in the United States and the highest being over 80% in Norway. In 2001 the mean level of health spending in the OECD countries was 8.4% of GDP, with the public sector disbursing an average of 71% of total spending.

The United States continues to top the OECD ranking for overall healthcare spending at $4900 per capita in 2001 - more than twice the OECD average of $2100.[3] Though more than half of this is private funding, public spending per capita in the United States is also high (only Norway, Luxembourg and Iceland spend more), even though only about one-quarter of the population is insured through public programmes compared with 90 per cent or more in most other OECD countries. Health expenditure as a percentage of GDP in the United States jumped from 13.1% in 2000 to 13.9% in 2001, largely reflecting the American economic slowdown. Switzerland, which spent 10.9% of GDP on health and Germany, which spent 10.7% of GDP, were the next highest spenders in relation to their

[3] OECD Health Data 2002

GDP. The lowest spenders as a proportion of GDP were Korea, Luxembourg and the Slovak Republic, spending less than 6% of their GDP on health in 2000 or 2001.

Table 1

Growth of expenditure on Health in the OECD Countries, 1990- 2001

Country	Real per capita growth rates, 1990-2001 (%)		Health spending as percent of GDP		
	Health spending	GDP	1990	2000	2001
Australia	7.8	2.4	7.8	8.9	-
Austria	2.5	1.8	7.1	7.7	7.7
Belgium	3.5	1.7	7.4	8.6	9.0
Canada	2.3	1.6	9.0	9.2	9.7
Czech Republic	4.1	0.6	5.0	7.1	7.3
Denmark	1.9	1.9	8.5	8.3	8.6
Finland	0.5	1.6	7.8	6.7	7.0
France	2.5	1.5	8.6	9.3	9.5
Germany	2.0	1.2	8.5	10.6	10.7
Greece	4.0	1.8	7.4	9.4	9.4
Hungary	2.1	2.6	7.1	6.7	6.8
Iceland	2.8	1.6	8.0	9.3	9.2
Ireland	6.7	6.2	6.1	6.4	6.5
Italy	1.9	1.4	8.0	8.2	8.4
Japan	3.8	1.1	5.9	7.6	-
Korea	7.4	5.2	4.8	5.9	-
Luxembourg [b)]	3.0	3.9	6.1	5.6	-
Mexico	4.9	1.4	4.5	5.6	6.6
Netherlands	3.1	2.1	8.0	8.6	8.9
New Zealand	3.0	1.5	6.9	8.0	8.1
Norway	3.5	2.8	7.7	7.7	8.3
Poland [b)]	5.0	3.3	5.3	6.0	6.3
Portugal	6.1	2.3	6.2	9.0	9.2
Slovak Republic	-	-	-	5.7	5.7
Spain	3.4	2.3	6.7	7.5	7.5
Sweden	2.1	1.5	8.2	8.4	8.7
Switzerland	2.4	0.2	8.5	10.7	10.9
United Kingdom	4.2	2.0	6.0	7.3	7.6
United States	3.2	1.7	11.9	13.1	13.9
OECD Average	3.4	2.1	7.3	8.1	8.4

Source: OECD Health Data 2002

[b)] Hungry: 1991-2000; Luxembourg and Poland: 1990-1999; OECD average excludes the Slovak Republic because of missing 1990 estimates; For Turkey, no recent estimates are available

The increase in public and private spending on pharmaceuticals has been one of the main drivers of rising health expenditure in many OECD countries in recent years, reflecting the introduction of new and more expensive drugs. Pharmaceutical spending rose by more than 70%, in real terms, between 1990 and 2001 in Australia, Canada, Finland, Ireland, Sweden and the United States. Pharmaceuticals now account for more than 10%

of total health spending in nearly all OECD countries, and over 20% of health spending in France and Italy.

The average length of stays in hospitals continued to decline in nearly all OECD countries as a result of less invasive surgical treatments and efforts to control costs. The average length of stays for acute hospital care decreased, on average, from 8.8 days in 1990 to 7 days in 2000. The average length of stays fell particularly quickly during the past decade in Nordic countries - Denmark, Finland and Sweden - as well as in other European countries including Austria, France and Switzerland. In the United States, the average length of stays for acute hospital care fell from 7.3 days in 1990 to 5.8 days in 2000.[4]

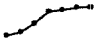
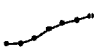
The longitudinal growth of health spending can be seen clearly from Table 2, which shows changes in health expenditure from 1960 to 2000, in terms of per capita spending in US dollars over this period. The last column clearly shows the rise in health care expenditures over all periods.

According to OECD figures, spending on overall health services has reached an average of approximately 9% of total final consumption, while the health sector is seen as being one of the largest employers, accounting for an average of some 5% of total employment, according to the figures in Table 3.

[4] OECD Health Data 2003

Table 2

Per Capita Health Care Spending in the OECD Countries (in US dollars)

Countries	years							
	1960	1970	1980	1990	1995	1998	2000	trend
Australia	87	n/a	658	1300	1765	2058	2211	
Austria	64	159	662	1206	1831	1968	2162	
Belgium	n/a	130	577	1245	1896	2008	2269	
Canada	109	260	710	1676	2114	2285	2535	
Denmark	n/a	n/a	819	1453	1882	2241	2420	
Finland	54	161	509	1295	1415	1529	1664	
France	n/a	n/a	n/a	1517	1980	2109	2349	
Germany	90	223	824	1600	2264	2520	2748	
Greece	n/a	98	348	712	1131	1307	1399	
Iceland	50	137	576	1376	1823	2204	2608	
Ireland	36	99	454	777	1300	1576	1953	
Italy	n/a	n/a	n/a	1321	1486	1774	2032	
Japan	26	130	522	1083	1631	1735	2012	
Luxembourg	n/a	148	605	1492	2122	2361	n/a	
Netherlands	n/a	n/a	668	1333	1787	2040	2246	
New Zealand	n/a	174	458	937	1244	1450	1623	
Norway	46	131	632	1363	1865	2439	2362	
Portugal	n/a	40	265	611	1146	1345	1441	
Spain	14	83	328	813	1184	1384	1556	
Sweden	89	270	850	1492	1622	1748	1806	
Switzerland	136	288	881	1836	2555	2952	3222	
Turkey	17	23	75	171	190	303	412	
United Kingdom	74	144	444	972	1315	1527	1763	
United States	144	349	1058	2739	3703	4178	4631	

Source : OECD, Health Data, 2001

n/a – data are not available

Table 3

Employment in Health Care percentage of Total Employment

Country	1980	1987	1994	1998
Australia	5.2	5.9	5.5	5.6
Belgium	4.3	5.2	4.6	
Canada	4.5	5.1	5.6	
Denmark	4.5	4.5	4.7	
Finland	4.9	6.1	9.1	10.2
France		6.7	6.9	
Germany	4.5	5.4	6.3	
Greece	2.0	3.0	3.1	3.3
Hungary	2.3	2.8	4.4	
Iceland	5.7	6.2	6.3	
Ireland		4.8	5.4	4.8
Italy	4.1	4.6	4.1	4.2
Japan		3.4	2.4	
Luxembourg		3.9		3.2
Mexico	1.0		1.7	1.6
Netherlands	6.0	5.4	5.4	
New Zealand	5.8		4.3	
Norway	8.2	8.9	15.2	
Portugal	2.1	2.4	2.6	2.8
Spain	2.6	3.1	4.3	4.5
Sweden	9.9	10.1	9.2	7.7
Switzerland	4.4		9.9	
Turkey	0.7	0.9	1.0	1.0
United Kingdom	4.6	4.9	6.4	6.6
United States	5.2	5.9	6.2	
OECD mean	4.9	4.9	5.6	4.6

Source: OECD, Health Data, 2001

The significance of the health sector is internationally acknowledged. In each country, it is shown as a branch of "social protection," but one which is difficult to comprehend and even more so to investigate.

Until the 1920's, the provision of public health services was not effective in combating the basic causes of death, which at that time consisted largely of infectious and parasitic diseases, strongly linked with social conditions. An increase in life expectancy was a primary target in the effort to improve living standards and, more generally, the level of public health. At that time, neither costly hospital treatment nor specialized and modern medical techniques were available. Later, and particularly during the 1940's and 1950's, medical services began to improve, as a result of economic growth, enabling many countries to develop national systems for the funding and provision of medical services. The introduction of the welfare state to enhance social solidarity resulted in the belief that it was among the basic obligations of the State to protect all citizens and meet their

needs, and that access to public health services was among the fundamental rights of citizens. During the 1970's, the parallel public and private funding of medical care, along with the improvement in the quality of the care provided, helped to bring about a rapid increase in demand for such care, leading to a dramatic increase in health costs. However, in the state of crisis in which most of the OECD member-states found themselves, the question arose of how long the state was going to be able to fund the constantly growing public health services induced by the increasing demand for them.

It was clear, by that time, that although the objective of the systems for funding and providing public health services was to provide those services on an equitable basis and improve them, the systems had failed to improve their effectiveness in terms both of supply and of demand. It was observed, on all sides, that funds were not being managed in an effective manner and that human resources were not being distributed and administered rationally. These problems led health policy planners of the various states to give priority to cost control. Because of the unique characteristics of the health sector, state intervention in the health sector was judged to be essential. However, the difficulty in determining the level of need, lack of knowledge on the part of the users of health services, and a range of other endogenous and exogenous characteristics of the systems for funding and insuring health and for providing public health services combined to result in a situation in which almost all the health systems were distributing resources in a non-rational, inequitable, and inadequate manner.

After the mid-Seventies, despite the unprecedented downturn in spending on health, the rate of increase in such expenditure continued to be higher than the rate of increase in GDP. The health services of the OECD countries now display the following common characteristics concerning health spending:

- Illnesses are combated regardless of the potential for funding.
- Users are dependent upon the decisions of those who distribute public health services, who - by reason of economic interest, prevailing medical codes, or the increasing demand induced or not, which they receive from consumers - are indifferent to the cost of their practices.
- There is a trend on the part of distributors of health services to channel them towards hospital care rather than towards alternative forms of care.

- The distributors of health services have a preference for expensive medical techniques whose results they have not evaluated.

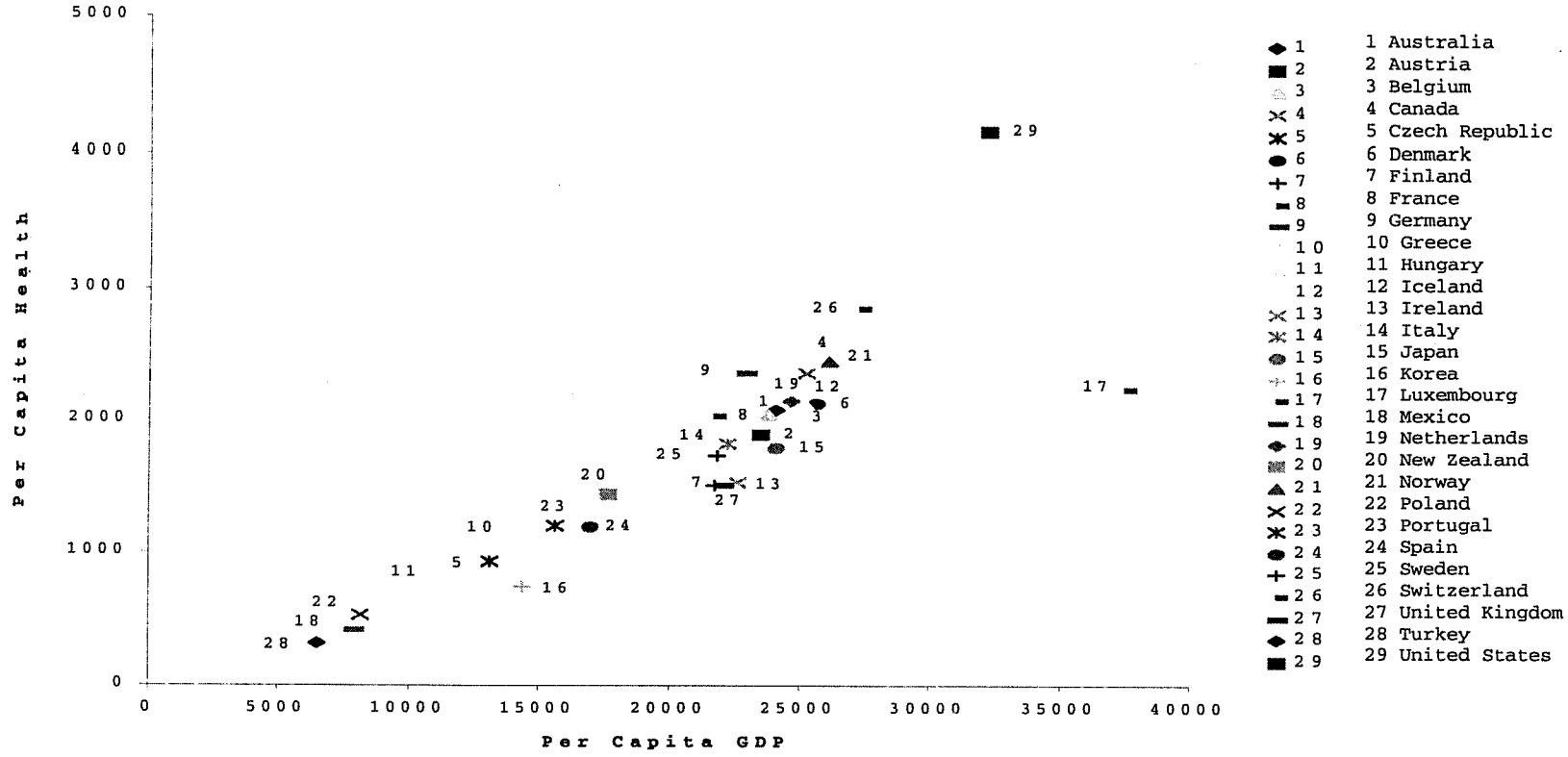
Furthermore, the observation that a considerable part of mortality is social in origin and results from life-style and various other environmental factors leads to the necessity of modifying individual and collective behavior. According to Nutley and Smith (1998), it has been demonstrated that the introduction of various economic measures does not bring about the expected results in this respect. Occupational insecurity, under-employment and unemployment are among the factors which have a significant effect on social life, health, and quality of life in general. Macro-economic and micro-economic indicators have indicated that the unemployed and their families display high percentages of mortality and morbidity, with the frequent occurrence of high blood pressure, cardiovascular problems, psychological disturbances and suicide. Among the most important questions is the frequent impossibility of measuring the results of medical expenditures in terms of the purpose for which they were, intended, i.e., restoring or safeguarding "good health." A major contemporary problem is that there is no common standard for measuring the level of health, no standard that is accepted by all, empirically justified, and capable of producing direct information and showing the relationship between medical expenditure and the improvement of public health.

3.3. *The Elasticity of Health Expenditures*

An understanding of the relationship between health expenditures and GDP and, in particular, an evaluation of the rate of increase in health spending which is a characteristic common to all the OECD member-states is possible if we measure the elasticity of health expenditures with respect to GDP. This point has been stressed in recent years, not only because it is an indication of priorities in social and economic policy but also - and more importantly - because economic circumstances have imposed a need for control of the rate of increase in health spending. It has been noted by Schieber and Poullier (1989) that the level of health expenditure is connected with the level of GDP and that the correlation between them is statistically significant at the 0.01 level with a value of R^2 0.86. The affinity between per capita health expenditure and per capita GDP for the OECD member-states is shown in Figure 3.

Figure 3

Per Capita Health Expenditure and Per Capita GDP in OECD Countries, 2000



The formula for the income elasticity of health expenditure is:

$$(3) \quad e = \frac{d(HCE)}{d(GDP)} \times \frac{GDP}{HCE},$$

where e = elasticity; HCE = health expenditure, GDP = gross domestic product.

The income elasticity of health expenditures is thus the ratio of the rate of change of health expenditures over the rate of economic growth. If $e = 1$, expenditure is increasing at the same rate as GDP. If $e \leq 1$, health expenditure is increasing at a rate below that of GDP, which means that the public health sector does not have a high priority among the goals for social and economic development. If $e \geq 1$, health expenditure is increasing at a rate above that of GDP, which means that the public health sector has been given high priority.

The detailed analysis of income elasticity in the OECD countries, shown in Table 4, for the periods before and after the economic crises of the 1970's.

Table 4

Elasticity of Total Health Spending with respect to GDP

(with health expenditures and GDP measured in US dollars)

Country	1960-1975	1975-1984	1980-1984	1960-1984	1984-1998
Australia	0.8	0.6	1.0	0.9	1.4
Austria	0.7	0.7	0.5	0.8	1.8
Belgium	1.3	1.5	0.9	1.6	1.8
Canada	1.6	1.3	1.1	1.5	1.4
Denmark	1.9	1.4	-0.3	1.8	0.8
Finland	2.0	0.9	0.5	1.8	1.1
France	1.6	2.6	0.4	1.9	1.5
Germany	1.2	0.9	0.1	1.3	1.4
Greece	1.8	1.8	3.4	1.7	
Ireland	2.3	0.9	-1.5	2.0	0.8
Italy	0.9	1.3	1.1	1.1	1.8
Japan	1.3	1.6	1.1	1.4	1.4
Netherlands	1.5	0.5	-1.3	1.3	1.3
Norway	1.7	1.5	0.5	1.5	2.1
Spain	1.7	2.1	-0.4	1.9	1.8
Sweden	2.4	1.6	0.02	2.7	0.4
United Kingdom	2.1	1.0	0.4	2.1	1.5
United States	1.8	1.2	0.9	1.7	1.9
OECD mean	1.6	1.3	0.5	1.6	1.4

Sources: OECD, 1987, 2001

Table 4 demonstrates that while the mean level of income elasticity was quite high during the period from 1960-1975 (approximately 1.6), it fell to 1.3 during the period from 1975-1984, rose to 1.4 during period 1984 to 1998, then declined sharply, to 0.5, between 1980 and 1984. This dramatic decline was the result of the restrictive economic stabilization policies implemented in many countries.

3.4. *The Breakdown of Health Expenditures*

Although the available data are incomplete, it is interesting to analyze the breakdown of health expenditure into the various categories of hospital care, primary out-patient care, and pharmaceutical and medical products. According to Culyer (1989), in many cases it is not possible to distinguish with accuracy between expenditures on in-patient and out-patient care or to separate the cost of primary care provided by the hospitals from that of community-based agencies. In general, expenditures on hospital care are the main component of health spending - especially of public spending.

Table 6 indicates that this trend continues to exist, with a positive annual rate of growth in hospital spending.

On the other hand, the annual rate of change of spending on open care during the 1970's was negative, with the exception of certain countries which had adopted special national programmes for the development of public health. The same negative trend can also be seen in pharmaceutical care. There is a need for the systematic assembly and processing of data, and, in particular, for the harmonization of data on health spending among the OECD countries. Against that background, the data provided here are indicative and need to be supplemented with data about the breakdown of private health spending before one can say that they give an overall picture of the breakdown of health expenditures.

Table 6

Breakdown of Health Expenditures in the OECD Countries (In percentage)

Country	Hospital care			Ambulatory care			Pharmaceuticals			Others		
	1980	1987	1998	1980	1987	1998	1980	1987	1998	1980	1987	1998
Australia	51	47.8	43.3	22.3	20.5	22.0	7.9	8.0	11.4	18.8	23.7	23.3
Austria			45.6	19.3	22.2	24.0	12.0		10.9			19.5
Belgium	33.1	32.5	36.0	39.2	40.2	36.5	17.4	16.0	17.5	10.3	11.3	10.0
Canada	53.8	50.2	43.1	25.1	26.4	26.5	8.5	10.6	15.0	12.6	12.8	15.4
Denmark	61.6	59.4	54.3	22.3	21.0	23.8	6.0	6.7	9.2	10.1	12.9	12.7
Finland	46.3	44.5	41.1	25.0	31.5	30.6	10.7	9.6	14.6	18.0	14.4	13.7
France	48.2	45.8	44.6	25.2	28.3	23.0	15.9	16.2	21.9	10.7	9.7	10.5
Germany	33.2	34.4	34.0	33.4	30.9	28.9	13.4	14.1	12.7	20.0	20.6	24.4
Greece	26.5	30.3	37.1	24.6		41.8	18.8	13.3	14.7	30.1		15.6
Iceland	59.1	57.3	55.1	16.9	20.4	22.9	15.9	14.7	15.5	8.1	7.6	6.5
Ireland	58.8		56.9				10.9	10.8	9.9	11.2		11.5
Italy	46.7	46.1	47.7	27.5	28.0	30.1	13.7	18.7	18.1	12.1	7.2	4.1
Japan	30.9	33.4	37.6	44.6	42.2	32.8		20.3	16.8		4.1	12.8
Korea		19.1	26.4		35.9	44.8		31.1	13.8		13.9	15.0
Luxembourg	31.3	27.1	30.7	49.5	51.0	49.9	14.5	14.9	12.3	4.7	7.0	7.1
Netherlands	55.5	53.4	52.8	21.4	21.7	20.2	7.4	9.3	10.8	15.7	15.6	16.2
New Zealand	72.2	62.8					11.9	14.7				
Norway	63.9	63.2	35.4	18.4	20.8		8.7	8.6		9.0	7.4	
Portugal	28.7	24.6	31.5				15.9	24.9	25.8			
Spain	54.1	53.7					21.0	18.7				
Sweden							6.5	7.5	12.5			
Switzerland	39.9	49.1	50.3	42.6	41.2	40.1		8.2	7.6		1.5	2.0
United Kingdom	53.5		42.9				12.8	13.6	15.3			
Turkey		35.8	29.3			64.1		12.6				
United States	49.6	46.9	41.3	27.2	31.2	32.5	9.1	9.3	10.1	14.1	12.6	16.1

Source: OECD, Health Data, 2001

3.5. *Causes of the Increase in Health Expenditures*

Since the economic crises of the 1970s and the fiscal problems that ensued of social services in the Western industrial countries has given rise to a series of concerns and debates about the factors which have caused the increase in health expenditures.

As can be seen from Figure 4, the rise in health expenditures is caused by demographic factors, epidemiological factors, socio-economic factors, public health factors, and the increase in volume and value of health services.

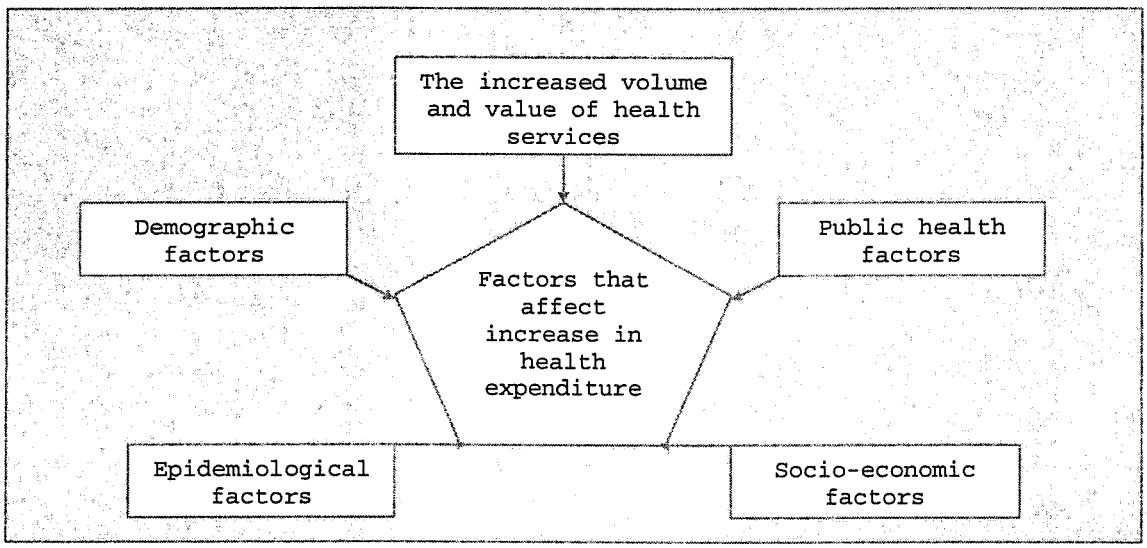


Figure 4. - Factors that affect increase in health expenditure

The ageing of the population and the improved life expectancy in the industrial countries have increased the proportion of elderly people in the population to 15% of the total. These individuals have greater need for health services, and they spend more than twice the time in hospital. According to the European Commission's Report (1996) estimates show that the per capita consumption of health services among the elderly is between four and six times greater than that of the rest of the population. These considerations increase the cost of health for the elderly, and the trend will continue to be upward in view of the further demographic ageing of the population.

The principal parameter that characterizes epidemiological factors is the increase in chronic and degenerative illnesses in the industrial countries (heart disease, neoplasm, accidents, and mental illness). Such conditions call for long-term and often ineffective medical interventions, which raise the cost of care and lead to higher health expenditure.

As for socioeconomic factors, the increase in per capita disposable income makes possible the consumption of health services provided outside the social security networks, thus raising the level of private spending. Furthermore, the full social security coverage of the population fosters an increase in the consumption of health services because the

cost is met by third parties. According to OECD figures (1994, 2002), the price index for health services is rising more rapidly than the consumer price index - or, at any rate, it did so in the Sixties and Seventies, and a partial reversal of this trend was only possible after the introduction of cost control programmes. The shift in demand towards services, such as health, education, and communications have also been identified as contributing to increased expenditures on health.

The rise in health expenditures has also been influenced by public health factors. The constant growth of medical and diagnostic services, their expansion into new fields and new public health needs, the development and dissemination of biomedical technology, and the continuous renewal of this technology all contribute to the rising costs of health services provision, despite the improved diagnosis and therapy provided. The growth in the number of health professionals, particularly of medical staff, whose economic interests lead them to favor or induce demand which does not correspond to actual health needs, and the vastly-increased supply of medical services induced by the extension of the public health system, are the components on which research and efforts to control costs have focused.

Finally, the rise in health expenditures can also be attributed in part to the increased volume and value of health services. The first of these parameters - volume - is connected with the constantly increasing demand for health services, which, in quite a number of instances, does not correspond to actual health needs. The second parameter characterizes the high fees for the work done, the misuse and non-rational utilization of biomedical technology, and the abuse of the production of paraclinical prescriptions on the part of the medical staff, which also artificially increases demand.

In recent years, these phenomena have been encountered in all the OECD countries, creating a tendency towards cost increases and higher spending on health. However, it has also been observed that the increase in health expenditures has not been accompanied

by a corresponding improvement in the level of health in the population. We know, too, that the state has a whole series of social demands and needs to deal with, including those connected with education, welfare, housing, and unemployment. These factors, in conjunction with the scarcity of funds, have created a restrictive framework for health policy and a need to take measures to control costs and ensure that they are effectively and fairly distributed so as to meet the public health needs of the population.

3.6. *Causes of the Differences in Health Expenditure*

Observed differences in health care expenditures in the OECD countries are due to measurement errors, random factors, and systematic factors. In the econometric analysis, I consider only systematic factors.

Systematic differences in health expenditures are the outcome of a composite of economic, demographic, social and political factors. Any explanation that does not take all of these factors into account will necessarily be incomplete. The problem in practice is how to operationalize and hence assess the quantitative impact of those factors where conceptual and measurement difficulties abound. Differences in health care expenditures must ultimately reflect some combination of differences in the demand/need for health care as well as the historical, social, and political context within which competing demands/needs and other pressures are determined. According to Zweifel (1992), all factors are categorized in seven broadly defined groups, which are depicted in Figure 5.

The first factor that influences health care expenditures is aggregate income. Numerous studies, for example, Andersen et al. (2000), Murillo (1993), Newhouse (1977), Wagstaff and Doorslaer (2000), at the micro level reveal a weak relationship between income and marginal utility of health services. This contrasts with evidence obtained from aggregate data. The individual consumer is not faced with the full resource cost of utilization due to subsidies, whereas the nation as a whole is. Culyer (1988) drew attention to the presence

of non-price rationing, so that health care is not consumed to the point of zero marginal value when the price is zero to the consumer. If such non-price-rationing is relaxed with increasing aggregate income, the income elasticity at the macro level is larger than the income elasticity at the individual level, and may exceed unity, as reported by most empirical studies.

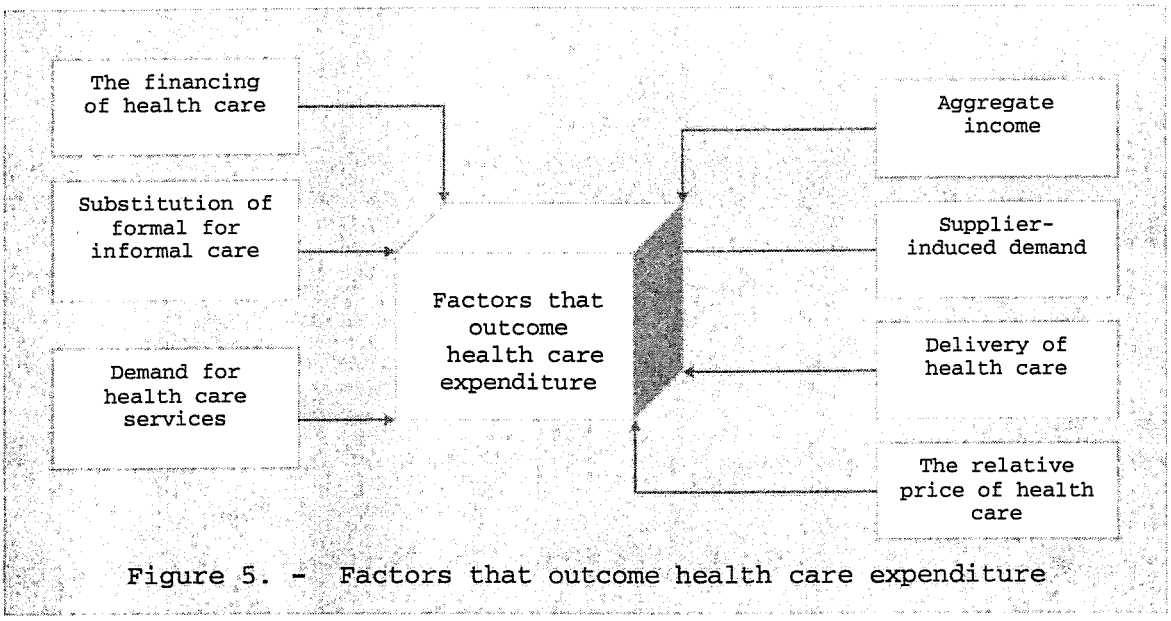


Figure 5. - Factors that outcome health care expenditure

The second factor that can explain variation in health care expenditures is relative price. The demand for health care services is usually considered to be relatively inelastic with respect to the consumer price. According to Maynard et al. (1987), the Health Insurance Experiment provided strong empirical support for this result. For similar reasons, this result may not generalize to the macro level. Under fixed budget regimes, the price elasticity is -1, and Gerdtham and Jonsson (1998) reported estimates of the aggregate price elasticity with respect to the quality of health care as close to -1.

Two additional variables that can introduce the demand for health care services are age-distribution and urbanization. It is well known that the consumption of health care services is unevenly distributed over the life cycle. According to Denton and Spencer

(1995), and Levy (1982), the hospitalization prevalence rate of persons over 75 over that of persons about 50 years is 10. Therefore, it is commonly agreed that changes in age-distribution affect the utilization of health care services. However, Barer et al. (1995) mentioned that these utilization rates depend in turn on a variety of factors inherent in the health care system, so that the relationship between age distribution and demand for health care services is by no mean certain. According to Gerdtham (1992), Gerdtham and Jonsson (1998), only one fifth of the growth of health care expenditures in Sweden between 1970 and 1985 is explained by changes in the age distribution. According to Leu (1986), the time and travel costs are lower in urban areas. Also, according to Denton and Spencer (1995), urbanization implies social change, as a result for instance, of the size and composition of households, which reduce the capacity of the households to take care of sick and debilitated persons.

Another factor that partly explains the rise in health care expenditures is the substitution public by the private care. A part of the observed increase in health care expenditures might be explained by transition of health care from the family to institutions. According to Fuchs (1994), and Levy (1982), care of the elderly was previously the responsibility of the multi-generation family, while today it has been taken over by health care institutions.

The manner in which health services are delivered also influences health care expenditures. The relative efficiency of public versus private provision cannot be determined in a priory manner, and empirical comparisons suffer from difficulties in standardizing for mixed cases. From a public choice view, Leu (1986) argued that public provision increases health care expenditures through two different channels on the supply side: the effect of the amount of health care services provided and the effect on unit costs at each level of activity. The former of these effects arises because bureaucrats in public or private non-profit institutions act like budget maximizers who are maximizing their own utility (status, better pay, promotion possibilities, reduced average work load, etc.). The effect on unit costs is expected to be positive owing to less intensive competition in

the public sector, which in turn reduces incentives for cost minimization at each level of activity.

Finally, and according to Leu (1986), health care expenditures also increase with the increasing share of public finance, - assuming implicitly that this share reduces the price to the consumer. This line of reasoning was also advanced by Culyer (1989). Both of Leu's hypotheses, public finance and public provision, increase expenditure – according to Culyer - depend on a passive response from the financing agent to adjust the supply of finance to the quantities and prices of health care services. Culyer suggested that the financing mechanism, in particular the degree of open-endedness of finance, is more relevant than the distribution per se of finance and provision on public and private institutions. According to Leu (1986), an open-ended financing system is characterized by multiple finance sources, such as insurance companies and by fee for service remuneration. The conclusion of all this appears to be that the impact of the share of public finance and/or provision on health care expenditures cannot be determined in an a priori manner. However, countries with more closed health care financing systems are anticipated to have lower expenditures.

3.7. *Determining the Level of Health Expenditures*

In most OECD countries, the uncontrolled increase in health expenditures has focused attention on control policies and has stimulated discussions and thinking about the determination of the necessary and "permissible" level of health expenditures. It has been argued by Culyer (1988), Evans et al. (1989) that the political process and the system of funding health services, in conjunction with measures to control health expenditure have a significant impact on the containment of health expenditure. On the other hand, it has also been demonstrated by Newhouse (1977), Levy (1982), Leu (1986) that in the industrial countries there is a positive correlation between the magnitude of domestic product and the level of spending on health. In this context, it is also necessary to

determine the rate of increase in health expenditure which will be necessary in the years to come. The literature on this subject looks at the prospect of the longitudinal growth of health spending from four different perspectives: the economic approach, the health needs approach, the GDP approach, and the approach according to which comparison is made on the basis of international development.

The economic approach, which originated among health economists, does not attempt to provide a direct answer to the question of the necessary level of health expenditure, but raises questions about the benefit which society gains from the use of the funds. It is argued that it is impossible to say with scientific precision whether a health system is spending too much, too little, or an optimal amount of funds. The crucial question which has to be answered is that relating to the benefits for the population from the use of the specific funds and to the procedures chosen for maximizing those benefits. In other words, the existence and dissemination of information about the ratio between input and output in the health system is necessary before the target of effective utilization of health expenditures can be achieved. This presupposes the measurement of costs and benefits and, by extension, the promotion and application of cost/benefit and cost/effectiveness analyses. The interests of health economists can thus be seen as focusing not on determining the level of health expenditure but on finding ways to use the expenditures efficiently. In that sense, a country can be said to be spending funds on health or increasing those funds efficiently when the ratio of social benefits over social costs exceeds unity.

The health needs approach links the level of spending on health to the health needs of the population. Under this approach, the first step is to define public health needs as they emerge from demographic and epidemiological developments, changes in medical technology, and the priorities set at the national level. The additional sums required each year are then calculated, with the expenditures in the previous year used as the base point from which this calculation is carried out. Application of this approach involves a series

of methodological problems, and it also calls for a health system based on national planning. Furthermore, it does not examine whether the level of spending in the base year and the breakdown of health expenditures are optimal. Lastly, it should be emphasized that the concept of "need" is relative rather than absolute, and that to attempt to define it leads to a series of complex philosophical, scientific, and political problems.

According to the GDP approach, which is seen as somewhat technocratic, attempts should be made to lower the intensity of political debates among political parties over the determination of the level of health expenditure. The idea originated with O' Higgins (1987), and its objective is to achieve a social agreement to increase health expenditures while at the same time avoiding the use of concepts such as "need" and "demand" for health services. The volume of health expenditures should depend on what a country is capable of spending: in other words, it is argued that the increase in health expenditures ought to keep pace with the increase in national income. Over and above this basic position, the rate of increase in health spending could include additional sums corresponding to necessary items of expenditures stemming from demographic and epidemiological changes. Although this is an interesting point of view, since it provides a scientifically documented and politically neutral basis for discussion, it is capable of causing serious problems to the public health sector. The most important of these problems concerns the automatic adjustment of health expenditures to the course of national income. If the growth of GDP is zero or even negative but public health needs increase, the problems which arise out of the lack of funding will exacerbate political conflict. It should also be borne in mind that the public health sector is labor-intensive, and in that sense even a small increase in the salaries of public health personnel will bring about a large rise in public health expenditures. As a result, although this proposal fulfils quite a number of scientific criteria, it requires further elaboration before it can deal with the cases in which increased public health spending is required when the rate of growth in GDP is negative.

The last approach is based on a comparison on the basic of international developments. This approach attempts to determine the necessary health expenditures by drawing on figures stemming from a comparative presentation of the growth of health expenditures at the international level. A country can approximately determine the level of the public health spending it needs by examining international developments in health spending related GDP, which the various countries devote to the public health sector. Although there is a certain amount of logic in this position, since social, economic, demographic and epidemiological conditions generally coincide in a number of countries, there are also manifold problems and shortcomings, the most important of which are bound up with the way in which the term "health expenditure" is defined and in which its content is collected and recorded.

The problem of determining the necessary level of health expenditure continues to resist solution despite the various methods proposed to date. The theoretical tools are frequently incapable of taking account of all the aspects of the problem.

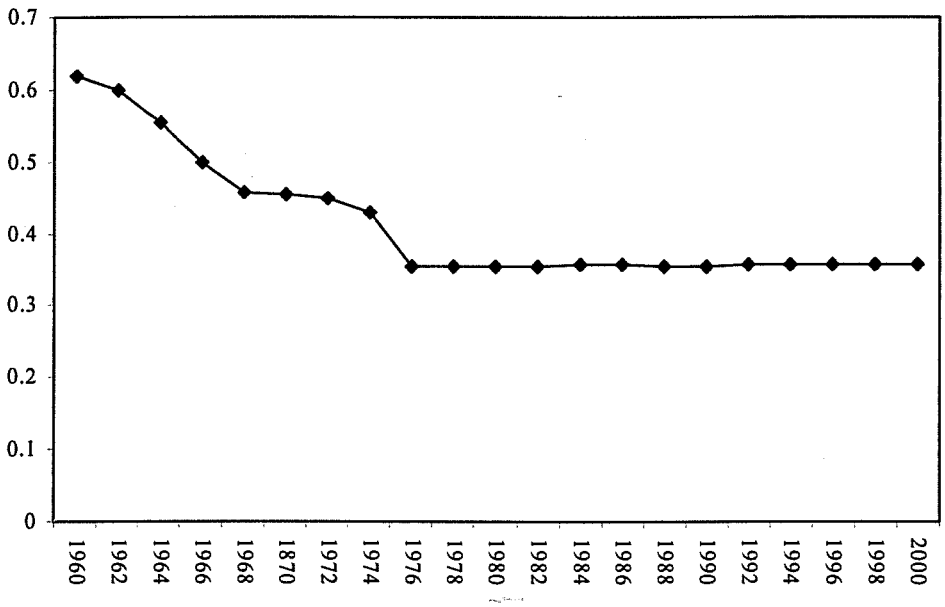
4. AN ECONOMETRIC MODEL OF THE DETERMINANTS OF HEALTH CARE EXPENDITURES IN THE OECD COUNTRIES

4.1. *Theoretical Background*

The substantial differences in health care expenditures across the OECD countries have attracted much attention among health economists in recent years. The relationship between national health care expenditures and gross domestic product has become the subject of numerous empirical studies. Researchers, such as Gerdtham and Jonsson *et. al.* (1995) and Herwartz (2003), have argued that the growing interest in this field mirrors the importance of its implications, for instance, with respect to the role of institutional factors or the integration process of European countries. According to Barro and Sala-i-

Martin (1995), for another but related issue which builds on such a relationship, one may consider the design of a fair health care financing system for different regions within a country. In the present paper, more attention is paid to the explanation for differences in health care expenditures growth across countries. In order to obtain a better understanding of the growth in health care expenditures, cross-country and time-series variations are going to be used. On theoretical grounds, the analysis of differences in expenditure levels explains what factors characterize less costly health care systems at a certain point in time, while the analysis of growth rates indicates which systems favor a greater growth of health spending. Policy recommendations on health system organization should not be based solely on studies of the level of health care expenditures. Understanding the geography of growth in health spending can be as important as understanding the level differences across health systems.

Before proceeding to the analysis, it is useful to look at the variation over time of the dispersion – across countries - of health expenditures per capita. In Figure 6, only the countries for which a complete data set is available are included. In the past 30 years, there was an increase in the dispersion of health expenditures per capita, measured by the standard deviation in health expenditures per capita - showing that countries are moving apart on this matter. However, average health expenditures per capita have also increased substantially, making the ratio of standard deviation over the mean fairly stable since the mid 1970's, with a slight downward trend, as can be seen in Figure 6. From 1960 to 1976, there was a clear decrease in relative dispersion across countries. The same evolution pattern occurred in the dispersion of the share of health care expenditures in GDP, even if standard deviation over mean has remained stable.



Source: OECD database

Figure 6.- Ratio of standard deviation over average value

It seems desirable to test which system did promote a lower rise in health care expenditures. This test may yield results which differ from hypothesis tests based on levels of health care spending. It might be the case that for some structural reason a country has, at a given point in time, a higher level of health care expenditure, without any relation to the health system in place. In cross-country level analysis, this effect may be, at least partially, attributed to the type of the health system instead of being identified with country characteristics. The distinction between determinants of level and growth of health expenditures is by no means a trivial one. It is not possible, a priori, to establish a unique link saying that factors explaining cross-countries and over-time differences in the level of health care expenditures should also be the relevant ones for explaining differences in growth rates. A health system that has a lower level of health expenditures may experience faster growth. Also, health systems that performed relatively well in the sense of keeping health care spending at a low level may or may not exhibit rapid growth

in a changing socio-economic environment. Systems that perform better at a certain moment in time may become, in the future, inefficient.

4.2. *Methodology*

Because of the small sample size, only a limited number of hypotheses can be tested. We focus on the health system features that may have contributed to cost-containment. Judging cost-containment measures is a tricky business. Besides evaluating whether or not cost-containment measures are desirable, targeting a value for health care expenditures is more of a political issue than an economic one. Nevertheless, evaluation of the effectiveness of such measures is warranted. If such evaluation is made on a cross-section basis alone, it is probably not possible to tell what is due to reforms and measures undertaken and what should be attributed to other factors like country characteristics. Looking at growth rates of health care expenditures and their determinants potentially yields useful knowledge on this ground.

The first hypothesis to be tested is whether not those countries that already spent relatively more on health care were also the ones where expenditures grew more. The dissemination of medical knowledge, which is made at an increasingly faster pace, and the wide availability of new drugs and equipment suggests that countries may experience a tendency to have similar per capita health expenditures.[5] If this holds true, one should observe a higher growth rate in countries with initial lower expenditures level, as they catch up with other countries. To test for the presence of a significant impact of the starting point, beginning of period values of the dependent variable are included in the econometric specifications.

Another important factor for health expenditure growth is, probably, GDP growth. In cross-country explanations of health care expenditure differences, GDP has been singled

[5] This notion is close to the concept of β-convergence in growth theory. However, the reasoning underlying convergence theories cannot be applied to health care expenditures.

out as the most important explanatory variable. In fact, empirical studies systematically found that GDP accounts for more than 90% of the observed variation. Thus, cast in terms of growth rate, a positive association between GDP growth and health expenditure growth is expected.

Institutional features of a health system may influence the health care expenditures growth rate. For example, fee-for-service rules do generally imply higher expenditures in health care than capitation schemes. Nonetheless, we cannot state that growth rates of health care expenditures will differ substantially in both systems. To test for the importance of institutional arrangements on the growth of health care expenditures, two characteristics of health systems were include as possible determinants. The first is the OECD characterization of the health system as public reimbursement, public contract, or public integrated. Integrated model is compulsory or voluntary health insurance or third-party funding in which both the insurance and provision of health care is supplied by the same organization in a vertically integrated system. The public version of this model involves government financing and provision of health care and is often funded mainly out of general taxation. Reimbursement is a payment scheme whose level is determined only after service has been provided. Public contracts are agreements between payers and providers which define in advance the health services to be purchased, the quantity, quality and price. The second is the use of physicians/general practitioners as gatekeepers in the system.

Traditionally, ageing of the population is pointed out as an important factor in rising health spending. The argument states that as people get older more health care will be delivered to them. Accordingly, a variable accounting for the ageing of population is also considered. Some recent work, for example, McGuire et al. (1993); Zweifel, et al. (1995), Zweifel et al. (1992) has seriously challenged this view. However, to our knowledge, it has not been tested if population ageing has any bearing on the growth of overall health care spending. Existing studies essentially look at spending for different age cohorts and

are based on micro data. The main finding is that population ageing is of less importance for health care expenditures than usually held. Ageing has a strong impact on other aspects of the welfare state, such as retirement pensions. Some extrapolation to health care services of this demographic pressure may have been made.

The role of government financing has generated some controversy, as both positive and negative effects on total health care expenditures have been reported. Gerdtham et al. (1995) provided a useful discussion of the empirical findings. Gouveia (1995) has argued, theoretically and empirically, against the notion of perfect substitution of public and private health care expenditures. This suggests the inclusion of the proportion of state-financed expenditures as a regressor to investigate whether or not systems with a larger state financing have experienced higher expenditures growth. A pioneer study on the relation between the share of public expenditures in health and spending levels is Leu (1986). In the model of the current paper, a panel data structure and time specific effects are added to the econometric specification. The panel data structure of the sample also allows for the introduction of country-specific effects, but the small time dimension makes overall estimates reflect essentially cross-country differences, rendering imprecise estimates of the country effects. Therefore, I do not compute country-specific effects.

Apart from GDP per capita, a health expenditures variable, and a measure of the demographic composition of the population, various variables related to life-styles, such as liters of alcohol consumed divided by the population over 15 and grams of tobacco consumed divided by the population over 15, have been included in the model.

Since my interest lies in expenditure growth over time, the dependent variables are average growth rates over a decade. Three decades, 1970-1980, 1980-1990, and 1990-2000, are considered. The decision to use growth rates over a decade can be explained by the following reasons. First, there is a clear cost relative to alternatives like year to year or 5-year average growth rates; it reduces degrees of freedom. Second, lower-frequency

average growth rates have disadvantages of their own. Third, some variables used in the analysis move slowly over time. And finally, decade-wide averages capture broad trends instead of short-term variations, which would become more important sources of variation if shorter period averages were considered. Actually, computation of the basic model with 5-year average or annual growth rates has to have the same qualitative results.

4.3. *The Data*

Some data are obtained from the World Health Organization (WHO) website, and some data are obtained from the Penn World Data (PWD)[6], known as the Summers-Heston data. The current data set is an updated version of the previous versions called Mark 5.0 and Mark 5.6. PWD allows access to online statistics covering 29 key variables on 151 major world economies for which data are available.

Most of variables are extracted from the CREDES-OECD database. The data set covers 24 OECD countries. However, for longer periods non-availability of information dictates the exclusion of some countries in the first two decades. The countries in the sample are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxemburg, The Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States.

The dependent variable used is the logarithm of the growth rate of health expenditures per capita averaged across a decade. The decade average growth rates for each country are computed in the following manner

(4) $\Delta LogHCE = Log(HCE_{t+1}) - Log(HCE_t)$

[6] http://bized.ac.uk/dataserv/pennhome.htm

Using 2000 as the base year, the health care expenditures for each year are first converted into units of national currency expressed in 2000 prices, and then brought to a common basis for the base year with the help of PPP's. An alternative dependent variable would be the average growth rate of the ratio of health expenditures over GDP. However, in growth regression equations, the two alternative dependent variables are linked by a simple linear transformation and, therefore, it is possible to expect similar results from both formulations. It is thus clear that the empirical specifications are essentially the same when cast in terms of growth rates. However, this is not true for the analysis of levels of health care expenditures.

When the dependent variable is per capita health spending, the growth rate of the share of health care expenditures in GDP should be included as an explanatory variable, $sHCE\_{GDP}$. The growth rate of the share of health care expenditures on GDP is equal to the growth rate of per capita health expenditures minus the growth rate of per capita GDP. However, in the model per capita health expenditure growth is used as the dependent variable. The data for the dependent variable were extracted from the CREDES-OECD database.

The explanatory variables are constructed as follows:

To reflect initial conditions, the first independent variable is the value of per capita health spending in the first year of the period. This variable is denoted by *HCEpercapinit* for per capita health care expenditures. The data for this variable was obtained from the World Health Organization (WHO) website and the CREDES-OECD database.

A dummy variable controls for the existence of gatekeeping, ***GK***. It assumes the value 1 if the system has gatekeepers and zero otherwise. The countries for which gatekeeping is present are Austria, Canada, Denmark, Germany, Iceland, Ireland, Italy, The Netherlands, New Zealand, Norway, Portugal, Spain and the United Kingdom. The remaining

countries are Australia, Belgium, Finland, France, Greece, Japan, Luxemburg, Sweden, Switzerland, Turkey and the United States.

Two dummy variables reflect the system's type: ***PR*** for public reimbursement (Australia, Belgium, France, Italy (up to 1978), Japan, Luxembourg, Switzerland and the United States) and ***IN*** for integrated (Denmark, Finland, Greece (from 1983), Iceland, Ireland, Italy (from 1979), New Zealand, Norway, Portugal (up to 1977), Spain (up to 1983) and Turkey). This definition of system types follows the characterization of OCDE health systems. Such systems are quite complex, and the diversity of their institutional arrangements is so large to make it impossible to find a classification that is simple, manageable, and universally accepted.

The income variable employed is average growth rate of GDP over the period, ***GDPGR***. The source of information for this variable is the Penn World Data, known as the Summers-Heston data.

Ageing of population is measured simply by the change in the percentage of population over 65, ***AGE65***. This variable was extracted from the CREDES-OECD database.

The group of variables that relate to life style, such as alcohol consumption divided by the population over 15 and tobacco consumption divided by the population over 15, are denoted, respectively, by ***AL*** and ***TB***. The great differences in health status observed across countries and among groups within countries have highlighted the fact that there are variables, such as life style characteristics, which are linked to social and economic factors that are at the core of political and societal development.

The role of state-financed expenditures is proxied by the share of state financing in overall health care expenditures, ***PUBFIN***.

The data for the last three variables were obtained from the CREDES-OECD database.

The equation - with $\Delta LogHCE_{it}$ as the dependent variable representing the growth rate of health care expenditures - to be estimated has the following form:

$$\Delta LogHCE_{it} = \alpha_0 + \alpha_1(\Delta HCEpercapinit_{it}) + \alpha_2(\Delta AGE65_{it}) + \alpha_3(\Delta GDPGR_{it}) +$$

$$\alpha_4(\Delta AL_{it}) + \alpha_5(\Delta TB_{it}) + \alpha_6(PR_{it}) + \alpha_7(GK_{it}) + \alpha_8(IN_{it}) + \tag{5}$$

$$\alpha_9(\Delta PUBFIN_{it}) + \varepsilon_{it}\,.$$

In (5), the double subscript it of a variable refers to the observed value of this variable for country $i, i = 1,...,24$, in period $t, t = 1,2,3$. We have used $t = 1,2,$ and 3 to denote, respectively, the decades 1970-1980, the decade 1980-1990, and the decade 1990-2000. Also, Δ represents the difference operator; that is, if x_t is the value of a variable in period t, then $\Delta x_t = x_{t+1} - x_t$.

The independent variables in equation (5) are:

HCEpercapinit : health care expenditures per capita,

*AGE*65 : the percentage of the population over 65,

GDPGR : the average growth rate of GDP over the period,

AL : total alcohol consumption divided by the population over 15,

TB : total tobacco consumption divided by the population over 15,

PR : a dummy variable that characterizes whether or not the system type is one with public reimbursement,

GK : a dummy variable that characterizes whether or not the system type is one in which gatekeepers exist,

IN: a dummy variable that characterizes whether or not the system is integrated,

PUBFIN: the share of state financing in overall health care expenditures,

As for the disturbances, we assume that $\varepsilon_{it}, i = 1,...,24, t = 1,2,3,$ are independent random variables with the same distribution $N(0,\sigma^2)$. Finally, the parameters to be estimated are $\alpha_0,...,\alpha_{11}$. The equation is estimated by the OLS technique, with the help of SHAZAM.

4.4. *Results of the Estimation*

Before discussing the coefficient estimates RESET tests have been carried out. A simple RESET test was applied to test for misspecification in the functional form. The results of the test performed on the preferred linear version are presented in Table 7.

Table 7

RESET Tests

Degree of freedom		Ramsey		Fresetl		Fresets	
num.	denom.	F-test	p-value	F-test	p-value	F-test	p-value
1970-1980 period							
1	13	15.332	0.002	-	-	-	-
2	12	61.589	0.000	16.705	0.000	1.8520	0.199
3	11	354.59	0.000	-	-	-	-
4	10	-	-	49.748	0.000	1.0785	0.417
6	8	-	-	390.05	0.000	0.6802	0.671
1980-1990 period							
1	13	4.2397	0.0286	-	-	-	-
2	12	3.5763	0.0577	8.4267	0.0066	0.4042	0.676
3	11	9.4690	0.0071	-	-	-	-
4	10	-	-	8.4208	0.0067	1.1114	0.404
6	8	-	-	8.4849	0.0080	1.2829	0.362
1990-2000 period							
1	13	5.0366	0.0105	-	-	-	-
2	12	5.7510	0.0180	6.0584	0.015	1.1097	0.361
3	11	4.5497	0.0410	-	-	-	-
4	10	-	-	4.9146	0.047	2.0095	0.169
6	8	-	-	6.1688	0.015	1.4767	0.297

The application of the RESET test to the preferred linear specification indicated a misspecification error, leading to the inclusion of the quadratic term $(\Delta HCEpercapita)^2$ as an additional exogenous variable in equation (5).

SHAZAM prints a total of nine different RESET statistics. For all cases, the way to carry out the test is to compare the p-value to the chosen level of significance, say 5 %. At the 5% level of significance for the 1970-1980, 1980-1990 and 1990-2000 periods, two tests – RAMSEY and FRESETL - lead to the conclusion that we can reject the null hypothesis, implying that the model is not correctly specified. And only according to the FRESETS test we cannot reject the null hypothesis, implying that the model is correctly specified.

The results show that there is a clear misspecification problem in the regression equation. This implies that some explanatory variables have been omitted or that the functional form is misspecified. The estimates of the coefficients are then biased or inefficient. There is then a high likelihood that the disturbance variance will be incorrectly estimated, and, consequently, confidence interval and hypothesis testing procedures are likely to give misleading results.

As shown in Table 8, this is no longer true when the quadratic term is added to the model.

At the 5% level of significance for the all three decades, all three RESET tests lead to the conclusion that we cannot reject the null hypothesis, implying that the model with the quadratic term $(HCEpercapinit_{it})^2$ is correctly specified.

Table 8

RESET tests with the quadratic term

Degree of freedom		Ramsey		Fresetl		Fresets	
num.	denom.	F-test	p-value	F-test	p-value	F-test	p-value
1970-1980 period							
1	13	0.0313	0.862	-	-	-	-
2	12	0.0879	0.916	0.0614	0.941	0.5621	0.586
3	11	0.0571	0.981	-	-	-	-
4	10	-	-	0.1822	0.942	0.5705	0.691
6	8	-	-	0.3480	0.890	0.7952	0.602
1980-1990 period							
1	13	0.6189	0.447	-	-	-	-
2	12	0.3111	0.739	0.2107	0.813	2.3190	0.144
3	11	0.4625	0.715	-	-	-	-
4	10	-	-	0.8405	0.533	1.5766	0.262
6	8	-	-	1.5361	0.292	1.0536	0.466
1990-2000 period							
1	13	2.1701	0.166	-	-	-	-
2	12	0.9959	0.400	1.6476	0.237	2.3467	0.142
3	11	1.1999	0.359	-	-	-	-
4	10	-	-	1.1167	0.407	1.5139	0.277
6	8	-	-	0.7235	0.645	2.4717	0.134

Essentially, the qualitative results show robustness across specifications, the major differences being the introduction of a quadratic term on the initial value of health expenditures.

Additional tests for non-normality of error terms and heteroskedasticity are also performed.

In order to test for non-normality of error term the Jarque-Bera test was used.

$$(6)\quad JB = n\left[\frac{s^2}{6} + \frac{(k-3)^2}{24}\right] \sim \chi^2_{(2)},$$

where s is skewness and k is kurtosis of the residual.

The results of Jarque-Bera test for normality of errors are presented in Table 9.

Table 9

Normality test

	period 1		period 2		period 3	
	χ^2	p-value	χ^2	p-value	χ^2	p-value
Jarque-Bera test	0.7878	0.674	0.6152	0.735	0.7519	0.687

The null hypothesis for the test is that the residuals are normally distributed. Under the null hypothesis we state the statistic as having a Chi-square distribution with 2 degrees of freedom. Setting the level of significance at 5 %, the decision rule is to reject the null hypothesis if the observed Chi-square is greater than the critical value. The critical value for χ^2 with 2 degrees of freedom is 5.99147. Since the observed values of the Jarque-Bera test for all three cases are significantly less than the critical value, we cannot reject the null hypothesis that the errors are normally distributed.

Since the errors are normally distributed in order to test for heteroskedasticity it is possible to use the Breush-Pagan-Godfrey test. The results of that test are presented in Table 10.

Table 10

Heteroskedasticity test

	period 1		period 2		period 3	
	coeff.	p-value	coeff.	p-value	coeff.	p-value
KOENKER(R2)	7.618	0.66608	16.577	0.08427	6.664	0.75675
B-P-G (SSR)	9.944	0.44542	10.791	0.37400	5.066	0.88671

SHAZAM prints two versions of the BPG test statistic. One is the original statistic. The other, labeled KOENKER, is the modified statistic. In all three periods for both versions p-values are higher than 5% level of significance. Thus, there is no evidence of a systematic relationship between the explanatory variable and the absolute values of the residuals which might suggest that there is no heteroskedasticity in the presented model.

After all diagnostic tests the model to be estimated is

$$\Delta LogHCE_{it} = \alpha_0 + \alpha_1(\Delta HCEpercapinit_{it}) + \alpha_2(\Delta HCEpercapinit_{it})^2 +$$

$$\alpha_3(\Delta AGE65_{it}) + \alpha_4(\Delta GDPGR_{it}) + \alpha_5(\Delta AL_{it}) + \alpha_6(\Delta TB_{it}) + \tag{7}$$

$$\alpha_7(PR_{it}) + \alpha_8(GK_{it}) + \alpha_9(IN_{it}) + \alpha_{10}(\Delta PUBFIN_{it}) + \varepsilon_{it}\,.$$

Table 11 presents the estimated effect of the exogenous variables on growth of total health care expenditure per capita.

Table 11

Results for growth rate equation

Variables	periods					
	1970-1980		1980-1990		1990-2000	
	coef.	p-value	coef.	p-value	coef.	p-value
Constant	-0.0437	0.9864	3.1876	0.0972	1.9575	0.1484
HCEpercapinit	-0.3121	0.0495	-0.2329	0.0205	-0.2302	0.0298
(HCEpercapinit)²	0.0247	0.9534	0.0338	0.1939	0.0028	0.1590
PUBFIN	-0.3361	0.0383	-0.3511	0.0467	-0.4471	0.0198
GDPGR	0.4599	0.0306	0.0083	0.0025	0.0700	0.0469
AGE65	-0.2186	0.5836	0.1649	0.3197	0.2026	0.0524
AL	-0.0304	0.8047	0.0159	0.8815	-0.0852	0.4004
TB	0.0430	0.3879	0.1318	0.0327	0.0588	0.1341
PR	-0.2270	0.7435	-0.3554	0.5359	0.6993	0.1839
GK	0.1713	0.8011	0.0669	0.8832	0.9718	0.0421
IN	-0.2432	0.6138	0.3114	0.5027	0.1301	0.6739
R^2	0.5996		0.7519		0.8102	
$\overline{R}^2$	0.2916		0.5610		0.6643	
Number of obs.	24		24		24	

If we choose a 5% level of significance, it is possible to see from the table that most of the coefficients are not significant. The most important observation to make is that countries with a higher initial health care expenditure per capita experienced a lower rate of growth in health care expenditures. The quadratic term, $(\Delta HCEpercapinit_{it})^2$, allows for a non-linear effect of the starting point of each country and yields a significantly better result than a linear approximation. By itself the quadratic term does not have any significant impact since in all three decades its p-value is higher than 0.05 level of significance. All the other effects are qualitatively unchanged by this term.

The effect of the initial level of health care spending has a negative effect in all three periods. That is, the higher is the initial health care expenditures per capita the lower is the growth rate in the next period, holding other factors constant. For example, for the decade 1990-2000, as the initial level of health care expenditures per capita decreases by 1 percent the growth rate of health care expenditures goes up by 20 percent. This suggests the existence of some convergence among countries. The absolute effect is stronger for heavier spenders, although at a decreasing rate.

Among the factors outlined, GDP per capita, and public financing have a significant impact. Thus, it is possible to conclude that some of the proposed explanatory variables turn out to have significant effect, and can provide some explanations about the slowdown in the growth rate of health care spending. However, it is obvious that the identification of the determinants that successfully contributed to a slower growth of health care expenditures is still an important topic of future research.

The non-significance of the other variables means that apparently the existence of gatekeepers or the type of health system (public reimbursement, public contract or integrated) have played no significant role in containing health care expenditures growth. This finding suggests that the type of health system may have implications for the explanation of the level of health expenditures across countries, but not for growth rates.

Ageing of population and the variables related to life-style have not contributed to growth of health spending. The first finding runs against common wisdom, but it is in line with previous studies, such as Zweifel et. al. (1995), Herwartz (2003), and Barros (1998) which found no significant impact of population ageing.

Another interesting result was that economic growth, measured by per capita GDP growth, had a significant bearing on the growth of health expenditures. For instance, for the last decade, as per capita GDP growth goes up by 1 percent the growth of health expenditures goes up by 7 percent. This suggests an income elasticity lower than but close to unity.

In addition, the negative effect of public financing of health care services in all three decades has been achieved. The effect results from budgetary pressures on most OECD countries. In fact, public financing of health expenditures as a share of total expenditures has decreased in most countries, but so has the weight of public health expenditures in government's budget. This suggests that priority setting at the budget table is probably the explanation for this effect, which does not correspond to the general trend of a diminishing role for the public sector.

A final word with respect to the adjusted R^2 is needed. For example, its value for the last decade suggests that about 66.4 percent of the variation in the growth health care expenditures can be explained by variables such as the per capita GDP growth, the initial level of health care expenditures per capita, etc. Irrespective of whether the obtained value should be considering high or low, it is worth nothing that the unexplained residual amounts to roughly 33%. This is below Newhouse's (1992) estimate of a technological progress residual in health care rising costs in the US. Since no control for technological progress was made, we cannot exclude expensive new technology as the main driving force behind this finding. Technological advances allow diseases and other health problems that could not be cured at any price in the past to be treated effectively today.

Technological progress reduces the cost of any given treatment. No doubt, with more data available, it is interesting to investigate the role of technological change. It is not claimed that technology accounts for the large residuals. It is, however, the case that the results do not run against an important role of technology in the growth of health care spending.

Thus, the impact of technological change on health care expenditures has to be taken into consideration. This casts doubt upon the view that mainly differences in income are responsible for differences in health care expenditures across countries. A large number of factors are responsible for these differences. Therefore, the future task is not only to find all possible determinants of health care expenditures across countries but also to analyze how these determinants influence the quality and quantity of health care services in different countries and which systems perform better in terms of cost-effectiveness.

To check for consistency of the used database with earlier studies, estimation for cross-country level differences in health care spending ratio to GDP is presented in Table 12.

Table 12

Results for level equations

	1970		1980		1990		2000	
	coef.	p-v	coef.	p-v	coef.	p-v	coef.	p-v
Const	4.510	0.0038	4.399	0.000	5.903	0.000	6.869	0.000
AGE65	0.0719	0.4275	0.1061	0.010	0.0004	0.9417	0.0644	0.1069
GDPGR	1.4706	0.0106	0.0532	0.0466	0.0894	0.0075	0.9250	0.0079
PUBFIN	-0.0813	0.0488	-0.6368	0.0143	-0.0945	0.0071	-0.7380	0.0062
PF	-0.2143	0.4073	0.8388	0.0091	0.5353	0.0452	-0.1330	0.8113
GK	0.7092	0.1284	0.3801	0.1550	0.3960	0.0526	-0.1289	0.1631
IN	0.6308	0.2503	0.0588	0.8014	-0.3233	0.1151	0.1590	0.5022
R^2	0.4289		0.6354		0.7277		0.5898	
$\overline{R}^2$	0.2273		0.5067		0.6316		0.4450	
Num. of obs.	24		24		24		24	

These regressions are based on variables observed in four points in time: 1970, 1980, 1990, 2000. In these regressions no time or country-specific effects were included. The results are in line with previous studies. The most important single explanation factor is GDP. Unlike the previous model, no misspecification tests were performed. This is justified by the objective of sticking as close as possible to earlier work on level differences across countries in total per capita health spending.

Since the variables present in this paper evolve slowly over time, the cross-section time-series data for contiguous years tends to reflect essentially the cross-country variation. An approach of using observations spaced in time (decade) allows time variation to play a bigger role in determining estimates. Similar to the growth rate analysis the negative effect of public financing of health care services has been achieved. As in growth rate analysis, the presence of gatekeepers and ageing of population have no explanatory power on health care expenditures, except, 1980 year where the last variable is statistically significant. Overall, these estimates are qualitatively similar to the ones present in recent studies, suggesting that no significant bias emerges from the database used and that results on growth rates will probably hold in other data sets as well.

It is possible to conclude that actual differences in health care expenditures across countries have to be explained more by country-specific effects than by differences in income or in the age structure of the population. It would be quite interesting to investigate the variation in output and health expenditures per capita across countries due to different steady state growth paths resulting from differences in the national saving rate, population growth, human and health capital. Clearly, in order to explain such variation the augmented Solow model can be used. But it is the topic for future investigations.

5. CONCLUSION

There are serious difficulties involved in the measurement of health expenditures and in any attempt to make international comparisons. One of the causes is differences in measurement from country to country. Thus, the main challenge is to find some ways to deal with country-specific effects. Making inferences about health care expenditure patterns, based on broad aggregates over countries and time, is risky, especially if they are not in accordance with received wisdom of previous work. Hence, results should be interpreted carefully.

Using decade-average growth to isolate the analysis from short-run random influences, we found that the coefficients of the variables believed to influence health expenditure increases are essentially non-significant. This is a mix of good news and bad news. The good news is that it corroborates earlier findings for the effects of ageing population, and the bad news is that gatekeepers are usually seen as a way to achieve cost-containment.

It is possible to observe a clear slowdown in health care expenditures - as a share of GDP - growth in the decade 1990-2000 relative to the average evolution in the two previous decades. The determinants of this slow down, however, are not identified by the proposed model. These seemingly "negative" results are not contradictory with existing analysis of determinants of health care expenditures in levels. This is true both on empirical and theoretical grounds.

Combining both types of investigation – level differences and growth rates – it is possible to say that even if some systems were able to sustain lower spending in health, increases in expenditures have hit, in a roughly similar way, all systems, thus preserving the level differences between countries. This also gives a partial justification to why panel data analysis embodying contiguous yearly observations may yield estimates consistent with pure cross-section studies. The analysis is a little more refined than this, as initial position

is negatively related to growth. That is, more costly systems tended to grow less. The magnitude of the effect is, however, small.

Received results suggest that institutional factors cannot be captured only by country-specific dummy variables. The influence of the income elasticity of health care expenditures and the impact of technological change on health care expenditures have to be taken into consideration. This casts doubt upon the view that mainly differences in income are responsible for differences in health care expenditures across countries. It also was found that the actual differences in health care expenditures across countries have to be explained more by country-specific effects than by differences in income or in the age structure of the population.

There are a large number of factors that might be responsible for differences in health care expenditures. The determinants of expenditure growth should, therefore, be researched more closely, and it would be quite interesting to investigate the variation in output and health expenditure per capita across countries due to different steady state growth paths resulting from differences in the national saving rate, population growth, human and health capital. Clearly, in order to explain such variation the augmented Solow model can be used. But this is a topic for future investigations. Furthermore, the future task is not only to find all possible determinants of health care expenditures across countries but also to analyze how these determinants influence the quality and quantity of health care services in different countries and which systems perform better in terms of cost-effectiveness. Overall, the estimates of this paper are qualitatively similar to the ones present in recent studies, suggesting that no significant bias emerges from the database used and that results on growth rates will probably hold in other data sets as well.

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