

A comparison of the efficiency of health systems in providing life expectancy

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1 Introduction

Mortality in the last decades has been declining rapidly. With few exceptions, life expectancy has risen all around the world (Oeppen and Vaupel 2002).

As pointed out by Cutler and Meara (2001:1), “the constancy of mortality reductions masks significant heterogeneity by age, cause and source”. Although factors like increase in income, improved nutrition, hygiene, housing conditions contributed to the steady increase, modern health care systems and medical technology undoubtedly played a key role. This is demonstrated by the numerous references in the literature that mention medical technology and knowledge as important exogenous source of the health improvement and increase in life expectancy (Bunker et al. 1994; Preston 1996; Cutler and McClellan 2001; Jamison et al. 2001; Kremer 2002; Soares 2005; Papageorgiou et al. 2007).

For the majority of people, the access to medical knowledge and technology is determined by the health care system, which can make this access easier or more difficult, almost universal or rather market oriented. Therefore, we think that a crucial factor for explaining life expectancy trends are the health systems and it is this relation that we want to investigate.

It is well known that countries differ in their welfare systems (Esping-Andersen 1990) and that these differences are strongly reflected on the way health services are provided. Countries with a social democratic welfare system aim to “comprehensiveness, equality, universality and generosity” (Kvist 1999:232), while countries with a liberal welfare system let the services operate mainly in the free market. Moreover, countries differ in the level of expenditures devoted to the health system as well as in the efficiency and effectiveness of the services.

All these factors are likely to influence the country’s performance in terms of life expectancy. Trends in mortality decline are also likely to be closely related to the architecture of the health system and to the level of expenditures over time.

As Hoffmann (2011:1986) already noticed, “ a recent branch of research tries to look more systematically at categories of welfare states and their performance in terms of relative and absolute health disparities” (Dahl et al. 2006; Eikemo et al. 2008). In our research, we would like to adopt a similar approach but focusing on the relation between health systems and life expectancy and healthy life expectancy.

However, not only the health systems contribute to life expectancy. By Preston (1975, 1985), literacy rate can be used as a proxy for the non-health system related aspect of health.

2 Data

Information on the characteristics of the health systems are available in, e.g., the Generations and Gender Program - Contextual Database (GGP 2012) and the OECD Statistics (OECD 2012). These databases contain several information about the characteristics of the national health system such as total health expenditures in percentage of the GDP, the proportion of this expenditures funded publicly and privately, type of health insurance and the percentage of its coverage, number of beds per 1000 population, number of physicians, total health expenditure per capita and other indicators.

Reliable information on life expectancy at birth or remaining life expectancy at certain ages can be found in the Human Mortality Database (HMD 2012). Data on literacy rates are reported in the World Health Organization Data Repository (WHO 2012).

3 Methodology

It is difficult to have any preconceptions about how much money or how many hospital beds are transformed into how many years lived. However, it can be observed how effectively individual countries manage their health expenditures. Our research question then can be formulated as “what is the relative efficiency of individual countries in providing life expectancy given their inputs of the health system”.

We propose to use an output-oriented data envelopment analysis (Charnes et al. 1978), a linear programming technique used in operations research. It is seldom used in the field of public health (Evans et al. 2001; Greene 2004; Despotis 2004; Somarriba and Pena 2009). It is a nonparametric approach that identifies an efficient frontier based on the attainable production set of the countries. The efficiency of a country is defined as the ratio of the weighted sum of its outputs (life expectancy)

and the weighted sum of its inputs (health expenditures and indices). The efficient frontier is established by those countries that achieve the maximal life expectancy from a given number of inputs. These countries serve as benchmarks for the less efficient countries whose (in)efficiency is given by their distance from the efficient frontier.

The advantage of using data envelopment analysis versus the traditional parametric approaches (i.e., specifying a functional form of the production function) is that (i) no a priori distribution or functional form is assumed; (ii) the efficiency indices of the countries can be directly compared with each other as each efficiency index envelopes the effect of all inputs; (iii) the optimal weights of the inputs are computed, and not arbitrarily set.

Literacy rate can be incorporated in the model as an environmental variable that explains a portion of the distance that can be observed from the efficient frontier.

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