UNIVERSITY OF LJUBLJANA
FACULTY OF ECONOMICS

MASTER'S THESIS

COST EFFICIENCY OF BASIC HEALTH CARE PROVIDERS IN SLOVENIA

LJUBLJANA, May 2004 PETRA DOŠENOVIĆ

I, Petra Došenović, hereby declare that I am the author of this Master's thesis that was written under the mentorship of Nevenka Hrovatin, Ph.D. and in compliance with Paragraph 1 of Article 21 of the Act on Copyright and Related Rights. I hereby agree to this thesis being published on the website of the Faculty of Economics.

Ljubljana, May 2004 Petra Došenović

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1. INTRODUCTION

1.1. Focus of the master's thesis

Three points of departure can be identified in this thesis. First, a significant share of GDP is earmarked for health care and this share is not determined by economic principles. In welfare economics, the share of GDP allocated to health care is determined by the selection of an appropriate point along the grand utility-possibility frontier, which is a political decision. Second, only a small part of the health care sector is on the market where competition can help evaluate its efficiency and the efficiency of the allocation of the earmarked share of GDP. Third, for these reasons an evaluation of efficiency is crucial from the state's point of view.

In line with Pareto efficiency conditions, efficiency in production is expressed in value terms through cost efficiency. This implies that in health care too 'production' must be on the adequate production possibility frontier. Prices in perfectly competitive markets are the mechanism through which producers attain this frontier. In health care, however, the market is neither all-embracing, perfectly competitive nor always efficient (even in the case of perfect competition). Two conclusions can be drawn from these facts. First, efficiency in health care has to be evaluated taking the absence of the market into consideration and, second, in evaluating efficiency social criteria (in line with the principles of welfare economics) should be taken into account.

'Production' of the health care sector is highly heterogeneous. It includes a variety of services provided by hospitals, specialist and primary care providers and the services of other health care professionals and organisations. The provision of these services is organised either under private or public ownership. The services themselves can also have the nature of either private or public goods. In addition, health care providers work in widely differing social and business environments.

Given these characteristics of the health care sector, the cost efficiency of basic health care providers is of particular interest in Slovenia. Basic health care as part of primary care is provided by both public and private providers. Therefore, this sector is also characterised by the competition of public and private ownership forms. Services also have the nature of public and private goods, although the line between the two is most often not clear. The separation of the market activities and other non-market activities of providers is regulated. In these circumstances, the analysis of cost (in)efficiency is essential for the state as the regulator in order to make reasonable decisions and to try to answer dilemmas regarding the role of different types of ownership and the market in this segment of the health care sector. This is another of the central interests of this thesis.

1.2. Aim and hypotheses of the master's thesis

The aim of the thesis is to estimate the degree of cost inefficiency and its determinants in the basic health care provided by public health centres and private providers. We derive from the hypotheses that for cost efficiency certain factors such as the type of ownership of health care providers, regional location of providers, type of financing, profession and background of managers, organisation of providers and some other general features of health care providers that are characteristic of any entrepreneurial organisation may hold some very important implications.

1.3. Methodology

The methodology applied in the thesis is based on an econometric estimation of the cost functions and cost frontier functions of basic health care providers in Slovenia. The analysis of error terms derived by estimating stochastic cost frontier models enables the decomposition of the error term into a normally distributed random error and the inefficiency residual which is assumed to be positive. The latter can be attributed to various factors that can affect the cost efficiency of health care providers. These factors were outlined in the previous section.

In order to derive such empirical estimations, the thesis begins by outlining the theory underlying the issues of organisation and ownership of health care providers, the role of the market within health care and the importance of incentives and state regulation. The main intention is to show how these characteristics of the health care sector are relevant for achieving efficiency and to identify those areas where the determinants of cost efficiency emerge.

1.4. Composition of the master's thesis

In the second chapter, we begin by looking at how efficiency and inefficiency are defined generally in economics and more specifically in the context of health care. Five key areas where factors emerge that affect efficiency within health care are then outlined in the third chapter. These factors emerge in connection with ownership, organisation and management, market and competition, the system of both demand and supply-side incentives and the system of regulating basic health care. In the fourth chapter, the analysis of these factors is further extended by looking at the characteristics of basic health care provision in Slovenia. This provides the basis for an econometric estimation of the cost efficiency of basic health care providers in Slovenia, as shown in the fifth chapter. Cost functions and stochastic cost frontier functions are estimated separately for public health centres only and jointly for both public and private basic health care providers. The purposes of this empirical analysis are to determine which factors that affect efficiency within health care are predominant in Slovenian basic health care and to outline relevant policy implications as found in the concluding chapter of the thesis.

2. EFFICIENCY IN HEALTH CARE

The issue of efficiency in health care involves many special factors. However, if health care is viewed as an economic activity then efficiency in health care can generally be defined in the same way as for other areas of economic activity.

2.1. Efficiency and inefficiency in economics

1. In economics, efficiency is defined by Pareto efficiency conditions that an economy must satisfy if it is to produce and distribute goods efficiently. Within the framework of Pareto efficiency conditions, the issue of defining efficiency emerges in consumption, production and in the link between consumption and production.

To examine efficiency in consumption the behaviour of consumers who trade goods among themselves must be analysed. In a Pareto efficient allocation of goods no one can be made better off through a reallocation of goods without making someone else worse off (Ferguson, 1972, pp. 467-472; Pindyck, Rubinfeld, 1998, pp. 584-592; Griffiths, Wall, 2000, p. 446; Tajnikar, 2003, pp. 42-49, 71-78). This occurs at the point where the marginal rate of substitution between every pair of goods, i.e., relative marginal utilities, is the same for all parties consuming these goods.

Efficiency in production emerges in three areas. First, to see how a particular producer (firm) combines inputs efficiently we must find various combinations of inputs that can be used to produce different outputs. In an efficient combination of inputs, i.e., labour and capital, the ratio of marginal products of the inputs (marginal rate of technical substitution) is the same in the production of all goods (Ferguson, 1972, pp. 473-475; Pindyck, Rubinfeld, 1998, pp. 598-599; Tajnikar, 2003, pp. 50-57, 80-107). If this condition is fulfilled, a producer (firm) produces maximum quantities of goods with a given amount of inputs[1]. Second, it is also important to see how inputs can be efficiently allocated among different producers. This point occurs when the marginal revenue products of a specific input are equal for all producers. If this condition is fulfilled then an economy produces maximum quantities of goods with given inputs (Tajnikar, 2003, pp. 57-59, 110-117). Third, the efficient allocation of the production of goods among different producers occurs when the rate of product transformation (the marginal cost of producing one good relative to the marginal cost of producing any other good) is equal for all producers (Pindyck, Rubinfeld, 1998, p. 601; Tajnikar, 2003, pp. 59-62, 119-120).

For an economy to be efficient, efficiency must be achieved in both consumption and production. This occurs when the marginal rate of substitution equals the rate of product transformation (Pindyck, Rubinfeld, 1998, p. 601; Tajnikar, 2003, pp. 64-69, 129). In such circumstances, goods are produced in combinations that match the consumer's preferences.

[1] This is also referred to as input efficiency.

2. Pareto efficiency conditions are fulfilled in conditions of perfect competition (Pindyck, Rubinfeld, 1998, p. 601; Tajnikar, 2003, pp. 80-130). Two conditions of perfect competition in particular have to be satisfied. First, when making decisions economic agents, who in the elementary model include only consumers and producers, have to behave as either utility or profit maximisers. The former applies to the decision-making of consumers and the latter to the decision-making of producers. Second, the relative prices of final goods and relative input prices have to be given and the same for all consumers and producers.

As these conditions are essential features of perfect competition and perfect competition is a characteristic of a market economy, the fulfilment of Pareto efficiency conditions also implies the need for private ownership (Tajnikar, 2003, pp. 374-375; Griffiths, Wall, 2000, pp. 474-475). The existence of contractual relationships in the selling and buying activities that form a pivotal part of any market economy is conditional on the dominance of private property rights of both buyers and sellers. This is why Pareto efficiency conditions can be fulfilled only within a private ownership economy with a perfectly competitive market.

3. These conclusions are valid in all but two cases: (a) as the fulfilment of Pareto efficiency conditions is conditional on perfect competition, economic efficiency is not achieved if imperfect competition characterises the market; and (b) these conditions are also not fulfilled in the case of a market failure. In the presence of a market failure efficiency diverges from private and social points of view. Market failure refers to the existence of imperfect and asymmetric information, the existence of public goods and both positive and negative externalities that can arise in either consumption or production.

The framework of Pareto efficiency conditions therefore clearly shows that economic inefficiency can arise either due to the absence of private ownership and consequently of a market or due to imperfect competition and the existence of other market failures such as imperfect and asymmetric information, public goods and externalities.

Inefficiency can arise in two forms. The first form is known as technical inefficiency. In the case of technical inefficiency the economy fails to achieve the maximum possible level of production. This problem emerges when for whatever reason the economy lies inside its production possibility frontier and, consequently, also inside the grand utility-possibility frontier (Pindyck, Rubinfeld, 1998, p. 599; Ferguson, 1972, pp. 476, 488). Namely, according to the fifth Pareto efficiency condition it is possible to produce with a given set of inputs maximal quantities of goods and thus also achieve maximal consumer satisfaction. Technical inefficiency therefore arises when the allocation of goods lies inside these frontiers. In such cases, producers do not attain efficient production functions and consumers do not attain efficient consumption functions. It can be assumed that in conditions of private ownership and profit and utility maximisation both consumers and producers have such functions. This is why technical inefficiency arises when private ownership is absent and a market economy is non-existent.

Inefficiency can also arise when consumers are on their efficient consumption functions and producers are on their efficient production functions yet the combinations of goods that are consumed, the combinations of goods that are produced and the combinations of inputs entering the production process are inappropriate considering both the prices of goods and input prices. This type of inefficiency is referred to as allocative inefficiency. The goods produced and inputs employed are not allocated appropriately given their prices. When consumers and producers act in line with their own private interests, allocative inefficiency can arise due to imperfect competition. Also considering the possible divergence between private and social interests allocative inefficiency can also emerge in cases of imperfect and asymmetric information, public goods and externalities.

2.2. Efficiency and inefficiency in health care

Pareto efficiency conditions can also be applied to health care. The basis for understanding the application of the Pareto efficiency framework to health care is the production function in health care that links suppliers to providers and payers and the latter to users, i.e., patients and their health. At these links conditions emerge that either enable the fulfilment of Pareto efficiency conditions or create obstacles to their fulfilment and thus contribute to the inefficiency that can appear within health care.

2.2.1. The production function and technical and allocative efficiency in health care

1. Measuring the output of the health care system is necessary to assess the productivity levels and growth of a country's economy[2] and, of course, its health care system (Berndt, 2000, p. 122). There are two ways of looking at the output of health care. First, health care or medical care (m) can be regarded as the final output produced by physicians, hospitals, and other providers. Second, health care can be viewed not as a final output, but as one of many inputs that contribute to an output referred to as good health (H) (Feldstein, 2002, pp. 18-19). Technically, this relationship can be shown by the following equation:

$$H = f\left[m = f\left(inputs\right)\right] \qquad (1)$$

This distinction is important when examining the issue of efficiency within the health care sector. Namely, in order to determine whether health care is being produced efficiently health care needs to be viewed as a final output. When trying to determine the most efficient way to allocate resources to increase health, health care should be regarded as one of the inputs that contribute to good health (Feldstein, 2002, p. 19).

[2] Bhargava et al. (2001) modelled the effects of health on economic growth and their results showed positive effects of adult survival rates on GDP growth rates in low-income countries.

2. Characteristics of production functions such as input substitutability, the marginal productivity of each input, the law of variable proportions, and returns to scale determine the nature of costs and the supply of medical services in both the short and long run (Feldstein, 2002, pp. 169-171). However, an important question that needs to be addressed is whether these assumptions are fulfilled in medical markets. In health care, for example, there are legal restrictions on the tasks that various health professionals are permitted to perform and ratios such as the ratio of medical to nursing staff are often fixed. These legal restrictions limit input substitutability. When substitution that would not result in reduced quality of care is prevented, the costs of producing that care increase. Another assumption in determining the least-cost combination of inputs is that relative input prices are not distorted. Subsidising one input such as, for example, hospital capital, results in economic inefficiency. Economic efficiency in production also requires decision-makers to use the information on marginal productivity and relative prices of inputs to produce the output at minimum cost (Feldstein, 2002, pp. 171-172). In health care, however, decision-makers of non-profit organisations may have goals other than cost minimisation. It is also true that efficiency does not only depend on the mix of inputs but also on the structure of the industry (Feldstein, 2002, p. 18). A structural change such as the reorganisation of physicians from solo to group practice might affect the productivity of certain inputs and their costs. The same holds true for the increased degree of competition, changes in ownership forms, and systems of incentives that affect the behaviour of providers.

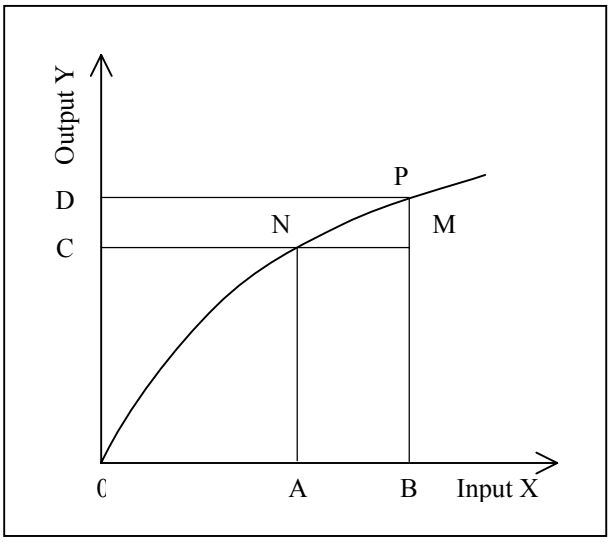
Clearly not all assumptions underlying production functions are fulfilled in health care. This implies factors such as regulation, form of ownership, organisation, competition, and incentives may have important implications for economic efficiency and must therefore be further examined.

3. In order to determine whether health care is being produced efficiently, health care needs to be viewed as a final output and the relationships between inputs to health care, outputs of health care and the cost need to be examined. The analysis of production frontiers, isoquants and isocost lines provides a framework for analysing both technical and allocative efficiency.

Technical efficiency underlines the derivation of production frontiers. Points N and P on the production frontier shown in Figure 1 depict technically efficient allocations. Two measures of technical efficiency can be considered: the input measure of efficiency and the output measure of efficiency (Griffiths, Wall, 2000, pp. 144, 184). The former refers to the proportion of the actual input that would be sufficient to produce a given output if the quantity of input were the minimal one. In Figure 1, for the allocation M the ratio 0A/0B can be used as an input measure of efficiency. The ratio 0C/0D can, on the other hand, be used as an output measure of efficiency for the allocation M. It refers to the proportion of the potential output that is actually achieved by a given level of input. Both ratios equal 1 for technically

efficient allocations. The greater the divergence from 1, the more technically inefficient the allocation.

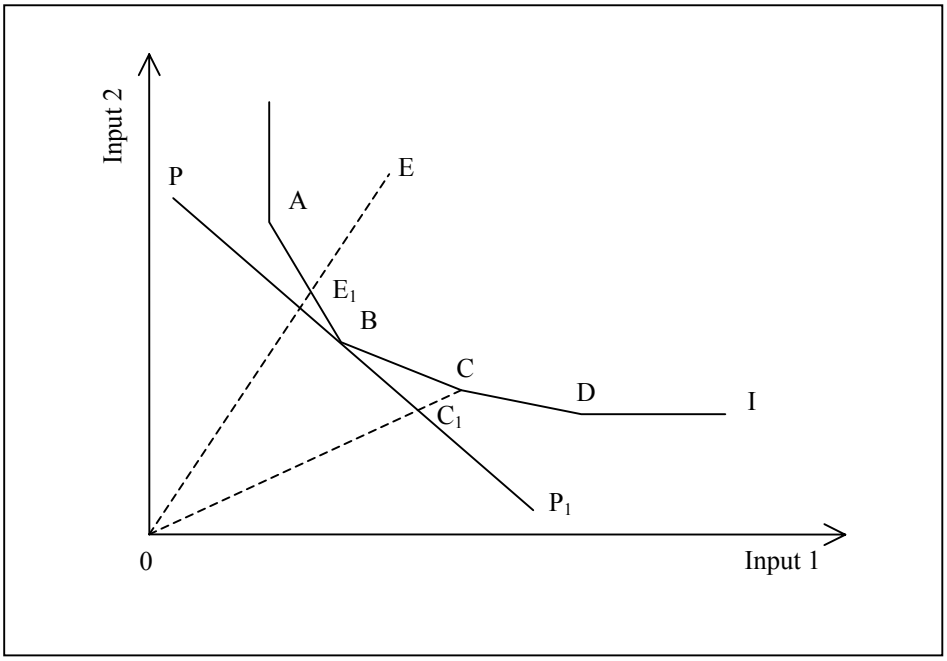
Figure 1: Input and output measures of technical efficiency



Source: Griffiths, Wall, 2000, p. 184

The framework shown above depicts a single input-output relationship. As shown in Figure 2, the principles also apply to multiple input-output relationships (Griffiths, Wall, 2000, p. 185). In this case, measures of efficiency are made along the rays extending from the origin.

Figure 2: Technical and allocative inefficiency



Source: Björkgren, Häkkinen, Linna, 2000, p. 194

Figure 2 shows a production technology of two inputs and one output. All units on the frontier, the isoquant I, produce the same output with different combinations of the two

inputs. Thus, units A, B, C, and D are technically efficient and will receive a technical efficiency score of 1. Unit E, on the other hand, does not lie on the frontier. It is therefore technically inefficient. Its technical inefficiency score is computed by the ratio $0E_1/0E$. Considering the efficient units A and B that use similar combinations of inputs and output as unit E it is clear that unit E should be able to produce its existing output with fewer inputs. For example, if the technical efficiency score for unit E is 0.75 then its technical inefficiency is 25%. This means unit E, if more efficient, could produce its output with the amount of inputs reduced by 25%.

Figure 2 can also be used to describe allocative efficiency. A price-efficient mix of factors of production requires that the slope of the production frontier I equals the factor price ratio PP_1 (price of input 2 divided by price of input 1). Unit C is technically efficient but does not achieve allocative efficiency since it uses relatively too much of input 1 given its relative price. C's allocative efficiency score equals the ratio OC_1/OC. Unit B achieves both technical and allocative efficiency, i.e., cost efficiency.

The above discussion implies that there is more than one source of cost inefficiency. Technical inefficiency arises when not enough output is being produced from a given set of inputs and the analysed unit lies above the isoquant for its output level. Allocative inefficiency arises when inputs are being employed in the wrong proportion, given their prices and productivity at the margin. The analysed unit is on its isoquant but at the wrong point. Technical and allocative efficiency are the two components of cost efficiency (Björkgren, Häkkinen, Linna, 2000, p. 193).

4. Technical and allocative efficiency are not the only interesting issues that arise when analysing costs and estimating cost functions of health care providers. Another obvious question is whether there are economies of scale. Scale inefficiency occurs when average cost can be reduced by changing the size and number of units. In such circumstances, individual units are on the wrong isoquants (Giuffrida, Gravelle, 2001, p. 164). There is some evidence that the costs of relatively high-technology procedures fall with volume (Cronin et al., 1998). In health care, economies of scope can also be found. This implies that a health care organisation can obtain some savings by combining certain different services (McPake, Kumaranayake, Normand, 2002, p. 36).

5. In economics, a process of transforming medical care into health can also be viewed as a standard production function. The demand for health which can be thought of as a final product leads to a derived demand for the productive inputs comprising of various medical treatments (*m*). Demand for *m* is derived, depending on income, prices, severity of the individual's illness, and the perceived efficacy of the treatment (Phelps, 2000, p. 238). The demand for health (*H*) therefore leads to the demand for medical care (*m*) which produces, i.e., restores, health:

$$H = f(m) \quad (2)$$

Considering that in economics this process is thought of as a standard production function, we can also presume that the marginal productivity of medical care is positive and that the incremental effect of *m* on *H* diminishes as the use of *m* increases (Phelps, 2003, pp. 12-14). Productivity changes on both the extensive and intensive margins[3].

6. However, both health outcomes and the productivity of medical care also depend on the actual disease an individual has. Health can thus be viewed as a function of both disease (*D*) and medical care (*m*):

$$H = f(m, D) \text{ or} \quad (3)$$

$$H = H_0 - D + f(m) \quad (4)$$

H, *D* and *m* are vectors of large dimensionality representing different aspects of health, different illnesses, and different treatments, respectively (Phelps, 2000, p. 238). Health production functions generally measure the contribution of medical services to health by quantities of the individual components of medical services (e.g. number of physicians and hospital beds per thousand population), utilisation of services (e.g. number of physician visits) or by aggregate expenditures on medical services. The latter include changes in prices, utilisation of services and differences in their quality (Feldstein, 2002, p. 27).

7. Several other issues need to be mentioned. First, as already mentioned medical care (*m*) cannot be described as a homogeneous activity. In practice, medical procedures are numerous and in light of technological advances their complexity and diversity is growing very fast. Second, output measurement is difficult when mortality is but one possible outcome. Morbidity, pain and suffering, functional and emotional impairment, and the quality of life are other aspects of treatment response (Berndt, 2000, p. 123). Also, many medical treatments do not change the eventual level of health that an individual can return to through the natural process of healing, but they do speed up the healing process. Similarly, for incurable diseases medical care can slow down the progress of a disease. Third, medical care is not the only factor affecting health. The lifestyle of an individual either reduces (e.g. negative effects of alcohol consumption) or contributes to health (e.g. healthy diet composition). Other inputs into the production of health include, for example, knowledge, time[4] and the environment (Berndt, 2000, p. 128). If X_B denotes a bundle of goods that have

[3] This distinction raises an interesting question. For example, if a hospital is aggressive on the extensive margin of care which means that it has an above-average number of admissions to the hospital, would the hospital more than likely be high or low on its choices of the intensive margin, i.e., length of hospitalisation (Phelps, 2003, pp. 91-92).

[4] Time is spent in seeking and receiving treatment, in recovery etc.

negative effects on health and X_G a bundle of goods that augment health, the production function can be shown with the following equation (Phelps, 2003, pp. 16, 18-24):

$$H = f(m, D, X_B, X_G) \tag{5}$$

8. The problems associated with measuring health status play an important role in this context. On an aggregate level, the health measures most often used are those that are part of vital statistics (e.g. number of births and deaths per thousand population, population-specific death rates, life expectancy at birth[5], probability of dying before the age of five etc.). If health gain is maximised from the available resources, the allocation of resources to health programmes (e.g. improvements in the number and quality of coronary care units) and health-related programmes meets the criterion of efficiency (Le Grand, 2001, p. 138). The question then remains how to allocate the medical services offered within a specific health programme to individual patients. The same efficiency principle, i.e. health gain relative to the cost of health care, can be applied (Le Grand, 2001, p. 139). Efficiency, however, is not the only criterion for the allocation of health care services. In modern societies egalitarian principles[6] are also accepted for the allocation of medical services (Kornai, Eggleston, 2001, pp. 49-50).

9. It is important to note that while the marginal utility of health is positive, health (H) is not the only argument in an individual's utility function. An individual's utility function has the following form:

$$Utility = U(H, X) \tag{6}$$

In other words, health (H) and other goods and services (X) can substitute for one another in producing utility. This is why the argument that individuals should avoid the consumption of goods that have a negative effect on their health is not irrefutable. Namely, the consumer's ultimate goal is not to maximise health but to maximise utility and the bundle of goods X_B presumably can increase the utility of an individual (Phelps, 2003, pp. 9-12, 19). As health has many measurable components such as life expectancy (H_1), freedom from pain (H_2) and mobility (H_3), the utility function can also be shown in the following form (Phelps, 2003, pp. 92-94):

$$Utility = U(X, H_1, H_2, ..., H_n) \tag{7}$$

[5] To assess overall population health and thus to judge how well the objective of good health is being achieved, WHO uses disability-adjusted life expectancy (DALE) (World Health Report 2000, 2001).

[6] Equity is concerned with notions of social justice and fairness. Horizontal equity concepts refer to the equal treatment of equals. Vertical equity concepts, on the other hand, refer to the unequal treatment of unequals. In funding arrangements, the focus of many governments has been the former concept, more precisely the concept of 'equal access for equal need' (Peacock, Segal, 2000, p. 79).

More precisely:

$$Utility = U(H_1, H_2, \ldots, H_n, \text{lifestyle, leisure time, other consumption goods and services, the environment etc.}) \quad (8)$$

Factors such as lifestyle and the environment have both a direct effect on utility and an indirect effect via health. Both the production function and the utility function also have intertemporal aspects (Berndt, 2000, p. 128). Current consumption goods, for example, affect future health status as well as current utility. Similarly, current medical interventions impact on future consumption possibilities.

2.2.2. The production function and reasons for inefficiency in health care

The outline of the production function in health care shows that, as in other economic activities, technical and allocative inefficiency can also arise in health care. These two forms of inefficiency arise, as indicated, when for certain reasons the fulfilment of Pareto efficiency conditions is prevented. It has been established that the absence of private ownership and a market orientation leads to technical inefficiency and that imperfect competition, imperfect and asymmetric information, the existence of public goods and externalities lead to allocative inefficiency.

We can therefore conclude that in health care inefficiency in the form of technical inefficiency also arises due to the absence of private ownership and lack of a market orientation within health care and in the form of allocative inefficiency due to the imperfect competition, imperfect and asymmetric information, public goods and externalities that also arise in health care.

3. COST INEFFICIENCY IN HEALTH CARE

If we assume, first, that the production function in health care links the suppliers to providers and payers and the latter to the users, i.e., patients and their health and, second, that inefficiency arises either as technical and/or allocative inefficiency then five key areas where factors emerge that affect efficiency within health care can be outlined. These factors, as will be shown, emerge in connection with: (a) ownership; (b) organisation and management; (c) market and competition; (d) the system of both demand- and supply-side incentives; and (e) the system for regulating basic health care. The analysis of these factors also clearly shows why the discussion regarding cost efficiency within health care is an important issue that deserves careful consideration.

3.1. Ownership and efficiency in health care

In health care systems four key entities play an important role: the patient or user of medical services; the health care provider; and, the insurer and sponsor (Kornai, Eggleston, 2001, pp. 69-71). In the simplest health care systems, patients buy health care services directly from their providers. In such systems the patient and the provider are therefore the only agents. However, uncertainty regarding the need for expensive medical services[7] creates room for intermediaries between the users and providers of medical services. One obvious intermediary is the health insurer[8]. The fundamental norm of equal access to health care, that would not be met if the insurance market were left free of any intervention, gives rise to anther intermediary. This is the fourth key entity referred to as the sponsor. The role of the sponsor can be performed by the government or large employers that purchase health coverage for their employees. The main functions of sponsors are to mediate between their beneficiaries and insurers, contribute funds for health care and perform other regulatory functions (e.g. licensing providers).

When discussing efficiency within health care systems, characteristics of key agents such as their ownership form play an important role. These issues are relevant primarily for two key agents, i.e., the provider and the insurer.

3.1.1. Ownership in health care

1. Both efficiency considerations and the possibility of choice for consumers argue in favour of competition among various ownership forms. In theory, incentives to efficiency strengthen as institutions become more private. This is due to the profit motive, the threat of being driven out of business and the closer relationship between the individual's rewards and individual's effort (McPake, Kumaranayake, Norman, 2002, p. 213). This implies that the welfare sector should also be opened to private institutions, both non-profit and profit-seeking ones (Kornai, Eggleston, 2001, pp. 24-25).

According to the criterion of who exercises property rights over health care organisations that employ physicians and other medical staff state-owned organisations, organisations with a non-profit, non-state owner and organisations with private, profit-seeking owners can be distinguished. Health care providers often also deliver services as independent, self-employed professionals or private entrepreneurs. In real life, these pure forms are mixed. Physicians, for example, may spend some of their time working under one form of ownership and some of it under another. It is also possible for a private practice to offer certain services within state organisations and collect fees for these services, while paying rent for the premises. Another such example is a state or non-profit hospital that may contract certain tasks (e.g. certain

[7] The distribution of health expenditures is highly skewed. The most costly 10% of patients account for as much as 75% of total health care spending (Kornai, Eggleston, 2001, pp. 51-52).
[8] The uncertainty driving the demand for health insurance arises because of the random nature of health and illness (Phelps, 2003, p. 319).

laboratory tests) out to privately-owned, for-profit organisations (Kornai, Eggleston, 2001, pp. 71-73). 'With contracting out, the state retains a fair level of control over the activities concerned, monitoring performance, imposing financial penalties, and replacing the contractor in cases of outright performance failure. This level of control is not afforded by privatisation' (Domberger, Jensen, 1997, p. 68).

2. Table 1 shows in more detail the predominant ownership forms of health care providers in OECD countries. From the point of view of ownership, health care providers in OECD countries are either predominantly public, predominantly private or a combination of the two.

Table 1: Predominant ownership forms of health care providers, OECD countries, 1992

Predominant ownership form		
Public	***Public and private***	***Private***
Denmark	Austria	Canada
Finland	Belgium	Netherlands
Greece	France	Switzerland
Iceland	Germany	United States
Ireland	Japan	
Italy	Luxembourg	
Norway	Turkey	
Portugal		
Spain		
Sweden		
United Kingdom		

Source: Kornai, Eggleston, 2001, p. 102

In most European countries, a keen sense of social solidarity has upheld the state's predominant role in both the provision and financing of health care. In recent years, however, the role of various forms of private provision and private insurance has been strengthening. It is also true that quasi-market and quasi-private forms (e.g. increased independence of management, restrictions on the expenditure of state-owned organisations to harden their budget constraints etc.) are gaining strength in the public sector (Kornai, Eggleston, 2001, p. 112). In Eastern European countries, most large, hospital-scale activity remains in public ownership. The privatisation of small-scale organisations has been far more extensive. In the Czech Republic, Hungary, Romania and Slovakia, primary care physicians have been converted from state employees to self-employed professionals. Privatisation of dental care has also been quite extensive in most Eastern European countries. The same holds true for pharmacies. On the other hand, the proportion of specialist care given through private practice remains low in most countries (Kornai, Eggleston, 2001, pp. 160-164).

3. As mentioned government, large employers and some other organisations (e.g. larger charitable organisations) can perform the role of sponsor. The sponsor can therefore also be either a state organisation, a private non-profit or a private for-profit organisation.

4. Insurance organisations can also be either state- or privately-owned and either non-profit or profit-oriented. In the EU voluntary health insurance markets are dominated by non-profit insurance organisations. In recent years, their share has declined in some member states and, in future, for-profit commercial insurers may be expected to play an important role (Mossialos et al., 2002, p. 6). Profit-seeking insurance companies sell insurance if premiums exceed the amount needed to pay for claims and the cost of administration. Risk-aversion explains why people voluntarily choose to buy such insurance (McPake, Kumaranayake, Norman, 2002, p. 208; Griffiths, Wall, 2000, pp. 100-105). It is important to note, however, that the existence of voluntary health insurance may also create distortions in the allocation of resources. This is most likely to happen when the boundaries between public and private health care are not clearly defined and particularly in the case when, for example, providers are paid by both the private and public sector, if capacity is limited and if voluntary health insurance creates incentives for medical workers to treat public and private patients differently (Mossialos et al., 2002, pp. 6-7).

Either the state or the insurance organisation can take on the role of the payer for health care services. It is common to distinguish public (state financing and compulsory insurance) from private (voluntary insurance and out-of-pocket payments) financing (Kornai, Eggleston, 2001, pp. 74-75). It is, however, important to note that this distinction might cause some confusion. For example, a state-owned organisation can provide voluntary insurance. This implies that the public and private provision of services has to be differentiated from public and private financing.

5. When looking at reasons for the privatisation of the public sector the main focus is the question of how public firms differ from their private equivalents. Two methods can be employed: the property rights approach and the public choice approach (Schneider, 2003, p. 24).

The first approach, i.e., the property rights approach, points out the practical difficulties in transferring ownership rights among individuals in the public sector and the relative ease of such transactions with private assets (Alchian, 1961). The latter also includes the ability of owners to monitor their agents. This implies that the principal-agent problem emerges in private enterprises as well but to a much lesser extent than in their public equivalents. The property rights approach seems to indicate that public enterprises are less efficient than private ones and that private production is cheaper than production in publicly-owned and managed firms. It also indicates that given sufficient competition between public and private producers the differences in unit costs are insignificant. One may therefore conclude that the

less efficient production seen in public enterprises in not so much the result of the difference in transferability of ownership but the lack of competition (Schneider, 2003, p. 25).

The public choice approach takes this fact into account and it therefore provides a broader analysis than the property rights approach. It not only recognises the differences in behaviour between publicly-owned and managed firms and private ones due to limited transferability of ownership. It also indicates that governmental agencies and firms have distinct biases leading to both higher production costs and an oversupply of public services due to the lack of competition in their production and provision. This oversupply that results because 'the staff of the bureaucracy can affect demand more readily under monopoly public ownership by the strength of its members' votes and/or lobbying efforts' may be used for the selfish re-election goals of politicians. It can also result in higher employment and higher wages in some regions at least for a certain time span (Schneider, 2003, pp. 25-26).

3.1.2. The effect of ownership on achieving efficiency in health care

The existence of different types of ownership is the first characteristic of health care that can cause inefficiency. On the chain from suppliers, providers, payers and patients this problem is essentially the problem of ownership of providers and insurers. Namely, the public network of health care providers does not make it possible to follow the profit motive. This, in turn, does not enable the attainment of an efficient production function by acting in line with private interests and profit-seeking behaviour. Therefore, due to the absence of private ownership technical inefficiency can arise in health care.

The presence of technical inefficiency can have two consequences (Tajnikar, Došenovič, 2004, p. 4). First, as the public sector does not enable the maximisation of profits the efficiency of health care cannot, in a market economy, be judged with regard to profit maximisation but only with regard to cost minimisation. Second, certain relationships between suppliers, providers and patients are not subjected to market forces and market prices as private property rights that underlie selling and buying activities are not characteristic for some of these agents. This is why in some cases the prices of goods and services supplied by health care providers do not even exist and there are only costs incurred for the provision of health care services. Products and services of health care providers are therefore not traded on the market and, considering that suppliers supply goods and services to health care providers at market prices, their production has to be oriented at cost minimisation. In this process market prices of final health care goods and services that could determine the efficient allocation of production among producers and affect the demand and consumption of these goods and services therefore do not exist.

Even if market forces and market prices exist in health care the heterogeneous ownership structure mostly involving the prevalence of public ownership can result in a monopoly of providers. Such a monopoly emerges not due to the size of providers but the type of

ownership. This type of monopoly can be linked with a monopoly of suppliers. The latter is, however, a characteristic of the market structure not the type of ownership.

In line with Pareto efficiency conditions three hypotheses can be outlined (Tajnikar, Došenovič, 2004, p. 5). First, due to the prevailing non-profit motive the analysis of (in)efficiency in health care should be in the form of cost (in)efficiency analysis. Second, it can be assumed that strengthened private ownership and the market orientation lead to increased efficiency in health care. Third, characteristics of ownership structure do not result in the formation of perfectly competitive prices of health care goods and services. This is why the introduction of appropriate markets and competition can also be linked to the formation of prices that can reduce the allocative inefficiency within health care.

3.2. Organisation and efficiency in health care

As shown in the previous sections, the health sector features the triad of the consumer, insurer/payer, and provider (Kornai, Eggleston, 2001, p. 53). In most cases, there is also a fourth party, i.e., the sponsor. These entities interact in different ways. However, the degree of integration between sponsors, insurers, and providers can vary (Kornai, Eggleston, 2001, pp. 76-97). As shown in Figure 3, in the case of an integrated health service all three functions are performed by the same legal entity. The National Health Service in the UK, for example, combines state-owned health care facilities on the supply side with state general revenue financing on the demand side. A second alternative is the integration of insurer and provider roles. For example, a private insurance company may have its own doctors who supply basic health care services. In this case the sponsor's role is separate. Alternatively, the sponsor and the insurer may be integrated, but separated from providers. In Canada, for example, each province operates a compulsory insurance programme under federal guidelines, paying independent providers. Finally, all three roles can be performed by separate legal entities.

Figure 3: Types of integration of the key entities

Integration	***Separation***		
sponsor	sponsor	sponsor	sponsor
insurer	insurer	insurer	insurer
provider	provider	provider	provider

Source: Kornai, Eggleston, 2001, p. 77

The above discussion implies that an analysis of implications the differences in organisation have for efficiency first entails the study of the health care system's organisation and, second, an analysis of how the key entities are organised.

3.2.1. Types of health care systems

A study of international experiences in providing health care is undertaken for several reasons. First, in light of the overwhelming increase in costs of health care that is attributed to factors such as cost-increasing technology, ageing of the population, supplier-induced demand, increasing health care prices and inefficiency (Vitaliano, Toren, 1994, p. 282) most countries are reforming their health care systems. In looking at cross-country differences in health care expenditures it is therefore important to keep in mind that high expenditures can be a result of a high average level of services, but they can also be a consequence of the high resource costs of services or their inefficient provision (Folland, Goodman, Stano, 2000, pp. 518-519). The countries are faced with an important dilemma: to which system should they most approximate. Understanding the approaches used by other countries can provide important clues for assessing a countries' own system (Folland, Goodman, Stano, 2000, p. 515). Second, the importance of the issue of health care systems' heterogeneity within the European Union is further highlighted by the prospect of an open, European-wide, health care market. Namely, this issue poses administrative burdens for access to cross-border care and risks creating confusion among patients, health care providers and payers (Palm, Nickless, 2001, pp. 13-14). Third, there are rich variations in health care systems and experiences that are in themselves worth discovering.

Health care systems can be differentiated according to two important features. The first feature is the predominant ownership form of health care providers, while the second is the predominant source of health care financing. From the point of view of ownership, providers can be predominantly public (United Kingdom, Denmark, Finland, Greece, Iceland, Ireland, Norway, Portugal, Spain, Sweden, Italy), private (Canada, United States, Switzerland, the Netherlands) or a combination of the two (Austria, Belgium, France, Germany, Japan, Luxembourg). The prevailing source of financing can be taxes (United Kingdom, Denmark, Finland, Greece, Iceland, Ireland, Norway, Portugal, Spain, Sweden), social insurance (Austria, Belgium, France, Germany, Japan, Luxembourg), a combination of taxes and social insurance (Italy), a combination of private sources and social insurance (Canada, the Netherlands) or private sources (USA, Switzerland) (Kornai, Eggleston, 2001, pp. 102-3).

In light of this diversity, it is useful to try to introduce a typology of health care systems (Kornai, Eggleston, 2001, pp. 108-11; Gordon, 1988, p. 204):

1. the national health service model;
2. the national health insurance model;
3. the social insurance model;
4. the mixed system model;
5. the Singapore model; and
6. the Soviet model.

Since the United Kingdom is a prime example of the national health service model, this approach is also referred to as the British model. It combines state-owned health care providers with state budget financing. The government acts as both the purchaser of services and the owner and manger of health care organisations. Provider and purchaser roles are therefore integrated. Universal and equal access to basic health care services is one of the main attributes of this model. Some other countries that may be listed within this category are Denmark, Greece, Italy, Czech Republic, Hungary and Poland.

The national health insurance model is also known as the Canadian model. This approach also emphasises universal and equal access to almost all standard health care services but it separates the purchaser and provider roles. Namely, health care providers are privately-owned but the provision of a national health insurance standard benefit package is publicly financed. In this case insurer and sponsor functions are integrated into a regional (provincial) single-payer institution. Hospitals are paid on negotiated budgets with a total budget cap for all provincial hospitals established by governmental authority. Physicians are also paid on the basis of fees negotiated between the government and medical societies. However, physicians generally function as independent firms. This strong governmental regulatory control on prices implies there is virtually no role for markets to set health care prices. Fee controls and capacity constraints on the provision of care have been successful in limiting cost increases through time. On the other hand, the adaptation of new technologies has a notably slower pace in Canada compared to the USA. Finland, Norway, Spain and Sweden also fall into this group (Kornai, Eggleston, 2001, p. 109; Phelps, 2003, pp. 558-560).

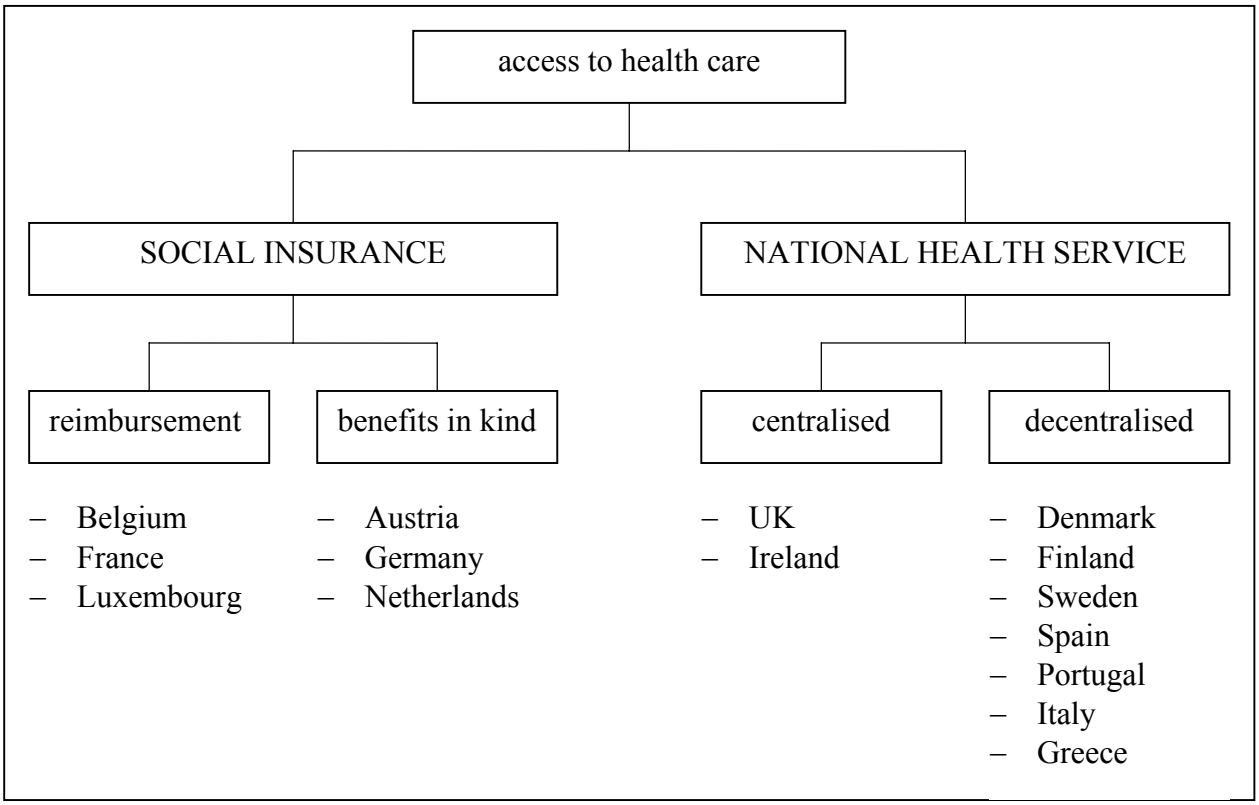
The social insurance model was first developed in Germany. This is why it is also known as the German or Bismarckian[9] model. It is also referred to as traditional sickness insurance. Initially, sickness funds hired physicians directly. Gradually, physicians were separated into 'panels' that negotiated with the sickness funds to provide care for patients. Today, sickness funds operate as non-profit entities and the membership of workers and their dependants is compulsory with a free choice of a specific fund[10]. Both workers and employers contribute to these funds. The link between sickness fund and providers, both public and private, is formalised. Public financing is therefore combined with contracting between purchaser(s) and providers. The insurance role is decentralised, the package of services guaranteed is standardised, and patients have a free choice of providers. Some other countries that can be listed in this category are Austria, Belgium, France and the Netherlands (Kornai, Eggleston, 2001, pp. 109-110; Phelps, 2003, pp. 561-562).

For EU countries any one of the national health service model, national health insurance model, or social insurance model is characteristic. Figure 4 summarises the typology of public

[9] German Chancellor Otto von Bismarck's government established a spectrum of social insurance for workers and partly their dependants in 1880.
[10] In practice, the selection of a specific fund depends on occupation and geographical region.

health care systems in the EU. Palm and Nickless (2001), however, do not differentiate between the first two approaches.

Figure 4: Typology of public health care systems in the EU



Source: Palm, Nickless, 2001, p.14

Countries such as the United States, Switzerland, Australia and Japan exhibit mixed elements of the above programmes (the mixed system model). The American model is an example of a health care system that is based on voluntary health insurance. The ownership of decentralised providers is mostly private.

The distinguishing feature of the Singapore model is its compulsory contributions to individual health care savings accounts. Providers can either be privately- or publicly-owned. In order to ensure more equitable access to basic health services, some public providers receive state subsidies.

The approach referred to as the Soviet model is characterised by the predominance of the state and its plan. This approach was a feature of the health care systems of Eastern European countries in the past. During the 1990s these countries turned from this integrated mechanism to a system that separates provision and financing and resembles the German model (Kornai, Eggleston, 2001, p. 145).

3.2.2. Organisation of health care providers

1. Privately-owned health care providers are businesslike organisations. This implies that they are organised, for example, as joint stock companies or limited liability companies. Health care providers often deliver services also as independent, self-employed professionals or private entrepreneurs.

State- or municipally-owned health care providers, on the other hand, can operate either as departments within a public authority or as legally independent entities. The latter have a similar framework as companies. Public providers in European countries are moving away from the first status to the second. Having a special legal status under 'public law' (e.g. public institutes) as opposed to 'private law' is another aspect that is becoming less common (Hall, 1998, p. 7).

2. Public enterprises can broadly be defined as including any undertaking which is owned wholly or partially by either central, regional or local government, has income related to the service provided (unlike, for example, defence or tax collection) and has its own accounts (Hall, 1998, p. 4). In public enterprises partly owned by the private sector, i.e., public-private partnerships, the public authority may remain the majority shareholder. As other shareholders are financial investors the company is clearly commercialised but the authority retains management control. The purpose of this type of commercialisation is to obtain extra finances. Private sector management can be introduced even if the authority remains the majority shareholder, but the other shares are held by the company. If the authority wants to maximise its income from the sale of shares it can hold only a minority of shares[11]. In this way the authority can still monitor the activities of public enterprises. Public-private partnerships may also take the form of functional joint ventures between public and private bodies (Hall, 1998, p. 9).

3. A physician-firm[12] can take the form of either a solo or group practice. Group practice is a more efficient form of organisation (Feldstein, 2002, p. 245). The most obvious explanation for the shift from solo to group practice is that physicians can increase their productivity and lower their costs if they take advantage of any economies of scale in group practice. Economies of scale arise and the average cost of providing services declines as a result of sharing inputs such as aids, equipment, and offices and from volume discounts on supplies (Feldstein, 2002, p. 242). Group practices can include doctors of only a single speciality or of multiple specialities (Phelps, 2003, pp. 188-189, 193). An advantage of the latter from the patient's prospective is 'one-stop shopping' for a wide variety of treatment

[11] For example, a golden share can be retained by the public authority.
[12] The typical physician-firm is also known as an office practice. It can also be referred to as ambulatory or outpatient care. However, ambulatory and outpatient care also refer to some specialised and hospital treatment settings (Phelps, 2003, p. 181).

alternatives. Multispeciality groups also have a larger optimal size than single speciality groups (Pope, Burge, 1996).

Diseconomies of scale emerge through problems of coordination, control of costs, and monitoring of work effort (Phelps, 2003, p. 189). This highlights the importance of incentives that affect either work effort or cost consciousness. Another important limitation on the scale of the physician-firm is the patient's travel time. The latter 'limits the sphere in which the physician-firm's market can meaningfully operate' (Phelps, 2003, p. 192). Studies of economies of scale attempt to determine the optimal size of practices. Such studies should not only consider practice costs but also patient travel costs. The optimal size of practice in a rural area is therefore smaller since patient travel time costs are higher given the lower population density (Feldstein, 2002, p. 242). Population size also has important implications for a physician's location decisions. Doctors respond to effective demand by locating in regions with the highest population/doctor ratio still available. The aggregate population/doctor ratio for a specific speciality corresponds closely to the size of the town that can effectively compete for a doctor within that speciality (Phelps, 2003, p. 212).

Lower average costs resulting from economies of scale are not the only factor that explains the growth of group practices (Feldstein, 2002, pp. 246-250). Informational economies of scale also exist within medical groups. Namely, it is less costly for the medical group to evaluate and monitor their member physicians than for consumers to do so. Increased market power and the desire by physicians to reduce uncertainty and share risk are other reasons for their participation in medical groups. Compared to group practice, for example, physicians in solo practice are likely to experience greater variation in workload and income. However, productivity incentives and incentives for the rational use of resources decline in a group practice setting.

Among self-employed professionals, general practitioners (GPs) play an important role. In countries with social insurance systems (e.g. France and Germany), GPs are self-employed and work under contract. In central Europe, many GPs have also become independent contractors rather than state employees. In national health care systems, GPs are either self-employed (e.g. in the United Kingdom) or salaried (e.g. in Finland and Portugal) (Groenewegen, Dixon, Boerma, 2003, p. 201). In tax-funded systems, the state has considerable control over the income of GPs, organisation of primary care, the number and distribution of primary care providers and fees or salaries of GPs. The degree of integration is of course larger in countries where GPs are salaried. However, during the last decade the scope for entrepreneurship has increased in order to improve the quality, responsiveness and efficiency of primary care. Consequently, there have been trends of a growing separation of purchaser and provider functions, and the devolution of budgets to primary care providers (Groenewegen, Dixon, Boerma, 2003, pp. 206, 209).

As Table 2 indicates the organisational features of general practice differ across EU countries. In tax-based systems, there has been a tendency to devolve budgetary responsibilities to independent primary care providers. In countries with salaried GPs, there is tendency to create a personal doctor-patient relationship by introducing a free choice of GPs and a list system. In most social insurance systems, GPs are mainly self-employed, paid on a fee-for-service basis and have no gatekeeping function. However, introducing the latter as well as personal patient lists are often advocated when considering the future role of GPs within such health care systems (Groenewegen, Dixon, Boerma, 2003, pp. 204-205, 212).

Table 2: Selected organisational features of general practice

Country	***Percentage of GPs self-employed[1]***	***Predominant payment system[2]***	***Personal list***	***Gatekeeping***
National health service				
Denmark	100	Capitation, FFS[3]	yes	yes
Finland	2	Salary	no	no
Greece	30	Salary (if self-employed, FFS)	no	no
Iceland	25	Salary + FFS (if self-employed, capitation + FFS)	no	yes
Italy	98	Capitation	yes	yes
Norway	58	FFS (if employed, salary)	no	yes
Portugal	1	Salary	yes	yes
Spain	4	Salary	yes	yes
Sweden	1	Salary	no	no
United Kingdom	99	Capitation, FFS	yes	yes
Social insurance				
Austria	99	FFS	no	no
Belgium	97	FFS	no	no
France	97	FFS	no	no
Germany	100	FFS	no	no
Ireland	91	Capitation	yes	yes
Luxembourg	98	FFS	no	no
Netherlands	93	Capitation + FFS	yes	yes
Switzerland	99	FFS	no	no

Notes:

1. This percentage was established in a European survey in 1993 and 1994.
2. If more than 25 percent but less than 50 percent has a different payment system, this is noted in brackets.
3. fee-for-service

Sources: Boerma et al., 1993; Boerma et al., 1997; Boerma and Flemming, 1998

4. Non-profit and for-profit organisations coexist in the health care sector. It is often presumed that profit-seeking organisations are more efficient in producing health care. A rationale for this hypothesis can, in a similar way as we showed in the previous section of the thesis, also be derived from property rights theory (Folland, Goodman, Stano, 2000, p. 427).

There are several theories that explain the existence of non-profits in the provision of, for example, hospital care. A non-profit organisation might emerge to provide unmet demands for public goods, especially where the provision of goods has significant external benefits (Weisbrod, 1975). In the standard economic explanation, state-owned organisations might have a role in improving market efficiency in the case of market failures such as externalities and public goods. Both cases of market failure characterise the health care sector. A complementary approach emphasises the special role of non-profit organisations in the case of contract failures (Hansmann, 1980). When, for example, quality is not easily assessed by the purchaser a for-profit health care provider may be perceived as having a conflict of interest because it can increase its profits by providing reduced quality. The interest group theory is an example of a very different approach to explaining the existence of non-profits within the health care sector (Bays, 1983). In this approach, physicians are those that prefer and advocate, for example, non-profit hospitals since they have greater power within them.

Many theories of non-profit hospital behaviour exist. Most commonly, hospitals are described as being either utility maximisers or profit maximises. The Newhouse model (Newhouse, 1970) is an example of a utility-maximisation type of model. It depicts the top hospital decision-makers as choosing a best combination of quantity and quality of care[13]. The Pauly-Redisch physicians' cooperative (Pauly, Redisch, 1973) is an example of the profit-maximising model. According to this approach the non-profit hospital is depicted as effectively making choices that serve to maximise the net revenue per physician. The Harris model (Harris, 1977) describes a non-cooperative oligopoly game. The hospital is depicted as really two firms representing the opposing interests of two principal power groups, the physician staff group and the trustee-administrator group.

These models have different implications for the nature of efficiency incentives (McPake, Kumaranayake, Norman, 2002, pp. 212-213). For example, if Newhouse's quantity and quality model applies there are incentives to technical efficiency. However, the quantity and quality objective may conflict with allocative efficiency[14]. In Harris's model, the 'trustee administrators' are likely to have some concern with technical if not allocative efficiency but the physician group may succeed in frustrating it. In the physician cooperative model, especially if fee-for-service reimbursement applies, the incentives to economise on costs will be absent. In the described non-profit health care organisations' setting, incentives for technical efficiency are therefore weak and in such circumstances allocative efficiency incentives are likely to be absent altogether (McPake, Kumaranayake, Norman, 2002, p. 213).

[13] See Section 3.4.2; this model can be used to describe non-profit firms of all kinds.
[14] For further reading see, for example, Feldstein, 2002, pp. 315-319.

3.2.3. Organisation of payers

1. When looking at the entities that pay for health care services four sources of funds used to pay health care providers can be outlined (Kornai, Eggleston, 2001, pp. 74-76). First, health care can be financed by the state through the budget, from tax revenues. Second, in the case of compulsory insurance purchases are made out of a special extra-budgetary fund with special sources of revenue, usually contributions made by both employers and employees. Compulsory health insurance[15] may be provided by one national, monopoly institution, by a set of regional monopoly insurers, or by a decentralised system of insurance companies that compete for enrolees. A third source of health care funds is voluntary health insurance. The fourth source is direct payments made by individuals, i.e., out-of-pocket payments. In 2000, out-of-pocket payments were around 10 to 20 percent of total health care expenditures in most Western industrialised countries (Co-payments for health care, 2003).

2. When the role of payer is performed by the government or a state-owned institution, the degree of decentralisation of this activity is also an interesting issue. Function-specific decentralisation ratios[16] are obtained by calculating the sub-national[17], i.e., sub-central, expenditures by function as a percentage of total government expenditures by the same function (Osterkamp, Eller, 2003a, pp. 36-37). For health expenditures, differences in the degree of decentralisation between OECD countries are quite remarkable. At over 95 percent they are highly decentralised in Canada and Denmark, while the decentralisation degree is very low in France, Luxembourg, the Netherlands and the United Kingdom. Analysis of the relative importance of sub-central expenditure categories (sub-central health expenditures as a percentage of total sub-central expenditures) gives a clearer characterisation of functional decentralisation. On average, countries concentrate their sub-central expenditures on education, social security and health. For health expenditures the average share is 15.4 percent. Although health is clearly an important expenditure category for sub-central levels, generally moderate health-specific decentralisation ratios (with the exceptions of Canada, Denmark, Russia, Norway and Spain) show that the central level is strongly involved in this activity (Osterkamp, Eller, 2003a, p. 38).

3. The organisation of payment systems is another interesting area. Within pay-as-you-go systems yearly expenditures are paid for with either contributions or tax money collected in the same year. Two main features characterise these types of systems. First, no savings or reserves are built up for the future and, second, this type of financing is an instrument for the redistribution of income between sub-groups of the population. Redistribution of income is

[15] What is referred to as health insurance is actually medical care or health care insurance. It offers insurance against the risk of payments for medical or health care services that usually cannot restore full health but can reduce suffering or prolong life (Kornai, Eggleston, 2001, p. 52).
[16] Degrees of decentralisation can be looked at by functional categories, i.e., types of expenditure (e.g. health, defence, education, social security and welfare etc.).
[17] state (federal countries), regional, provincial or local

not only created because the working population supports the elderly and the sick but also by, for example, the fact that people below a particular income threshold contribute less to the funding of yearly health expenditures. Contributions and taxes are therefore clearly not risk-based premiums and this is why the separation between allocation (insurance) and distribution (redistribution) either does not exist or is inefficient in health care (Buchholz et al., 2001). A large degree of redistribution means a lack of the market-oriented benefit principle (Wille, 2000).

The described redistributive mechanism would not need the accumulation of a capital stock for future expenditures in strong economies with a large enough working and young population. In times of population ageing, rising unemployment and economic stagnation pay-as-you-go systems are reaching their limits. This especially holds true for systems financed through employer and employee contributions as any increase in them creates wage issues. This increase also raises the issue of new and broader tax bases for social security contributions. In such circumstances, capital funding can be considered an alternative. Table 3 provides an overview of the two schemes (Henke, Borchardt, 2003, pp. 4-6).

Table 3: Pay-as-you-go versus capital-funded insurance systems

Pay-as-you-go systems	***Capital-funded systems***
Balance of revenues and expenditures of the total collective per period, no funding	Equivalence of per capita premiums and benefits over the life cycle
Combination of insurance (allocation) and redistribution	Separation of insurance (allocation) and redistribution
No need to accumulate stock	Capital stock must first be accumulated
Intergenerational redistribution due to demographic changes	More independence of demographic trends
Not affected by inflation	Capital stock subject to inflation (risk reduced when funds are international)
Strong economic position of social insurance carriers	Capital in hands of insurance companies represents market strength and investment potential
Low administrative costs	High administrative costs

Source: Advisory Council for the Concerted Action in Health Care, 1997, p. 63

Within a capital-funded system reserves or savings are accumulated in younger ages for future provision. This means that, from an intergenerational point of view, each generation finances itself. This implies, compared to pay-as-you-go systems, more independence of demographic trends. These can, however, affect the stability of capital-funded systems. Namely, the neoclassical model implies that a decline in the number of active workers will lower the capital productivity in relation to the labour force. Consequently, interest rates could fall and negatively affect the savings of health insurers (Senjur, 2001, pp. 131-139). The fact that

capital stock is subject to inflation or can be lost as a result of stock market depression or collapse is another more realistic and disconcerting possibility. Nevertheless, capital funding can have a positive effect on economic growth through a higher real savings ratio and investments (Henke, Borchardt, 2003, pp. 6-7).

4. In the European Union statutory health care systems are characterised by mandatory participation, near universal coverage and the provision of comprehensive benefits. These characteristics contribute to high levels of public health care expenditure and also determine the scope and size of the voluntary health insurance market (Mossialos et al., 2002, p. 2). However, with increasing pressures from the demand side health care services are getting harder and harder to finance. In some cases, the gap can be bridged by raising taxes or contribution levels. Nevertheless, cuts in state welfare spending and an increase in private financing will eventually become inevitable (Kornai, Eggleston, 2001, p. 42). As the American health care system shows, the expansion of voluntary health insurance does not automatically result in reduced levels of public health care spending or increased levels of coverage (Mossialos et al., 2002, p. 9).

In the EU context, voluntary health insurance can be substitutive, complementary or supplementary (Mossialos et al., 2002, pp. 2-3). Substitutive voluntary health insurance substitutes for cover that would otherwise be covered by compulsory health insurance. This implies that substitutive voluntary health insurance is limited to specific population groups (e.g. high-earners or the self-employed). Levels of this type of voluntary health insurance range from 0.2 percent of the population in Austria to over 24 percent in the Netherlands. Complementary voluntary insurance provides complementary cover for services either excluded or not fully covered by compulsory health insurance. This type of voluntary health insurance can therefore also provide cover for the reimbursement of co-payments. In member states where complementary voluntary health insurance predominates, levels of coverage range from 20 to 70 percent of the population. However, with the exception of France, the market for voluntary health insurance to cover co-payments is not substantial. Increased consumer choice and faster access are provided by supplementary voluntary health insurance and in the EU it generally covers around 10 percent of the population. People who purchase supplementary health insurance mostly come from higher income groups. It is important to note that voluntary health insurance does not play an important role in the EU. With the exception of France and the Netherlands, voluntary health insurance accounted for less than 10 percent of total health care expenditure in 1998.

3.2.4. The effect of organisational features on achieving efficiency in health care

Considering that the fulfilment of efficiency conditions in production is conditional on: (a) the existence of the profit motive; and (b) given, non-discriminatory prices two areas that certainly have important implications for efficiency are organisation and management. Inefficiency can arise in relations between suppliers and the labour market on one hand, and

providers on the other, that result in input prices that are not perfectly competitive and are thus not equal for all health care providers. In such circumstances the efficient outcome implied by the first Pareto efficiency condition in production (see Section 2.1.) is not achieved. Consequently, providers do not minimise their costs. This efficiency condition is also part of the second efficiency condition in production that defines the optimal size of health care providers. The absence of the profit motive results in a violation of the third Pareto efficiency condition in production as well. The latter requires that the product mix selected be such that the quantities of goods produced using all inputs available to the economy are maximised. This efficient outcome requires the rational, i.e., profit-maximising behaviour of health care providers.

We can therefore hypothesise that inefficiency in health care arises due to the inappropriate management of labour and other inputs, inappropriate amount of production factors allocated to individual health care providers, i.e., their non-optimal size, inefficient organisation of the production process that does not minimise costs and also due to the supply of such quantities of health care goods and services that do not accommodate patients' demand and preferences.

All these are cases of allocative inefficiency that arises due to the absence of the profit motive and appropriate input and factor prices and prices of health care goods and services.

Inefficiency in health care can also occur in consumption. This implies that the Patero efficiency condition that refers to efficiency in consumption is violated. This violation emerges either because the prices of health care goods or services are not equal for all patients or because the patient's choice of providers is not entirely free.

Both violations are possible because some general ethical principles apply to health care. Fairness and accessibility are, alongside quality and efficiency, two important principles that provide the answer as to which point on the contrat curve should be selected (Kornai, Eggleston, 2001, pp. 15-24). However, these two principles create room for intermediaries, i.e., payers, between health care providers and patients. The role of payer can be performed either by the state budget, compulsory insurance funds or private voluntary health insurers. In any of these cases the payer's task is twofold. First, to offer insurance against the risk of payments for health care services and spread the risk among high- and low-income population groups and high- and low-risk individuals. Second, to accumulate reserves or savings in younger ages for future health care provision.

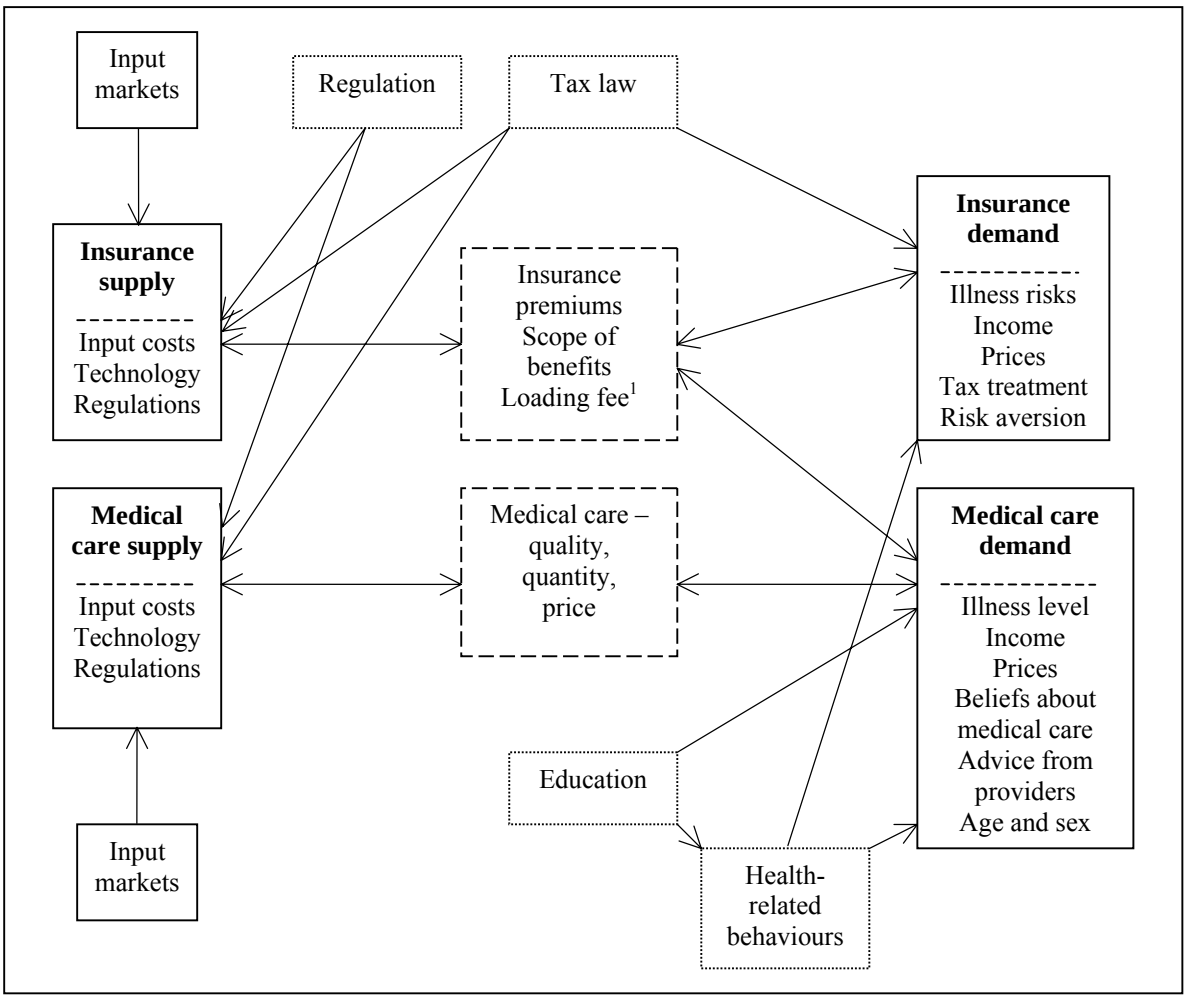
This is why the patient is often not faced with undistorted relative prices of goods and services that are determined by the marginal cost of production (in some cases prices do not even exist) and are limited when adapting their demand to these relative prices and seeking their equilibrium as consumers of health care goods and services. This is why there is only a limited possibility for the efficient outcome implied by the Pareto condition for efficient consumption to be achieved in health care.

Further, with the existence of intermediaries, i.e., the payers, certain issues of their ownership structure and private ownership as well as their efficient organisation and management call for careful consideration.

3.3. Market, competition and efficiency in health care

One feature differentiates health care from most other markets. Namely, the price the users of medical services pay is different from the price health care providers receive. This happens due to health insurance, which lowers the relevant price of medical care for decision-making by the user. This implies that the analysis of medical markets should link the supply and demand for medical care with the supply and demand for health insurance. Figure 5 shows how these (and related) markets interact (Phelps, 2002, p. 29).

Figure 5: The interaction of medical, health insurance, and other markets



Note:

1. The premium is the sum of average benefits plus a charge for administration, sales, and risk-bearing (the load): Premium = (1+loading fee)*(expected benefits)

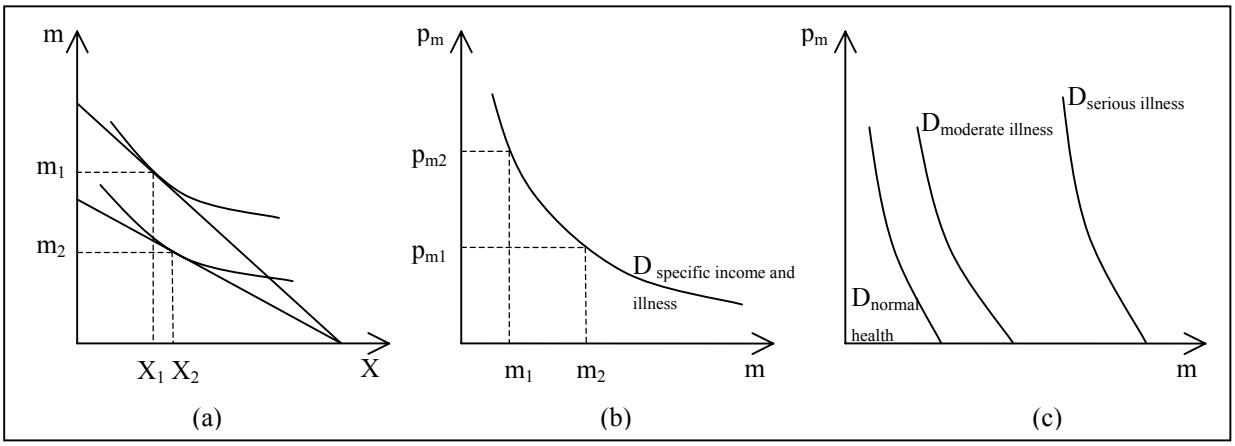
Source: Phelps, 2002, p. 30

3.3.1. Demand and supply of medical care

The health care market, like any market, is characterised by the interaction of supply and demand for medical services. As Figure 6 shows, the demand for health care is determined by both non-economic (e.g. illness level, age, sex etc.) and economic factors (patient's income, price of medical care, price of substitute and complementary services, type and comprehensiveness of insurance coverage, advice from providers etc.).

1. Demand for medical care can be constructed in the same way as demand for any other commodity. Figure 6 indicates this shift from indifference curves, showing how various combinations of health (*H*) and other consumption goods and services (*X*) create utility, to demand curves. The latter show how the desired quantity of medical care (*m*) changes with its price (p_m). Demand curves for medical care also depend on illness events (Figure 6c). The bigger the illness event, the flatter the indifference curves in Figure 6a become. As the slope of indifference curves flattens, the point of tangency occurs at a larger level of *m*, given a constant slope for the budget line (i.e. unchanged relative price). Therefore, people who are seriously sick will demand more medical care (Phelps, 2002, p. 109).

Figure 6: The demand for medical care



Source: Phelps, 2003, pp. 107-109

When looking at demand for health care the question of whether health care can be considered to be the same as other products and services arises. Health is a characteristic of an individual rather than a product. This also implies that health is in some way like a capital good. If individuals invest in their health, they are more likely to remain healthy. Health-damaging behaviour on the other hand can result in the poorer health of an individual. There are several features that also characterise the health care decisions of users. One obvious example is the fact that some health care services are used when we are very ill and thus when we may be unable to make sensible decisions. Another feature of, for example, our need for health care is that we seldom know in advance what we will need, when that need will occur and how much we will need. Another problem is timing. Namely, when we are younger we are least likely to

need health care, but most likely to be able to afford it. It is also important to highlight the uncertainty of the effects some interventions have for any individual (McPake, Kumaranayake, Normand, 2002, p. 12, 19). All these uncertainties affect demand for health care. 'In essence what we want to buy is access to care should we need it' (McPake, Kumaranayake, Normand, 2002, p. 19).

The evidence suggests that in general demand for health care is price inelastic (McPake, 1993). However, the evidence also shows that the demand of people with lower incomes is more elastic than the demand of wealthier population groups. Studies on income elasticity show that demand for health care is income elastic. This also explains why wealthier countries spend a higher proportion of GNP on health services (McPake, Kumaranayake, Normand, 2002, p. 25).

There is a divergence between private and social demand. There are three sources of this divergence (McPake, Kumaranayake, Normand, 2002, pp. 186-187). First, values derived from demand curves are determined not only by willingness but also the ability to pay. Because poor population groups, for example, suffer most from communicable disease they place high relative values on immunisation. However, due to their low ability to pay they express only a low level of demand in the market. Second, a lack of information influences the way individuals value and order their demands. Due to a lack of information individuals may place high value on interventions that have limited effectiveness. Third, there are important externalities in the health sector. Individuals' valuations of their own benefits usually do not take into account the benefits received by others. The relative positioning of private and social demand curves vary. Private demand for immunisation, for example, is likely to lie to the left of the social demand curve. The opposite may be true of the services of CT scanners.

2. Supply is affected by the price and the cost of producing medical services. Supply-side power and situations close to monopoly are quite common in the health sector. 'This is partly a natural result of the scale of production that high-technology services may entail' (Kornai, Eggleston, 2001, p. 62). It may not be reasonable, for example, to have more than one hospital in a smaller community. Supply-side power is unfortunately also frequently the result of less desirable forces such as, for example, efforts by health care providers to limit competition artificially for the financial benefit or cartelisation of insurance companies within a decentralised insurance system (Kornai, Eggleston, 2001, p. 62).

3.3.2. Demand and supply of insurance

Factors that affect the aggregate demand for health insurance include the price of insurance, the probability and magnitude of loss, and the income and risk-aversion of the user of medical services. The market structure, on the other hand, is determined by economies of scale, entry barriers, whether any insurers have cost advantages over other insurance organisations, and

whether there are regulations inhibiting competition among insurers (Feldstein, 2002, pp. 175-179, 195).

Even though health insurance can be structured in numerous ways some typical features such as co-payments, deductibles and upper limits on coverage can be outlined. Health insurance is usually structured in such a way that it reduces the price users pay for medical care at the time they purchase it. This produces a side-effect of increased medical care use (Phelps, 2002, pp. 114-115).

As shown in more detail in Section 3.4.2., increased insurance coverage (i.e., lower co-insurance rate) causes a shift in the demand for medical care and demand curves become less elastic. This results in the greater use of medical services. The actual price the user must pay and the amount actually consumed depends on the elasticity of both demand and supply. The more elastic demand and supply are, the greater the increase in quantity and the less the increase in price (Feldstein, 2002, pp. 111-114).

When competing for the insured population insurance organisations realise that population groups have different levels of risk. If the insurance company is unable to distinguish between high and low risks it may lose money due to adverse selection (Feldstein, 2002, pp. 137-139).

The intrinsic stability of the health insurance market is another interesting question (Phelps, 2002, pp. 334-336). As shown in Section 3.4., one problem that can seriously affect the stability of insurance markets is the problem of 'self-selection' or 'adverse selection'. In a competitive market, if the insurer could identify healthy and sickly people accurately it would offer insurance plans that charged a higher premium to sickly people. As Figure 7a shows, given equilibrium market prices, the healthy person would be charged a lower premium than the sickly person at every coverage level (1-C), hence the budget line[18] for sickly people (I_S) is lower than the budget line for healthy people (I_H). The latter are therefore persons with a higher effective income.

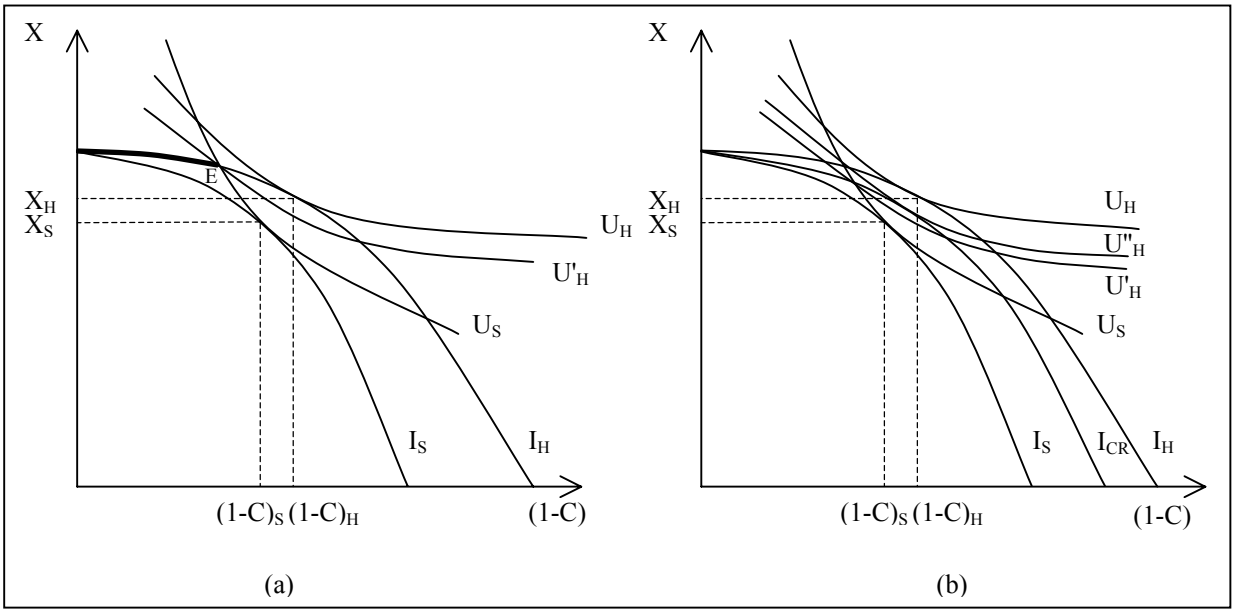
In reality, differences in peoples' propensity to get sick are not easily observable. In such circumstances the sickly people would try to buy insurance along the budget line that was intended by the insurer for healthy people. To prevent this, the insurer will offer only low-coverage plans at 'healthy-persons' prices. These are plans that create less utility to sickly people than the optimal plan for the sickly people along the I_S budget line (Phelps, 2002, pp. 337-338). In Figure 7a, this is shown by a boldface line. Once such a constraint is placed by the insurer, sickly people will therefore prefer to buy the plan where the indifference curve U_S is tangent to the budget line I_S. In other words, high-risk people self-identify themselves. The

[18] The budget line shows market-available tradeoffs between buying insurance coverage (1-C) and other goods (X). The budget line is concave because as C falls, i.e. coverage increases, the insurance premium increases more than proportionally. This is due to the fact that the insurer pays for more of the health care bill and also due to the effects insurance has on the demand for care.

low-risk person will also buy the plan that provides the maximum possible utility. Given the constrained choice set, this plan is shown in Figure 7a by point E, providing utility U'_H. Due to incomplete information the low-risk, i.e. healthy, individual is worse off since this person can achieve utility U'_H which is lower than the amount achievable if the insurer could accurately identify healthy and sickly people (U_H).

One alternative solution is to introduce a 'community rating' for insurance (Phelps, 2002, pp. 337-338). A range of insurance plans can be offered, but by law they need to be offered at the same price to the entire community (budget line I_{CR} in Figure 7b). In a regulated insurance market the outcomes are somewhat different than those described above. The optimal insurance plan for healthy people now allows them to achieve utility U''_H. Since I_{CR} lies close to I_H[19], U''_H offers more utility than U'_H (derived in the same way as in Figure 7a) and healthy people are made better off by the mandatory community rating. The same holds true for sickly people. Namely, as they face the budget line I_{CR}, they shift to a higher indifference curve, thus to more coverage at a lower cost (this is not indicated in Figure 7b). Both healthy and sickly people are made better off by the community rating which makes the community rating Pareto superior. It is however true that healthy people can be made even worse off than in the case shown by Figure 7a if the budget line I_{CR} lies close to I_S.

Figure 7: A simple model of selection and self-identification



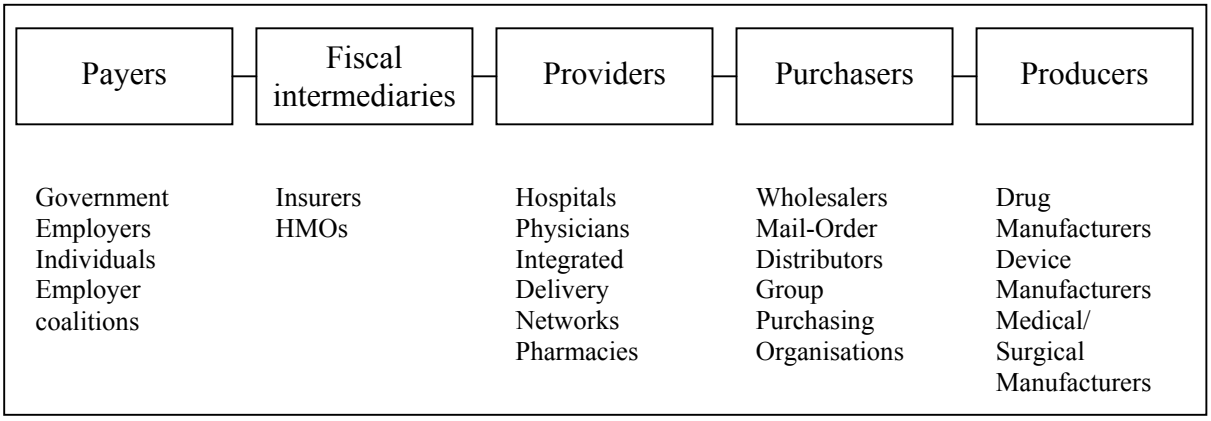
Source: Phelps, 2002, pp. 337-338

3.3.4. Competition

[19] The relative location of I_{CR} between I_H and I_S depends upon the relative mix of health and sickly people in the community.

1. The term 'value chain' refers to the entire production chain from the input of raw materials to the output of the final product consumed by the end user. Each link in the chain adds some value to the original inputs – hence the name value chain (Porter, 1980). As shown in Figure 8 there are three major players at various stages of the health care value chain: producers of health care products (e.g. manufacturers of pharmaceuticals and devices); purchasers of these products (e.g. group purchasing organisation, wholesalers, distributors); and the providers who utilise them in institutional settings (e.g. hospitals, physicians etc.).

Figure 8: Health care value chain



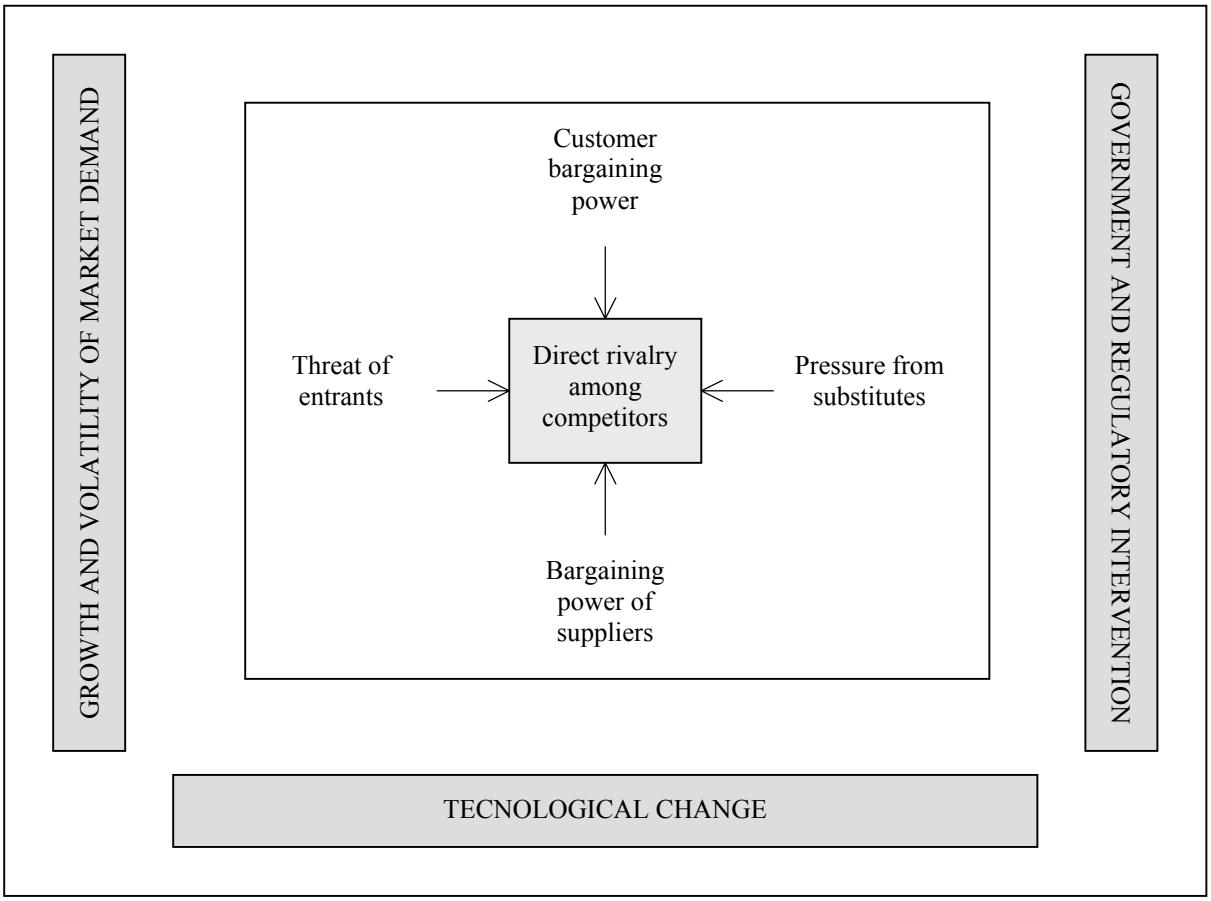
Source: Burns et al., 2002, p. 4

The purpose of health care value chain analysis is not only to profile these key players but to identify the strategic and competitive issues they face. This contributes to the understanding, for example, of the sources of efficiency in contracting between suppliers and providers and of the bases of cooperation and competition along the value chain. This implies that value chains are supposed to be collaborative partnerships. Through coordinated planning of production and distribution the aim of these partnerships is to create the lowest-total-cost solution that meets the customer's needs (Burns et al., 2002, pp. 3-10).

In health care, there are organisations operating at each stage of the chain (Figure 8). However, within health care the abovementioned coordinated efforts among key players, strategic alliance formation, knowledge sharing and competing value chains oriented to delivering greatest customer value at lowest cost are insufficient. Several reasons contribute to this situation. First, product demand is based on the clinical preference of physicians and cost-benefit analysis and budgetary constraints are not given sufficient emphasis (especially in the case of a fee-for-service payment). Predominant non-profit ownership has in part also contributed to the latter. Second, the health care industry is characterised by fragmentation that is coupled by decentralised decision-making and decentralised provider systems. Third, providers have historically invested in patient care rather than, for example, information systems. Within health care, information on the value or cost added at each link of the value chain is therefore severely lacking. All these factors imply that the analysis of the health care industry does not usually rely on the value chain framework. Instead, such an analysis can rely on the 'Five Forces' framework (Porter, 1980) that emphasises competitive rivalry,

supplier and customer (user) bargaining power, and the threat of new entrants and product substitutes (Burns et al., 2002, pp. 11-16).

Figure 9: Porter's Five Forces



Source: Porter, 1980, pp. 4, 187

2. In health care, competition can appear in five areas (Phelps, 2002, p. 30). There is the relation of health care providers to the buyers-users of their goods, the relation among providers themselves, the relation between health care providers and suppliers, the relation between health care providers and organisations of health care insurance, and competition among health care insurers. The existence of competition in these five areas also means the possibility of the existence of a market within the health care system.

The health care sector is characterised by imperfect competition irrespective of whether it is under state or private ownership. In order to prevent the emergence and exploitation of monopoly in all five areas in which competitive relations occur in the health care system, the introduction of private ownership is crucial. As long as there is only one owner of all health care organisations, i.e., the state, competition cannot be expected. The state is the largest monopolist. Privatisation is thus a condition for the creation of a market within the health care system (Tajnikar, Došenovič, 2003). There must also be competition so that citizens can choose. This enables the sovereignty of the individual which is, alongside solidarity, an important ethical principle (Kornai and Eggleston, 2001, pp. 24-28).

1. Of particular interest is the relation between users and health care providers (Tajnikar, Došenovič, 2003). With a larger number of providers of individual types of health care services or products, among which competitive relations exist, there would be a free choice of provider by the user even if financing is by compulsory health insurance. The principle 'money follows the patient' also creates competitive relations between providers and users.

2. If there is a shortage of doctors and other health care professionals, the free choice of providers is limited and the degree of competition in the labour market is fairly low. In this context, the question emerges of how the physician decides to supply labour to the market. The initial decision to become a physician and the decision to specialise are important. These decisions are clearly influenced by factors such as the opportunity cost of entering medical school and the rate of return on speciality training (Phelps, 2002, pp. 194-205). Decisions about the number of hours of labour supplied are usually studied within a basic income-leisure framework. Other arguments such as workload, ethical constraint on inducement behaviour, patients' welfare, the interests of society, doctors' reputation and status, intellectual satisfaction and practise characteristics can also be included in the physician's utility function (Scott, 2000, pp. 1184-1185).

The establishment of barriers to entry can provide physicians with a greater rate of return. However, a physician can earn even greater returns if price discrimination is possible (Feldstein, 2002, pp. 387-391). As conditions for price determination are quite easily met in the physician sector[20], price discrimination can be expected to occur. There is, however, an alternative explanation of such pricing behaviour. Namely, differences in prices charged for the same services to different patients are due to the physician acting as a charitable agency, i.e., charging more to individuals with higher incomes and less to those who cannot afford as much. Insurance also plays a role in the ability of physicians to engage in price discrimination (Feldstein, 2002, p. 392).

3. Providers possess a near monopoly in the choice and use of products for treatment supplied by, for example, drug and device manufacturers. The current shift to consumerism and increased awareness of patients limits the provider's free choice of health care products (Burns et al., 2002, p. 419). Public official invitations to tender and joint purchases, especially when made by public institutes, break up the monopolies of suppliers. However, they can also result in an unattractive monopsony[21].

In the USA, for example, group purchasing organisations[22] (GPOs) develop purchasing contracts and negotiate lower unit prices with product and non-labour service vendors for their members (e.g. hospital networks, physician groups, nursing homes etc.) in many areas.

[20] Cartel-like organisations like medical societies contribute to this.
[21] The 'white paper' supports and encourages joint purchases within the health care sector (Zdravstvena reforma 2003, p. 205).
[22] There are more than 600 group purchasing organisations (GPOs) in the US health care industry (Health Industry Group Purchasing Association, 2003).

Joint purchasing of supplies and services enables hospitals to exploit economies of scale and therefore generate savings that can be directed to labour services and the delivery of patient care (Burns, 2002, p. 62). All types of health care organisations use group purchasing. Nearly every hospital in the US (approximately 96 to 98 percent) chooses to utilise GPO contracts for their purchasing functions. Overall, about 72 percent of purchases that hospitals make are done using GPO contracts. GPOs save hospitals and free-standing nursing homes between 10 to 15 percent of their purchasing costs. Additionally, they provide valuable cost-avoidance savings to health care providers by helping them standardise and streamline their purchasing, as well as reduce the number of non-clinical staff employed to negotiate purchasing contracts. GPOs therefore give health care providers the ability to use fundamental economic principles to reduce the cost of purchasing products and improve the quality of care (Health Industry Group Purchasing Association, 2003).

4. Access to the funds of insurance companies, especially compulsory health care insurance companies, through tender offers, together with an increased number of health care providers, establishes competitive relations between insurance companies and providers (Enthoven, 1985). Relations among health care value chain players have also been characterised by consolidation. In the US, for example, hospitals have horizontally integrated into systems and networks to deal with large managed care organisations (Burns et al., 2002, p. 420). Many managed care organisations rely on a careful selection of providers in order to control the costs of care. One study (Zwanziger, Melnick, Bamezai, 2000) developed measures of competition among hospitals and measured the rate of cost growth and how it changed due to the introduction of selective contracting. The study shows a strong negative relationship between the degree of competition and the rate of cost growth after selective contracting was introduced. It is however true that, in addition to treatment costs, the quality of care also affects the choice of providers (Mukamel, Mushlin, 1998).

5. Competition for the insured population among insurance organisations takes place on the basis of both price and product differences (i.e., price and product competition). The product can differ according to characteristics such as type of coverage, demand-side cost-sharing arrangements, methods of claims payment, reputation for payment of claims etc. Another important factor affecting the competition and performance of the health insurance market is whether suppliers of medical services place restrictions on an insurer's ability to purchase medical services and on the sale by insurers of certain types of insurance products. Cost containment methods such as, for example, utilisation review and a review of the length of stay may be opposed by physicians due to the fact that the physician's decision-making authority is subject to review (Feldstein, 2002, pp. 175-179, 195).

3.3.5. Primary care and competition

The market for physician services, like any market, is characterised by the interaction of supply and demand for physician services. The latter is determined by both non-economic

(e.g. need, cultural-demographic factors) and economic factors (patient's income, price of medical care, price of substitute and complementary services, type and comprehensiveness of insurance coverage, time costs involved in the purchase and use of physician services) (Feldstein, 2002, pp. 239-242). The supply is affected by the price and the cost of producing physician services. The cost depends on input productivities and input prices, which are determined by the number of physicians, the number of hours they work, the capital and equipment available, other health manpower, and other inputs and expenses required for the provision of medical services. The relationship of prices to costs is a measure of how well a market for physician services performs. In relatively competitive markets, costs are minimised and prices approximate costs. On the other hand, in monopolistic markets prices may greatly exceed the cost of service provision (Feldstein, 2002, pp. 239-242).

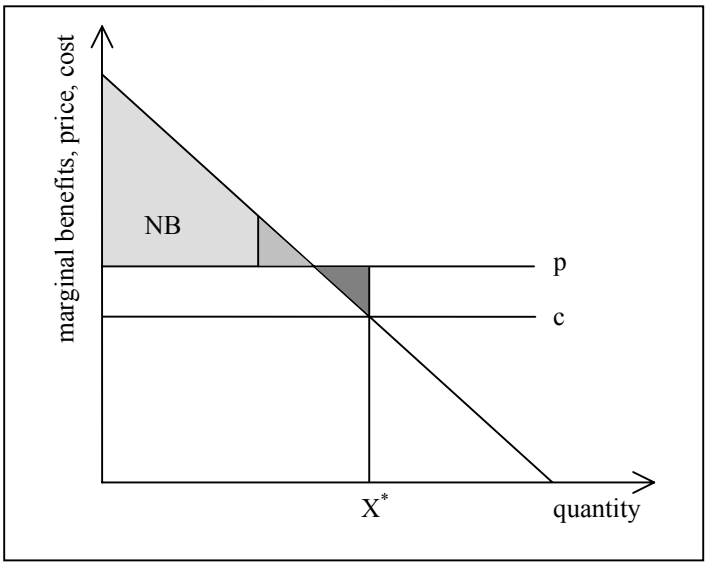
The process by which patients and doctors get matched with one another cannot be analysed in the context of purely competitive markets. The dispersion of prices seems far too large to correspond to quality differences, neither physicians nor their services are homogenous and there are real and perceived differences in their quality, doctors seem to face a downward-sloping demand curve for their services and there is also a widespread belief that doctors use price discrimination (Pratt, Wise, Zeckhauser, 1079; Kessel, 1958: Feldstein, 2002, p. 251). The physicians' service market is therefore described more accurately by the model of monopolistic competition (Phelps, 2002, p. 220). To analyse market behaviour the concept of consumer search is also employed in conjunction with the monopolistic competition model. The more the users of medical services in a market engage in the search for a 'better' doctor (improved quality, price, or both), the closer the market comes to being purely competitive. Monopoly prices are the other extreme outcome, emerging when nobody engages in such a search. Insurance also plays an important role in this context. First, due to insurance demand curves become less elastic and the price dispersion and average prices may increase. Second, insurance may change the incentives for patients to search. Other features such as, for example, density of doctors (Pauly, Satterthwaite, 1981) and value of patients' time (DeVany, House, Saving, 1983) also affect the incentives for patients to engage in this search. One way to increase the search in any market is to reduce the cost of information (Phels, 2002, p. 231). Advertising for professional services, for example, although highly controversial in health care[23], might reduce the costs of providing information to consumers.

Information also plays an important role in the interaction of physicians and patients. More precisely, in physician-patient relationships doctors have an informational advantage and the key question is how doctors use this informational advantage. The price-setting power (presumed by the model of monopolistic competition) also interacts with the possible ability of doctors to induce demand, i.e., to shift demand curves outward[24]. To date, numerous studies have dealt with this issue[25]. Recent modelling of induced demand looks at the

[23] That is why it was prohibited by many countries for years.
[24] See, for example, Feldstein, 2002, pp. 255-262 or McPake, Kumaranayake, Normand, 2002, pp. 50-51.
[25] The idea of demand inducement was given a prominent boost by Evans (1974) and Fuchs (1978).

physician's quantity-setting choice in a different way. Such a model leaves the consumer's demand preferences intact (rather than having them shifted by the physician, as in earlier descriptions of this behaviour) but allows the physician to limit the quantity choices of the consumer. In the McGuire model (McGuire, 2000), for example, a physician attempts to maximise profits from each patient but is constrained by the minimum net benefit desired by the patient for a medical encounter. This puts a cap on the ability of the physician to extract consumer surplus from the patient. Figure 10, for example, shows a patient who comes to the doctor with a certain value of net benefit that must be reached (*NB*). The doctor selects a price and quantity that maximise profits, while preserving the minimum net benefit for the patient. This is done by raising the price (to *p*, which exceeds unit cost *c*) and 'requiring' the patient to consume quantity X^*.

Figure 10: Setting price and quantity with a net benefit constraint



Source: McGuire, 2000, p. 480

Compared to the hospital sector, the market for primary care is less plagued by market and contractual failures. Extensive capital investment is not required, the concentration of supply is low and the problem of low market contestability therefore does not apply, while information asymmetry is less consequential than in other health care services. There may thus be better prospects for competition than in other sub-sectors of health care (e.g. hospitals, pharmaceutical laboratories etc.) (Rico, Puig-Junoy, 2003, p. 86).

3.3.6. The effect of market characteristics and competition on achieving efficiency in health care

Characteristics of health care markets show that in health care several obstacles exist that prevent either the existence of the market or its efficiency. As it has been assumed that the market and perfect competition are the basis for economic efficiency of the economy this also implies that inefficiencies characterise health care even if we do not assume the presence of

market failures that prevent the achievement of efficiency even in conditions of perfect competition.

However, inefficiency in health care does arise when private costs and benefits do not coincide with social costs and benefits and this can be due to the existence of the information problem, public goods and externalities. We can therefore suppose that inefficiency in terms of the violation of the Pareto efficiency condition that implies equality between the marginal rate of substitution and the rate of product transformation arises in health care as a result of: (a) asymmetric and imperfect information between health care providers and patients; (b) the problem of adverse selection of payers; (c) goods and services with the nature of public goods produced in such quantities that are inappropriate given the needs of society as a whole; and (d) violation of the optimal size of health care providers and efficient level of consumption when externalities exist in the provision of health care.

It has been established that inefficiency in health care also occurs due to the absence of market and competition. We can therefore assume that the problem of inefficiency arises as a result of the monopoly power of suppliers, conditions in the labour market and the fact that market for health care goods and services does not exist.

This, in turn, necessitates the existence of other elements that either substitute or complement the market for health care:

(a) Market forces and a lack of a more prevailing profit motive in health care can be substituted or complemented by a system of demand-side and/or supply-side incentives. The purpose of the latter is to stimulate efficient management and cost minimisation. This is achieved mostly through different payment or reimbursement schemes of providers. It can therefore be concluded that the appropriate system of incentives plays a crucial role in achieving efficiency within health care.
(b) Absence of the market, the existence of divergence between private costs and benefits and social costs and benefits and the application of some general ethical principles to health care also call for the regulatory role of the state. In order to follow these principles the state must regulate the amount, mix and quality of output and the organisation of payers. Due to the absence of the market and undistorted relative prices it must regulate the allocation of health care resources. Regulation of the amount, mix and quality of output and allocation of inputs is also needed due to the presence of imperfect and asymmetric information, externalities and public goods.

3.4. Incentives in health care and efficiency

3.4.1. Rationale for the system of incentives in health care

Incentives can only be understood within a principal-agent framework (McPake, Kumaranayake, Normand, 2002, p. 166). Within the health care system agency relationships

arise between various parties. These are health care providers, patients, organisations that finance health care, and sponsors.

There is a variety of factors that contribute to the decisions or behaviour of agents being sub-optimal from the viewpoint of principals[26]. These factors include asymmetry of information, moral hazard and adverse selection. Information asymmetry depicts a situation in which agents have information that is not fully available to principles. One party to a transaction therefore has more information than the other. In the market for health insurance, for example, it is often the insured, i.e. the demand side, who has more information regarding the current and future state of their health. In the allocation of medical care, health care providers, i.e., the supply side, possess more information about the costs and benefits of treatments (Kornai, Eggleston, 2001, pp. 54-55). Information asymmetry can also arise between the insurers and users of medical services. For example, voluntary health insurance markets can be characterised by a high level of product differentiation. Variability and complexity of voluntary health insurance products creates an asymmetry of information[27] (Mossialos et al., 2002, pp. 4-5; Rico, Puig-Junoy, 2003, p. 84). Moral hazard is most often applied to insurance situations. 'If insurance coverage is comprehensive, important incentives for preventing and restricting damages are absent' (Felder, Werblow, 2003, p. 43). As the coverage provided by the insurer increases, the incentives for the insured to avoid trouble or minimise the loss weaken and as a result the insured pressures both the providers and insurers to spend more[28]. The effect of providers in limiting the costs of care depends on how they are remunerated for their services. This again highlights the importance of incentives for participants in the process to pursue efficiency (Kornai, Eggleston, 2001, pp. 59-62). As the price for insurance is based on the average expected loss of the insured, an information asymmetry between the insurer and the insured can also lead to adverse selection. Adverse selection results in a biased sample of those who purchase health insurance. Namely, predominantly more high-risk individuals purchase insurance based on a lower-risk group's premium (Feldstein, 2002, pp. 137-139). This tendency gives insurers an incentive to discourage the enrolment of high-risk individuals. This is known as risk selection or cream-skimming (Kornai, Eggleston, 2001, pp. 58-59).

There are ways to reduce the principal-agent problem. Principals can, for example, carefully monitor the performance of their agents and can create incentives for the agents to act in desired ways (Griffiths, Wall, 2000, pp. 215-217). Informational asymmetries can be dealt with by applying incentive-compatible contracts (Felder, 2003, p. 15). Agency relationships are therefore governed by contracts that can be either explicit or implicit. Due to opportunism,

[26] One example of a specific type of agency imperfection is supplier-induced demand (McPake, Kumaranayake, Normand, 2002, p. 50).

[27] This can be mitigated by the use of standardised terms, the existence of a standard benefits package, accessible sources of comparable information on price, quality and conditions of voluntary health insurance products etc. (Mossialos et al., 2002, p. 5).

[28] Overuse of medical services does result in increased costs of supplying insurance (e.g. increased contributions in the case of compulsory social insurance) but patients rarely recognise the connection between their own spending and a general increase in premiums.

which refers to seeking self-interest with guile, and particularly bounded rationality, which suggests that it is impossible for all contingencies to be foreseen and accounted for, contracts cannot specify all relevant possibilities which affect the contracting parties (McPake, Kumaranayake, Normand, 2002, pp. 49, 125-134). This leads to an important conclusion. Because health care is governed by imperfect agency and a contractual relationship cannot overcome the principal-agent problem the appropriate specification of the system of incentives is crucial from the aspect of health care efficiency (Laffont, Tirole, 1993). 'Incentive mechanisms are also critical in upholding or undermining principles such as choice, solidarity, competition and financial sustainability' (Kornai, Eggleston, 2001, p. 79).

3.4.2. Incentives in Health Care

1. Both providers and users of health care services respond to incentives that are set up within a health care system. Incentives can therefore be either on the demand or supply side. Which incentives apply to the users of medical services, insurers and providers is determined by the payment system applied within a particular health care system. The term 'payment system' refers to both the insurance of users and the reimbursement of providers (Kornai, Eggleston, 2001, p. 80). Various payment-system incentives are summarised in Table 4 and shown in more detail in the next two sections of the thesis.

Table 4: Incentive effects – benefits and trade-offs

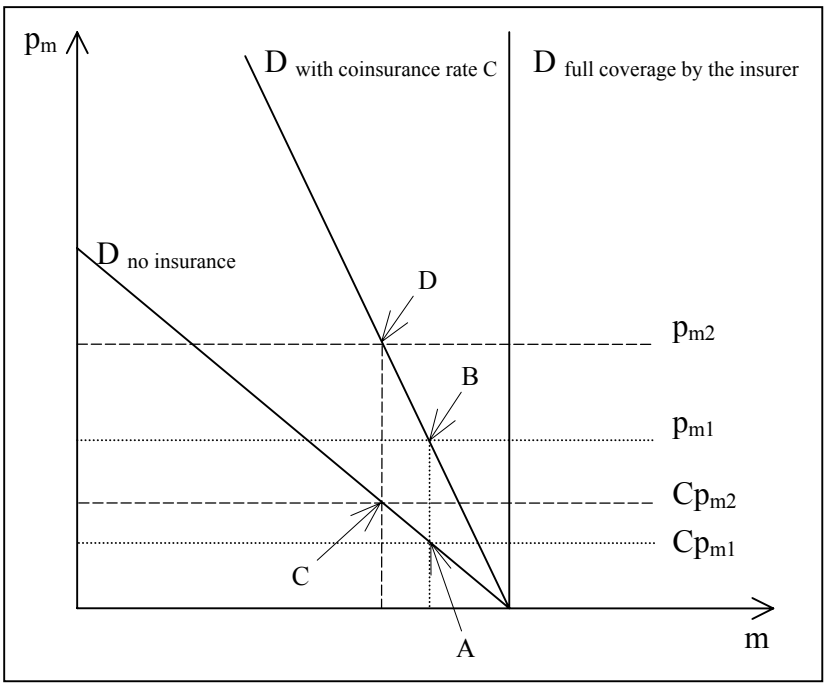
Instruments	***Benefits***	***Trade-offs***
Demand-side incentives	constrain overuse	inefficient risk-bearing
Supply-side incentives	– constrain overuse – encourage cost reduction	– underprovision – risk selection
Professional ethics	– restrain supplier-induced demand – moderate under-provision – reduce risk selection	moral hazard
Risk adjustment	prevents risk selection	
Competition among providers	encourages provider effort	risk selection

Source: Kornai, Eggleston, 2001, p. 98

2. Demand-side incentives derive from the problem of moral hazard and are most often in the form of co-payments and deductibles (Kornai, Eggleston 2001, pp. 80-81; Phelps 2002, p. 372; Feldstein, 2002, pp. 117-122). Namely, full coverage tends to lead to the overuse of medical services and the abovementioned incentives can be set in place in order to rationalise demand for medical care.

A co-payment is a sharing agreement between the user of medical services and the insurance company. Co-payments can be in the form of a proportional coinsurance rate (users pay a fraction of a medical bill), a flat indemnity payment (the insurance company pays the user a flat amount, predetermined in the insurance contract, for each hospital service) and a fixed co-payment (patients pay a fixed amount, for example, per visit). All forms of co-payments rationalise demand for health care but consumer choices and behaviour are affected in different ways. If a patient's co-payment is in a fixed amount, there are no incentives for patients to seek a lower-priced provider (Phelps, 2003, p. 372). In the case of a proportional coinsurance rate, the free choice of providers creates a stronger incentive for providers to be more efficient. Figure 11 shows how coinsurance-based insurance alters consumer demand.

Figure 11: The effect of coinsurance on consumer demand

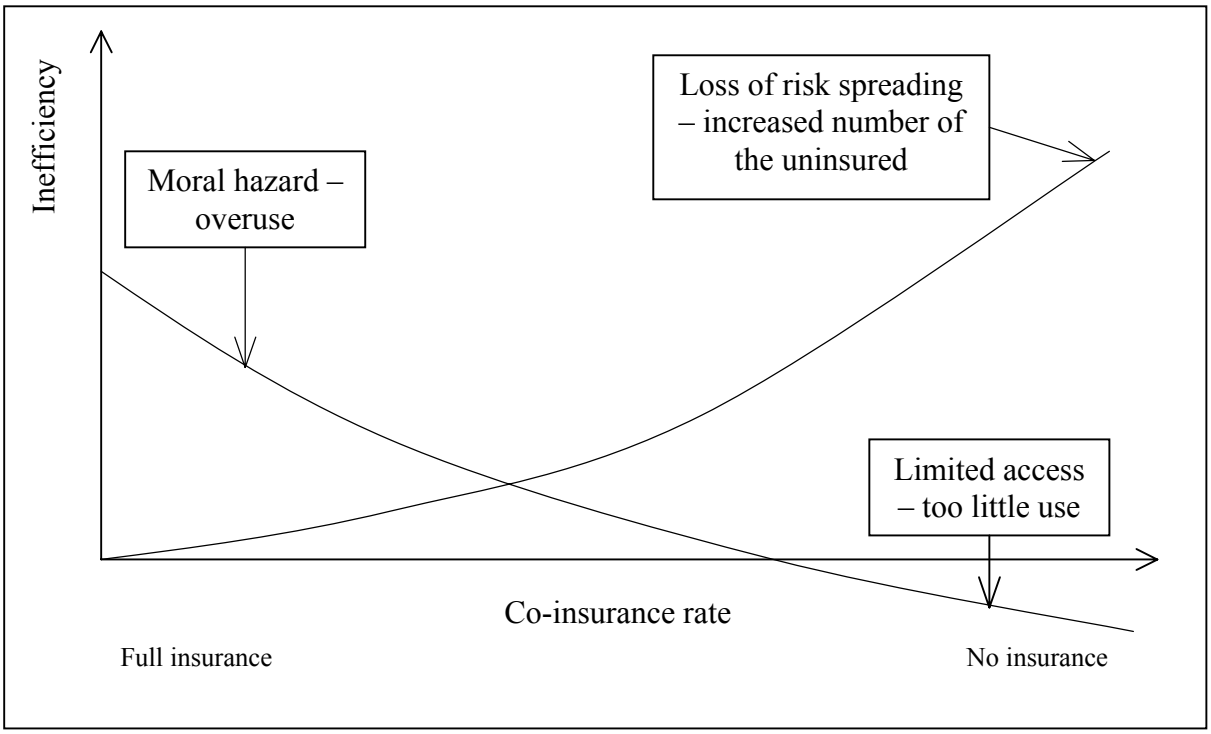


Source: Phelps, 2003, p. 116

In Figure 11 the demand curve for a certain illness is shown for the users of medical services without health insurance ($D_{no\ insurance}$). To construct the demand curve of the user with a coinsurance agreement, whereby the user's co-payment share is *C*, we can suppose that the effective price of medical care falls from p_{m1} to Cp_{m1}. The quantity demanded at Cp_{m1} (point *A*) is the quantity demanded at p_{m1} if coinsurance is in place (point *B*). Points *C* and *D* are derived in the same way. When p_m equals 0, then Cp_m also equals 0. The intercepts of both demand curves with the quantity axis therefore coincide. Figure 11 also shows that the demand curve of the user with a coinsurance agreement steepens as the coinsurance rate lowers. In the case of full coverage by the insurer ($p_m=Cp_m$) the demand curve is a vertical line. Co-payments in the form of a proportional coinsurance rate have two effects. First, when evaluated at the same price demand is smaller and, second, the demand curve becomes more elastic compared to the case of full coverage (Phelps, 2003, pp. 115-121). The question of

demand elasticity is an important one. Namely, estimations of demand elasticity[29] are a necessary input in the analysis of the effects that demand-side cost-sharing has on the utilisation of medical services (Newhouse, 1981, pp. 85-86).
Incentives therefore can reduce the demand for health care services, but incentives for efficient use of health care have a trade-off. Namely, demand-side cost-sharing imposes risk on the users and raises solidarity concerns. Figure 12 shows trade-offs in setting, for example, a particular co-insurance rate. An increase in the co-insurance rate has two effects. First, fewer services are used and moral hazard is reduced. However, a high co-insurance rate can result in an inefficiently low use of health care. Demand-side cost-sharing can therefore represent an access barrier which is a solidarity concern. Second, inefficiency associated with loss of risk spreading also increases (Kornai, Eggleston, 2001, pp. 79-83).

Figure 12: Trade-offs in setting the co-insurance rate



Source: Kornai, Eggleston, 2001, p. 82

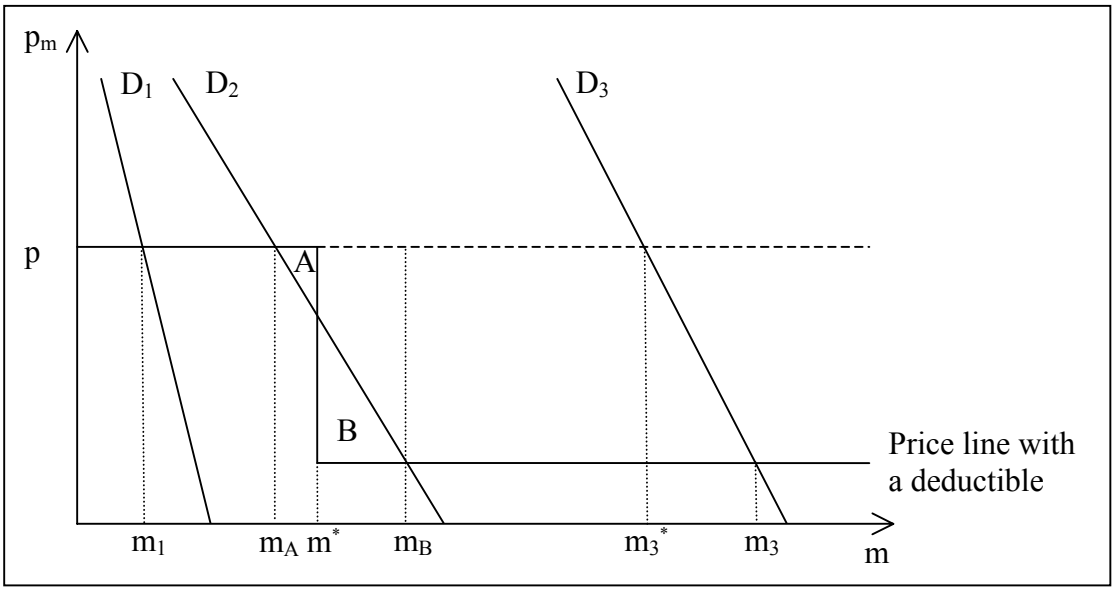
Another important effect needs to be pointed out when discussing the trade-offs associated with different types of health insurance. Types of insurance such as indemnity payment and the same percentage coinsurance on all services do not distort the relative prices faced by the patient when seeking health care. The opposite holds true for coinsurance with different rates for different services. This type of insurance artificially distorts the relative prices of medical services (Feldstein, 2002, p. 149).

When deductibles are in place insurance covers all or part of the remainder of the price of a particular service only after users pay a fixed amount for that medical service. One important

[29] Some studies suggest that elasticity of demand is around 0.2 (Newhouse et al., 1993, p.121; McPake, 1993).

advantage of deductibles is that they lower the administrative costs of processing small claims (Feldstein, 2002, pp. 118-120). This means that demand for health care in the case of mild illnesses should resemble demand from an uninsured user and, in the case of more severe illnesses, it should resemble demand from an insured user[30]. The effect of a deductible on the demand curve therefore depends on the degree of an illness' severity relative to the size of the deductible. As shown in Figure 13 the price of care lowers to, for example, 20% of its initial level after a deductible of size D ($D=pm^*$) has been met. In the case of mild illnesses (demand curve D_1) the deductible has no effect. This means that the user receives no insurance payment. This means that the quantity demanded m_1 equals the quantity demanded by the user with no insurance. The opposite holds true in the case of a severe illness (demand curve D_3) where the quantity demanded is m_3 and where it exceeds the quantity that would be demanded by the user with no insurance (m_3^*). Demand curve D_2 intercepts the price schedule in three places. At the first intercept the quality demanded is m_A. Expanding the demand for medical care to m^* is not rational as the consumer surplus falls by area A. However, expanding demand further to m_B increases the consumer surplus by area B. The rational quantity demanded obviously depends on the relative sizes of triangles A and B. In Figure 13 the size of triangle B exceeds the size of triangle A. The user's best choice is therefore to consume m_B. In Figure 13 an introduction of a higher deductible would change the price line as higher deductibles make the price for medical care higher for more types of illness events (Phelps, 2003, pp. 122-125, 147).

Figure 13: The effect of a deductible on consumer demand



Source: Phelps, 2003, p. 123

[30] This is in line with what Arrow proved. A risk-averse person seeking to maximise expected utility, when offered the opportunity to purchase insurance with a positive loading fee, will always insure the biggest risks. He or she will however be willing to have a deductible so that the insurance does not cover small events (Arrow, 1963).

In order to reduce moral hazard and increase the funding level of the health system, tax-financed systems can also introduce user charges. With the introduction of user charges an individual's access rather than general access to health services is taxed[31] (McPake, Kumaranayake, Normand, 2002, pp. 236-238).

All the abovementioned forms of demand-side cost-sharing could cause a patient with a serious illness to suffer a large financial loss. This is why limitations and maximums for out-of-pocket payments are set within payment systems[32].

The public system can also be rationalised on the demand side with non-financial instruments: by setting a pattern of supply, a gatekeeper system, waiting lists and queues. Decisions on setting the pattern of supply (e.g. building a new hospital, investing in premature baby units etc.) also determine access costs and the level at which other rationing mechanisms need to be implemented (McPake, Kumaranayake, Normand, 2002, pp. 201-202). Within health care systems that apply the gatekeeper concept, patients are required to obtain a specific referral from the primary care provider before seeing any specialist. Without referrals, compulsory insurance does not fund any specialist treatments (Phelps, 2003, p. 375). The role of the gatekeeper is to overlook the whole treatment process of a patient. This means that the gatekeeper both decides on his own part of the treatment and coordinates the part of other providers (Felder, 2003, p. 16). With the implementation of a gatekeeper model overall treatment costs are expected to decrease for several reasons. The most obvious case is where the disease or injury can be treated either by a specialist or generalist. In such situations gatekeeping assures lower costs as primary care physicians receive smaller fees than specialists. As medical care requires the presence of the patient, the time costs incurred while waiting in a queue as well as the costs of travel to and from the doctor should be recognised as the costs of acquiring medical care and as such they affect the demand for medical care. If

[31] User charges can be considered a health service sales tax.

[32] As an illustrative example, demand-side cost-sharing with capped out-of-pocket payments within the Swiss health insurance system is shown: in Switzerland, social health insurance includes a minimal € 160 annual deductible. Expenditure that exceeds this threshold is subject to a 10-percent co-insurance rate. Out-of-pocket payments are capped within the Swiss health insurance system and the maximum co-payment for an individual is € 560. This implies that medical bills are subject to co-insurance only up to € 4,160 (€ 160 is the deductible and € 4,000 are subject to the 10-percent co-insurance rate). 90 percent of the insured have expenditures below this threshold. Co-payment rules also apply to chronically ill and low-income individuals. This consistent application of co-payment rules is directed at moral hazard. The insured can also choose a deductible above € 160. The optional deductibles amount to € 270, € 400, € 800 and € 1,000. These optional deductibles come with premium rebates of 8 percent, 15 percent, 30 percent and 40 percent, respectively. The optional deductibles are used to fight moral hazard and allow the insured to choose the insurance contract according to their expected health care expenditure. In this case, 'good risks' are expected to opt for a higher deductible and a chronically ill person, by comparison, will more likely choose the minimal deductible. The study by Felder and Werblow (2003) shows that price signals from deductibles significantly affect the behaviour of the insured even when taking the endogeneity of contract choice into account. In other words, even though part of the reduction in health care expenditure is due to the rational choice of insurance contracts, co-insurance induces a change in demand that contributes to the reduction of health care expenditures. Even though decreased moral hazard is an efficiency gain optional deductibles also create an efficiency-equity trade-off. However, this trade-off can be handled by restricting, to a reasonable degree, the rebate attained by opting for a higher deductible (Felder, Werblow, 2003, pp. 43-46).

time costs rise as a consequence of longer queues, the demand for medical care falls. Systematic delays in appointment, i.e., waiting lists, can also serve to reduce demand for medical care. This mechanism does not rely on the opportunity cost of time. In this case, 'waiting time matters because the value of the good or service decays the longer it is delivered after order day' (Cullis, Jones, 1986, p. 250). In some cases, for example, illnesses heal spontaneously and so with the passage of time treatment becomes unnecessary. On the other hand, long delays for treatment can cause health to deteriorate to a degree that the patient can no longer be cured. In this way, the value of treatment decays as it is no longer affective (Phelps, 2003, pp. 126-127; Cullis, Jones, Cropper, 2000). It is important to note that these instruments rationalise demand within public systems. For example, if an individual estimates that the costs of joining a waiting list are too high, private treatment is an alternative.

3. Payment systems also create supply-side incentives based on cost-sharing on the part of providers when these provide specific services (Kornai, Eggleston, 2001, pp. 84-85; Phelps, 2002, pp. 376-429). It has already been mentioned that incentives can only be understood within a principal-agent framework. Namely, a perfect agent would be expected to provide the same access and same amount of care under any type of payment system (Feldstein, 2002, p. 262). In the case of imperfect agency, the supply decisions of health care providers therefore do respond to the form of payment and a degree of supply-side cost-sharing is needed to impose a harder budget constraint on the provider. However, financial incentives of alternative payment methods differ significantly and it is important to note that, even though all forms of supply-side cost-sharing can give a beneficial incentive for improving efficiency, they affect efficiency, risk pooling and cost containment in different ways.

One way to pay health care providers is cost reimbursement. Under full-cost reimbursement or fee-for-service payment no supply-side cost-sharing occurs. This means that health care providers are compensated for all the costs of care and are therefore not 'at risk' at all. The opposite is true for the insurance company that is 'at risk' in a large way. Patients are 'at risk' only to the extent of their, for example, deductibles and/or coinsurance (Phelps, 2003, p. 377; Felder, 2003, p. 16). Under a fee-for-service payment providers are paid a pre-determined fee for each service rendered. With this type of reimbursement providers face a soft budget constraint. No financial incentives are therefore present to limit the number of services provided and this can lead to induced demand and encourage overuse of health care services. These negative effects can be alleviated by budget restrictions (imposing a predetermined budget on provider reimbursement)[33] and by introducing some explicit amount of supply-side cost-sharing (Kornai, Eggleston, 2001, pp. 84-87). In the case of predetermined budgets, i.e., global payment caps, holdbacks are another method for controlling costs (Phelps, 2003, p.

[33] A good example is the German point system. In this system, medical procedures are assigned a certain number of points rather than a direct price. In such a system, an increase in overall quantity can be matched by a decrease in the price per unit quantity in order to constrain overall costs within a predetermined budget. It is important to note however that the budget constraint is imposed at a very aggregate level and individual providers still try to increase their income at the expense of others.

380). The insurer can hold back part of the payments until the end of the year to see if total costs have come within the targets.

Let us assume that the hospital utility function includes two characteristics. First, the quantity of health care services (*N* for number of days). Second, the quality per day of care (*S* for service). Therefore, the utility function the hospital attempts to maximise has the following form (Phelps, 2003, p. 288):

$$Utility = U(N, S)$$

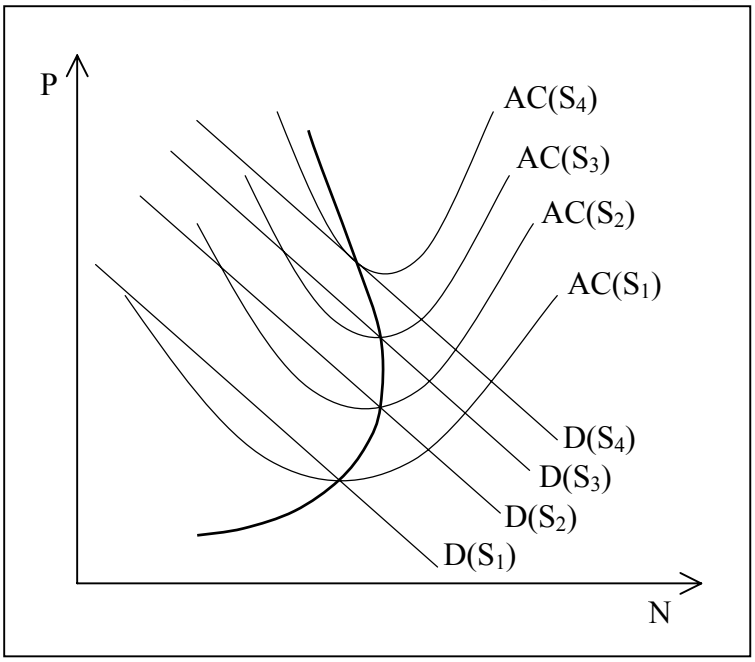
As shown in Figure 14, the patient's willingness to pay for hospital services decreases with total quantity (demand curve slopes downward) and increases with the quality of care (demand curve is higher at higher qualities)[34]. Figure 14 also shows the average cost curves for the hospital for different levels of quality (higher quality costs more at any given level of output). Points at which demand and average cost curves intersect show the combinations of price, cost, quality and quantity that keep the hospital in equilibrium. If the hospital charges a price that is equal to its average cost for a certain output and quality[35], the quantity demanded at that price will equal the quantity supplied. One important thing to note is that the two curves can intersect at either two points, one point (point of tangency) or never. No intersection occurs when it costs the hospital more to produce that level of quality than the patients are willing to pay for it. In the case of two intersections, the one to the lower right in Figure 14 is considered an equilibrium point. By assumption, hospitals prefer to provide more medical care as long as it is not at the expense of quality. In Figure 14 the accented line connects all quantity-quality points that satisfy both the demand conditions and the hospital's zero profit constraint. As Figure 14 shows, this line can slope either upward or downward. However, considering the form of the hospital's utility function only the downward sloping portion should matter. The best of all equilibrium points for the hospital is selected according to the hospital's utility function[36]. Namely, the best possible combination of *N* and *S* for the hospital has to be both an equilibrium point and a combination that maximises its utility function (Phelps, 2003, pp. 288-292).

[34] In this diagram everything else (e.g. quality and output of other hospitals, insurance coverage of the patients etc.) except *N, S* and *P* is held constant.

[35] For not-for-profit hospitals revenues equal costs: $P(N,S) \times N = C(N,S)$

[36] The points on the accented line in Figure 14 can map into an opportunity-possibilities frontier for the hospital and the optimum mix of *N* and *S* can be defined by the tangency to a hospital's indifference curve.

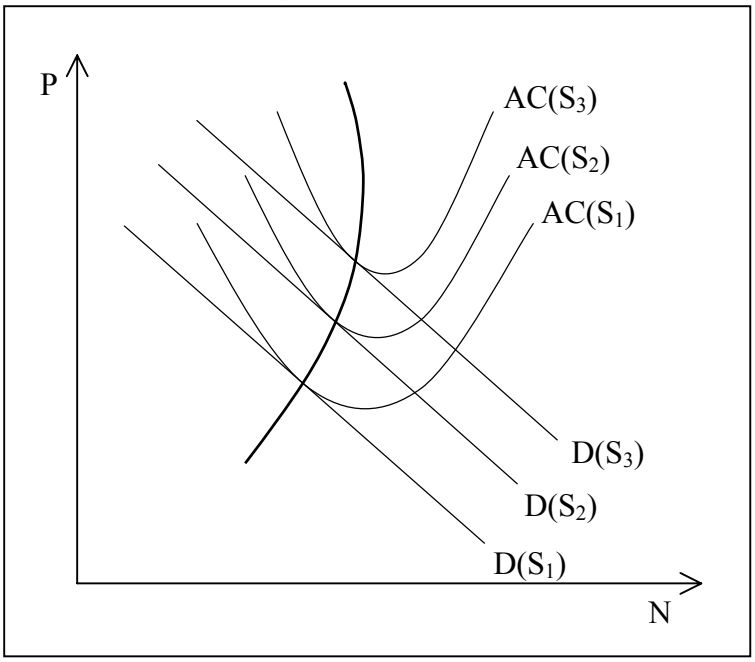
Figure 14: Equilibrium combinations of quality and quantity



Source: Phelps, 2003, p. 290

In the above analysis the quality and output of other hospitals are held constant. Let us suppose that, for example, another hospital in the region increases its quality. This will cause demand curves in Figure 14 to shift. Demand for higher quality will fall, because of the increased quality of the other hospital. Also, demand for lower quality service may rise, because the higher quality and price of the other hospital may drive some of its patients elsewhere. Consequently, the downward-sloping portion of the accented line will flatten. According to the hospital's utility function the most desired point will also shift to the one of higher output and lower quality. Similarly, the entry of a new hospital will shift demand curves shown in Figure 14, with the shift being greater for those qualities in which the new entrant specialises. The limiting case for market entry occurs when each hospital in the market has its demand curves at all levels of quality tangent to average cost curves. As Figure 15 shows, the point of tangency occurs in the downward-sloping portion of the average cost curves (declining average costs). This implies that a hospital underutilises its capacity (Phelps, 2003, pp. 292-294).

Figure 15: Excess capacity



Source: Phelps, 2003, p. 294

One form of cost reimbursement that creates supply-side incentives is case-based payment (also known as prospective payment). With this approach hospitals are paid on a per case basis rather than on a per item or per service basis (Phelps, 2003, p. 411). With case-based payment a fixed price per case is therefore offered to the provider. In Figure 15, this would be drawn as a flat line. This means that we are looking at the hospital as a price-taking firm. The hospital, as the abovementioned model shows, would select the quality such that the demand curve would be tangent to an average cost curve. In this case, the point of tangency occurs at the point of minimum average cost. This payment method therefore at least potentially forces hospitals to operate efficiently (Phelps, 2003, pp. 411-421). A fixed payment per case requires a pre-determined specification and a categorisation of cases (e.g. Diagnosis-Related Groups – DRG). This type of payment leaves the provider at risk for the costs of care within a given case category (Kornai, Eggleston, 2001, p. 87).

The most obvious response to incentives generated by the case-based-payment is to shorten the length of stay. Length of stay in easy to monitor and guidelines on the length of stay are easy to develop (Phelps, 2003, p. 413). In the largest hospital in Slovenia, i.e., Klinični center, a case-based funding system was introduced in 1997[37]. In the three following years the length of hospitalisation was reduced by 25 percent[38] (*Zdravstvena reforma* (Health Reform), 2003, p. 111).

[37] Within this funding system a per patient payment was introduced without any categorisation of cases (*Zdravstvena reforma* (Health Reform), 2003, p. 93).
[38] It is important to note, however, that a clearer picture of this effect would also require an analysis of the rate of readmissions and the shift of activities from hospital to outpatient care.

Another form of payment that creates supply-side incentives is capitation (also referred to as time-based payment). Capitation is a payment of a fixed amount per enrolled user within a specific time period. Incentives for reducing costs are maximal while quality assurance depends on the degree of competition in the market for health care services. If competition is fierce and users of medical services are quality-sensitive, then capitation can ensure both quality and cost control (Felder, 2003, p. 16). Pure capitation, where the provider is paid equally for a patient who uses many services and for a patient who uses few or no services, is a form of full supply-cost-sharing. Under capitation payment, physicians can increase their income if they have a larger number of capitated enrolees, while providing fewer services to each enrolee (Feldstein, 2002, p. 262). Pure and partial capitation (capitation can be combined with some reimbursement of costs for actual services provided) are therefore frequently associated with lower levels of use and give providers an incentive to produce services at least cost. Moral hazard inefficiency is thus reduced. However, the number of services, especially more expensive ones, is also reduced and skimping on quality and risk selection are also important trade-offs. For these reasons this type of payment is usually associated with providers that have a fairly large pool of patients and are responsible for a limited scope of services (e.g. primary care). In this way, the risk imposed on providers is lessened. Negative effects of risk selection and skimping can also be lessened if risk adjustment is introduced. Adjustment of payments to reflect the estimation of costs based on characteristics such as, for example, age and gender protects solidarity and preserves incentives for efficiency and quality improvement (Kornai, Eggleston, 2001, pp. 88-91).

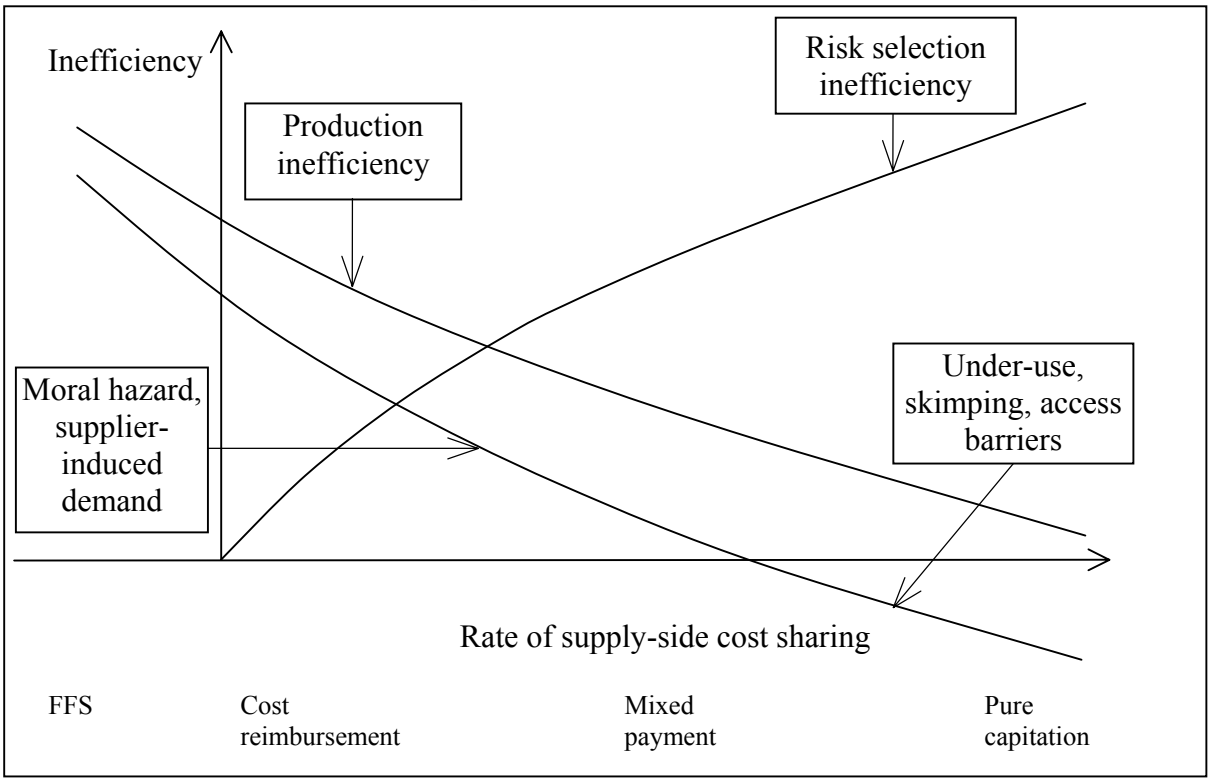
4. The above overview clearly shows that the financial incentives of alternative payment methods differ significantly. Supply-side incentive trade-offs associated with alternative payment methods therefore also differ. This is clearly shown in Figure 16. As the degree of cost-sharing increases, incentives for cost control and containment increase. Inefficiency in the production of health care services therefore drops. However, higher rates of cost-sharing may also create incentives for risk selection[39] and greater constraints on use. This can raise some serious solidarity issues. Figure 16 also indicates that the most negative effects occur at the extremes. Namely, a fee-for-service payment may induce over-use and supplier-induced demand[40] while capitation may induce under-use and skimping on beneficial treatment and create access barriers. For these reasons, intermediary levels of supply-side cost-sharing or mixed payment have been advocated by some health economists (Kornai, Eggleston, 2001, pp. 92-93).

[39] Risk selection also occurs in health insurance markets. Namely, insurers operating in a competitive environment (this is mostly true for the voluntary health insurance market) have a strong incentive to lower their costs by risk selection. Risk selection is more likely to occur if insurers limit access and reject applications (absence of open enrolment), exclude pre-existing conditions and cancel contracts (absence of lifetime cover). Risk selection not only represents a serious efficiency problem, lowering the optimal level of competition in an insurance market, but may also raise concerns about equity (Mossialos et al., 2002, p. 5).

[40] This is why it is illustrated with a negative level of supply-side cost-sharing.

Capitation contracts can, for example, be supplemented by measures that partly reimburse the costs of treating cost-intensive cases (Felder, 2003, p. 16). A compensation system that provides both a flat salary and a fee-for-service payment is also an example of mixed payment that tries to balance the negative effects of the incentives created by the two payment mechanisms. The best combination of the two depends on the strength of the adverse effects generated by each payment system. If, for example, demand-inducement effects are relatively large, the fee-for-service component shrinks and the salary component rises. In practice, finding the right balance of incentives is not nearly as simple. Namely, demand inducement varies by type of treatment, the educational level of the patient, the degree of competition etc. This is why demand-inducement effects are not easily measured (Phelps, 2003, p. 379). When studying demand-inducement effects the provider's income should also be considered. With a fee-for-service payment, for example, an imperfect agent whose income is low is probably more likely to induce demand (Feldstein, 2002, p. 262).

Figure 16: Trade-offs in setting the provider's cost-sharing rate



Source: Kornai, Eggleston, 2001, p. 94

3.5. Regulation of health care and efficiency

Regulatory interventions have two related purposes in health care. First, to control the introduction of new products such as pharmaceuticals to the market. Second, to manage market failures (Phelps, 2003, p. 498).

A breakdown in one or more of the assumptions necessary for a Pareto efficient allocation of resources is referred to as market failure (Griffiths, Wall, 2000, p. 465). In allocation theory,

market failure is therefore 'the failure of a more or less idealised system of price-market institutions to sustain 'desirable' activities or to stop 'undesirable' activities' (Bator, 1958, p. 351). Such market failures may be the result of imperfect information, externalities, public goods and imperfect competition (Griffiths, Wall, 2000, p. 465; Feldstein, 2002, p. 481; Cullis, West, 1979, p. 33; Tajnikar, 2001, pp. 366-419). When such market failures exist, there may be scope for the regulatory role of government or other government intervention. It is, however, also true that many market imperfections such as entry barriers have been created by government itself. The appropriate role of government should be 'to eliminate them and directly address the purpose for which they were imposed, namely, consumer protection' (Feldstein, 2002, p. 481).

3.5.1. Externalities

Externalities occur when a third party to a certain transaction either benefits of suffers some loss without explicitly choosing to do so. The former case is referred to as a positive externality and the latter as an adverse or negative externality. Both can arise either in consumption (externality on the demand side) or production (externality on the supply side). The individuals making decisions that produce external effects will, in the absence of some form of pubic intervention, take no account of them. As a result, socially beneficial goods may be under-provided and socially harmful ones over-provided (Cullis, West, 1979, pp. 33-35; Tajnikar, 2001, pp. 366-376; Bator, 1958, pp. 351-379; Coase, 1960, pp. 1-44; McPake, Kumaranayake, Normand, 2002, pp. 55-58). Externalities have two effects: on economic efficiency and on redistribution (Feldstein, 2002, p. 470).

One specific form of externality is option demand. Namely, people have option demands for facilities they are not certain to use. This means they would be willing to buy the right to use a medical facility in the future if they fall ill or meet with an accident. In a market in which patients pay only for the health care received, health care providers do not receive any payment for the abovementioned option benefit and might therefore decide to reduce their capacities because of a lack of revenue. To secure the social optimum, either public provision, market intervention or the purchase of options can be used. The latter mechanism is common in the financing of various clubs that provide several option benefits, but only to club members (Weisbrod, 1964, pp. 471-477).

The existence of externalities may justify government intervention. When externalities exist, the appropriate role of government is to calculate their magnitude and determine how the externalities should be financed. However, it is important to note that the existence of externalities does not necessarily require government production or provision of services. The criterion for whether the service should be governmentally or privately provided should be efficiency (Feldstein, 2002, pp. 471, 472).

3.5.2. Public goods

The definition of public goods focuses on two characteristics of goods and services. The first characteristic is rivalry. This simply means that one individual's consumption of a given good or service reduces its remaining supply and therefore reduces its availability to other consumers. The term 'indivisibility of benefits' can also be used to describe this characteristic (Corens, Sandler, 1986, p. 6). The second characteristic is excludability. If a good or service has this characteristic it is technically possible to exclude someone from the benefits of this good or service.

The market can function only in situations where the exclusion principle applies (Musgrave, Musgrave, 1989, p. 42). In the case of social or public goods exclusion is inappropriate because their consumption is non-rival. Non-rivalry creates market failure because the marginal social cost of providing an extra unit of the good to another consumer is zero. Non-rivalry is an extreme form of positive externality on the demand side (McPake, Kumaranayake, Norman, 2002, p. 59). Market failure also appears where consumption is rival but, while appropriate, exclusion is unfeasible (Musgrave, Musgrave, 1989, p. 42). This case refers to the situation where exclusion is difficult to apply. Non-excludability therefore leads to severe difficulties in organising a market in the good concerned.

Commodities characterised by both rivalry and excludability are described as pure private goods. For normatively private goods rivalry applies but exclusion is unfeasible, for example, due to a costly mechanism to exclude people. Individuals therefore cannot be excluded from the benefits even if they do not pay for the good or service. This reduces the individual's incentive to bid for the good. For goods for which excludability is possible, but non-rivalry in use is characteristic the term normatively public good is used (Cullis, West, 1979, pp. 36-38). All goods that are only partially rival and/or partially excludable can also be referred to as impure public goods[41] (Corens, Sandler, 1986, p. 7). In the case of a public good, the sum of the marginal benefits should equal the marginal cost. Here it is assumed that consumers are willing to reveal their marginal evaluations of the social good. If consumers want the good but understate their true preferences in the hope that they can 'free-ride', welfare loss will result from the free-rider problem (Griffiths, Wall, 2000, p. 477).

The distinction between private and public goods is based on the technical characteristics of public goods, i.e., the non-rival nature of consumption and inapplicability of exclusion (Musgrave, Musgrave, 1989, p. 56). However, the government also undertakes to provide many other goods and services that are not pure public goods. Merit goods such as health and education do not possess the same characteristics as public goods. Individuals can, for example, be excluded from consuming them. This implies they can be provided through the market mechanism. However, they are publicly provided free of charge because their

[41] An important subclass of goods with the excludability of benefits and partial non-rivalry are club goods (Corens, Sandler, 1986, p. 7).

consumption confers benefits on society as a whole and in the absence of state provision inequality of income would limit the availability of merit goods to low-income groups (Griffiths, Wall, 2000, p. 468).

3.5.3. Regulation in health care

1. 'Regulation serves to try to reconcile the goals of individuals and health care organisations on the one hand and those of society on the other' (Groenewegen, Dixon, Boerma, 2003, p. 200). If sectors of the medical care market do not perform efficiently, there may be a legitimate role for government intervention to increase the efficiency of the marketplace. Government intervention to boost efficiency should, however, be kept separate from policies that are directed, for example, at equity (Feldstein, 2002, p. 175).

Regulatory activity has two dimensions. Social and economic objectives such as equity and justice and social cohesion are the first dimension. The second dimension can be termed the health sector management mechanisms through which decision-makers seek to attain policy objectives. This can be achieved by (Saltman, Busse, 2003, p. 15; Allsho, Mulcahy, 1996):

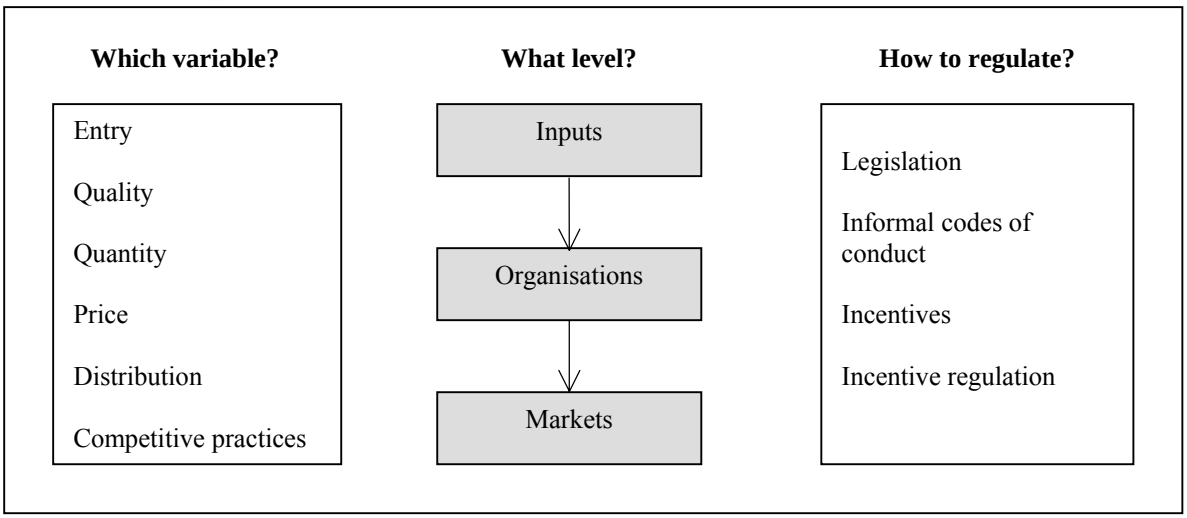
- regulating effectiveness and quality and ensuring safety (e.g. accrediting providers[42], assessing clinical interventions' cost-effectiveness, training health professionals etc.);
- regulating market entry and exit;
- regulating the payers (e.g. setting rules for contracting, developing prices for public-sector health care services, introducing case-based provider payment, regulating reserve requirements and investment patterns for private insurance companies etc.);
- regulating provider behaviour (e.g. transforming hospitals into public firms, regulating capital borrowing by hospitals, rationalising hospital and primary care interactions etc.);
- regulating physicians (e.g. setting salary and reimbursement levels, licensing requirements, malpractice insurance coverage etc.);
- regulating patient access and entitlements (e.g. introducing co-payments, gatekeeping and general practitioner lists etc.);
- regulating pharmaceuticals (e.g. generic substitution, reference prices, profit controls, positive and negative lists etc.); and
- regulating competitive practices and market organisation.

2. The purpose of different areas of regulation is the correction of one or more market failures (McPake, Kumaranayake, Norman, 2002, p. 156). Regulation of competitive practices, market entry and exit, and regulation of market organisation respond to the implications of a monopolistic market structure. Control of remuneration may correct monopoly power, motivate providers or be used in order to restrain increasing health care costs. The regulation of quality and ensuring of safety aim to correct any information asymmetry problems.

[42] See, for example, Scrivens, 2003.

Figure 17 lists the instruments used to affect the abovementioned target variables of regulation such as entry and quality and shows three levels, i.e., inputs, organisations and markets, at which target variables may be addressed by regulation (McPake, Kumaranayake, Norman, 2002, p. 156). For example, entry of inputs such as health care personnel to the organisation can be addressed by regulation. At market level, the entry of organisations to the market can be regulated. Quantity regulation can also be applied at various levels. It may be used to affect the volume of inputs, restrict the number of organisations or promote an increased number of providers in the market through anti-monopoly legislation. Instruments used to affect target variables can take the form of formal controls (legislation), informal codes of conduct and both financial and non-financial incentives.

Figure 17: The process of regulating

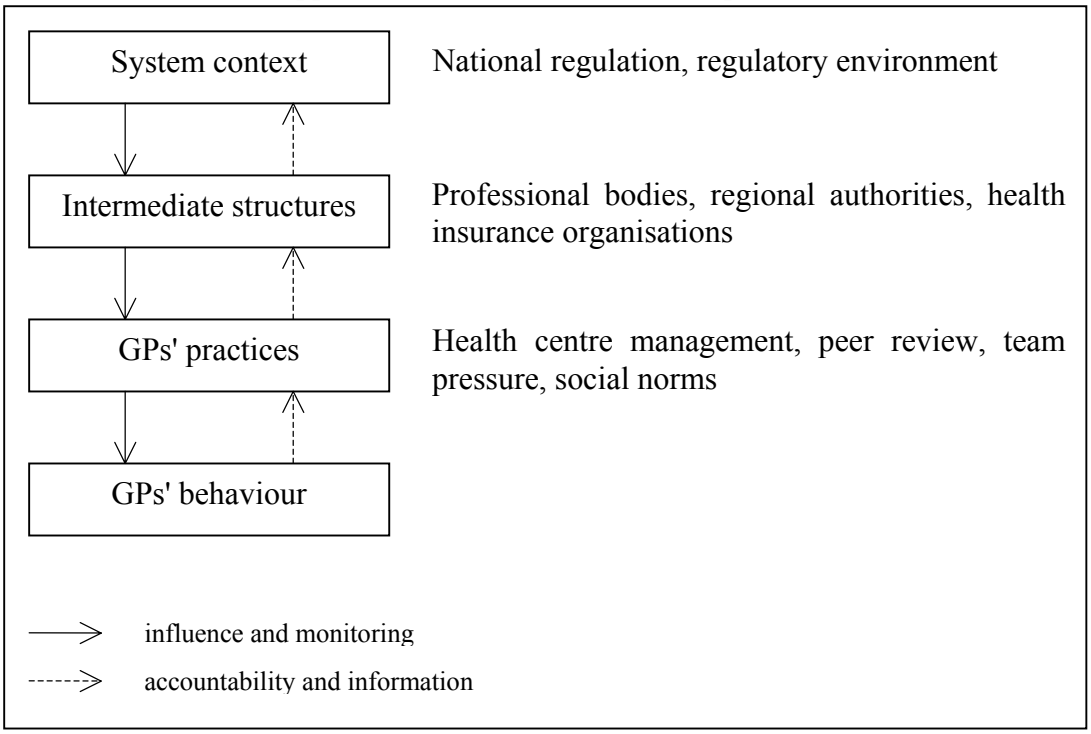


Source: Kumaranayake et al., 2000

3.5.4. Regulation of primary care

Across Europe there are significant differences in both the amount and content of the regulation of general practice. Yet there is some consensus regarding the regulatory elements that can contribute to the development of an effective system of primary care. These include the regulated establishment of new practices, incentives to work in under-served areas, lists of registered patients (to encourage GPs to be responsible for a defined population), elements of capitation in the payment system for GPs (to promote cost-effectiveness), gatekeeping (to encourage appropriate and prevent unnecessary specialist care) and facilitation of peer review (for effective monitoring of the quality of care) (Groenewegen, Dixon, Boerma, 2003, p. 204). To assure adequate access sufficient resources need to be allocated to primary care relative to secondary care (Groenewegen, Dixon, Boerma, 2003, p. 201).

Figure 18: Levels of applying the regulation of general practice



Source: Groenewegen, Dixon, Boerma, 2003, p. 203

As shown by Figure 18, the regulation of general practice has three levels of application: the macro-level of the health care system as a whole, intermediate levels of regional or local organisation and the micro-level of the GP's practice. National standards, rules and incentives that influence the broad scope of GPs' duties[43] are set at the macro-level. The behaviour of health care professionals can also be steered by intermediate structures such as professional bodies[44] which set professional values and standards of care. Professional standards influence the work of GPs also through the mechanism of peer review. Financial behavioural incentives are usually applied by the government or, at the intermediate levels, by sickness funds. At the micro-level, social norms, the incentives provided by micro-budgets and the number of GPs working in an organisational unit tend to influence GPs' behaviour. Team size, for example, may have an influence in weighing personal interests and professional values (Groenewegen, Dixon, Boerma, 2003, pp. 202-204).

4. BASIC HEALTH CARE IN SLOVENIA

Basic health care services are part of primary health care. In Slovenia, the latter also includes dental care, health care services of nursing homes, social care institutions and some other organisations that implement programmes for reinforcing, maintaining and restoring health

[43] In some countries GPs serve the entire population. In other countries primary care, for example, for women and children is more specialised (gynaecologists, paediatricians).
[44] In countries of Central and Eastern Europe, professional bodies are still relatively weak and those focused on GPs are either absent or in the early stages of their development.

(e.g. institutes for qualifying and training children and young people with compromised physical and mental development) and emergency transport. Basic health care includes activities such as care provided by general practitioners and dispensary units for the implementation of preventive and curative programmes for pre-school and school children, youth and students, women and other specific population groups and for mental health, nursing and home care, physiotherapy, occupational medicine, health education and counselling, activities of developmental clinics, urgent medical aid and the treatment of drug addictions (*Zakon o zdravstveni dejavnosti* (Law on Health Services), Article 7).

4.1. Some facts and figures about basic health care in Slovenia

The following analysis of primary care in Slovenia focuses attention on basic health care provided either by health centres organised as public institutes or private practitioners who can be organised as limited liability companies, sole traders or independent self-employed professionals without any defined legal form. In Slovenia, there are 63 health centres. Most of them, almost a third, are located in the health region[45] of Ljubljana. A large number of health centres is also located in the health regions Celje and Kranj. In the latter, all health centres are organised as independent departments within a single legal entity, i.e., Health Centre Kranj. This is why for this health region there is only one health centre included in the analysis.

In Slovenia, there were 936 private practitioners in 2003. As Table 5 shows, 228 were providing basic health care services, 493 dental care and 215 specialist care.

[45] The Health Insurance Institute of Slovenia has 10 regional units and hence Slovenia has 10 health regions.

Table 5: Number of primary care providers, 2003

Regional units of HII[1]	***Number of primary care providers***						
	Public institutes		***Private practitioners with concessions***				
	Number	*Share (%)*	*Basic care*	*Dental care*	*Specialist care*	*Private practitioners (total)*	*Share (%)*
Ljubljana	18	28.57	73	134	74	281	30.02
Celje	7	11.11	21	57	18	96	10.26
Koper	6	9.52	24	49	23	96	10.26
Kranj	7	11.11	18	58	17	93	9.94
Krško	3	4.76	7	13	2	22	2.35
Maribor	5	7.94	49	70	39	158	16.88
Murska Sobota	4	6.35	13	23	14	50	5.34
Nova Gorica	3	4.76	2	28	10	40	4.27
Novo mesto	4	6.35	7	21	6	34	3.63
Ravne na Koroškem	6	9.52	14	40	12	66	7.05
Total	63	100.00	228	493	215	936	100.00
Share (%)	/	/	24.36	52.67	22.97	100.00	/

Note:
1 – Health Insurance Institute of Slovenia
Source: *Seznam izvajalcev zdravstvenih storitev* (The Register of Health Care Providers), Health Insurance Institute of Slovenia [http://www.zzzs.si/izvjalci], 25.8.2003

In 2002, 27.5% of funds of compulsory and voluntary health insurance were allocated to basic health care in Slovenia. As shown in Table 10, this type of care is, in terms of the allocated amount of funds, the second most important health care activity.

Table 6: The allocation of funds of compulsory and voluntary health insurance to different types of care, 2002

Type of care	*Basic care*	*Specialist outpatient care*	*Secondary hospital care*	*Tertiary hospital care*	*Pharmacies*	*Health spa services*	*Social care*
Share (%)	27.5	3.9	49.2	8.9	2.5	2.0	6.0

Source: *Zdravstvena reforma* (Health Reform), 2003, p. 101

As Table 7 shows, the amount of funds of compulsory and voluntary health insurance allocated to basic health care was fairly stable in 1996 to 2002 and amounted to approximately 28% of all health care expenditure in Slovenia.

Table 7: Funds of compulsory and voluntary health insurance allocated to basic health care

Year	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*
Share of the total amount of funds (%)	27.8	27.9	28.2	28.5	28.4	28.0	27.5

Source: *Zdravstvena reforma* (Health Reform), 2003, p. 101

4.2. Providers of basic health care included in the analysis

Given that data was not available for the entire population of basic health care providers, the analysis of providers' cost efficiency includes almost all health care centres (57 out of 63) and 24 private providers that are organised either as limited liability companies or self-employed professionals. This analysis is based on financial data from balance sheets and the income statements of providers and other data for 2002. The main characteristics of providers analysed in this thesis are as follows (Tajnikar, Došenovič, 2004, pp. 8-28):

1. In Slovenia, two types of basic health care providers exist. First, health centres that are organised as public institutes and, second, privately-owned providers of various legal forms. This thesis analyses 57 health centres, 23 private providers that are organised as limited liability companies and 1 private practitioner with the legal form of a sole trader. All privately-owned providers included in the analysis work with concessions.

2. Among the analysed providers, privately-owned providers hold only 2% of the assets and create 1.5% of the revenues of all basic health care providers. However, they generate approximately 51% of the difference between revenues and costs. This clearly shows that the decision-making of private providers, contrary to public institutes, is governed by the profit motive. Private providers provide about 1.8% of all basic health care services analysed in this thesis. The value of services provided represents 3.4% of the value of services supplied by all basic health care providers included in the analysis. However, they treat approximately 2.7% of all cases. This implies that, compared to public health care providers, a smaller number of services per patient is provided. Health centres included in the analysis employ 8,546 employees and private providers 85 employees.

3. Private providers are also to a lesser extent financed by the compulsory health insurance fund. Health centres receive on average 96.8% of all funds from compulsory insurance. On the other hand, privately-owned basic health care providers receive only about 90.8% of funds from this source.

4. In health centres, total revenues exceed total costs only by 0.3% of total revenues. For private practitioners this difference amounts to 16.4% of total revenues. Return on equity is 0.4% in health centres while, for private practitioners, it is 39.2%. Revenue per employee in a health centre is SIT 7.590 million and for the private sector included in this analysis it is SIT

11.953 million. With the latter, revenues exceed the break even revenue point by 16%. For health centres this number is just 4%.

5. However, average costs (cost per service provided) are slightly higher for private basic health care providers and amount to SIT 950. The average costs of health centres equal SIT 930.

6. Selected financial performance measures of analysed basic health care providers are indicated in Table 8 and show significant differences between health centres and private practitioners.

In health centres gross wages amount to 68.2% of total revenues and in private practice they amount to 29.6%. Differences in liquidity, inventory stock and turnover, differences in relations with suppliers and customers, i.e. payers, and in rates of return on short-term investments, prices of debt and in debt-to-equity ratios indicate that efficiency varies among basic health care providers and this certainly has important implications for the cost efficiency of health centres and privately-owned basic health care providers. For health centres, the analysis of liquidity indicates that the value of the current ratio ranges from 0 to 28 and standard deviation equals 3.19. Days inventory in stock range from 0 to 160 with a standard deviation of 23.4. For the debt-to-total-capital ratio the standard deviation equals 1.13. These indicators imply significant differences in efficiency among different public basic health care providers.

Table 8: Selected financial performance measures for health centres and private basic health care providers, 2002

Financial performance measures	***Health centres***	***Private practitioners***
Rate of return on assets: (net income before tax+interest) / assets	0.006808	0.203803
Rate of return on equity	0.004987	0.392964
Rate of return on capital employed: EBIT / capital employed	0.004024	0.17127
Rate of return on sales	0.002502	0.16442
Current ratio	1.439953	0.380069
Quick ratio	1.406548	0.371075
Inventory turnover ratio	25.84587	19.94446
Days inventory in stock	14.12218	18.30082
Accounts receivable to accounts payable ratio	0.390164	0.172089
Days sales outstanding (average collection period)	16.53376	33.45458
Days payables outstanding (average days' credit)	158.2307	438.7308
Cash ratio	-127.575	-386.975
Debt to total capital ratio	0.25447	1.350409
Break-even revenues	62279087	470800.8
Target profit of 5% on equity	1607608	20845.2
Target profit revenues	89006364	539103.9
Price of debt	0.150116	1.136612
Rate of return on short-term investment	0.098456	0.048822
Revenue per employee	7590.562	11953.55
Revenue / break-even revenues	1.041585	2.168038
Average cost 1: total cost / number of cases	8.266731	3.862663
Average cost 2: total cost / quantity of services	0.931958	0.959011
Price of labour: gross annual wages / average number of employees	5175.987	3540.813
Price of capital 1: (depreciation + cost of financing) / total capital	0.082882	0.126432
Price of capital 2: (depreciation + cost of financing) / (fixed assets + inventory)	0.113902	0.182571
Price of capital 3: (total cost – cost of labour) / total capital	0.507741	0.561833
Price of capital 4: (total cost – cost of labour) / (fixed assets + inventory)	0.697768	0.811299
Average operating cost 1: total operating cost / number of cases	7.82945	3.284432
Average operating cost 2: total operating cost / quantity of services	0.882661	0.81545
Utilisation of capacities: quantity of services / fixed assets	0.143449	1.320178
Productivity: quantity of services / number of employees	8125.187	10415.05

7. Since basic health care is in most cases not on the market, the most important influence of the market on basic health care is via the labour market. There are two estimates of the shortage of general practitioners by health regions. In the estimates of the medical society this shortage is 131 and, according to the estimates of the Health Insurance Institute, there is even a surplus of 3 physicians.

8. With the 1992 health reform gatekeeping and personal patient lists were introduced to basic health care. The gatekeeping role is performed by general practitioners. In 1993, the capitation payment of general practitioners was implemented. Capitation is a payment of a fixed amount per enrolled user within a specific time period. There are, however, payment adjustments to reflect the estimation of costs that are based on characteristics such as, for example, age and gender.

Capitation payment has been combined with a fee-for-service payment. This contributed to the increase in the quantity of services provided by general practitioners, to the increase in costs and workload of physicians. Estimates for 1997 show that, due to the fee-for-service type of payment, the number of visits to health centres increased by almost 50%, the number of visits to a patient's home halved while preventive care was insufficient. The number of referrals to specialist care also increased. This is why capitation is becoming a prevalent method of payment (*Zdravstvena reforma* (Health Reform), 2003).

Currently general practitioners or general practice teams are reimbursed on the basis of capitation. The method of payment is equal for both the public sector and private providers with concessions. General practice teams receive 96% of funds on the basis of capitation, 4% is for preventive care and the remaining 4% is obtained only if the upper limit on the number of referrals to specialists is not exceeded. This type of financing was also in place in 2002, which is the year this analysis refers to.

5. ECONOMETRIC ESTIMATION OF THE COST EFFICIENCY OF BASIC HEALTH CARE PROVIDERS IN SLOVENIA

The following analysis of the cost efficiency of basic health care providers is based on the econometric estimation of the cost functions of basic health care providers. The analysis is built on the conclusions and hypotheses outlined in previous sections of the thesis. It is, however, limited by the unavailability of data.

The basic hypotheses that can be outlined are as follows.

First, due to the prevailing non-profit motive the analysis of (in)efficiency in health care should be in the form of cost (in)efficiency analysis.

Second, it can be assumed that in health care, like in any other economic activity, costs are determined by the quantity of services provided and by input, i.e., labour and capital, prices.

Third, capitation payment contributes to significant differences in the quantity of services provided. This is implied by differences in the productivity of basic health care providers.

Fourth, capitation payment also affects the number of referrals to specialists.

Fifth, for basic health care providers there may be increasing returns to scale and scope and thus the optimal size of health centres and private practitioners can be determined.

Sixth, in theory it can be assumed that privately-owned primary and in particular basic health care providers are *a priori* more cost efficient and that private ownership can therefore increase the efficiency of basic health care providers.

Seventh, education (business and economics vs. medicine) of the managers of public institutes affects the cost efficiency of these institutes.

Eight, competitive conditions in the labour market for physicians have important implications for the cost efficiency of basic health care providers.

Ninth, the costs of health care providers differ across health care regions and with regard to their location in larger cities and other areas.

5.1. The theory of econometrically estimating cost functions

The cost function can be derived from the production function, which describes the efficient production methods available in a certain time period (Molyneux, Altunbas, Gardener, 1996, p. 149). The total cost of production can be shown as $TC(Q,P)$, where Q is an m-dimensional vector of output quantities and P is an n-dimensional vector of input prices. If TC satisfies the following conditions (Jorgensen, 1986):

1. the cost function is positive for positive input prices and a positive level of production (positivity);
2. the cost function is homogenous of degree one in input prices (homogeneity);
3. the cost function is increasing in input prices and the level of output (monotonicity); and
4. the cost function is concave (concavity),

it is dual to the production function $f(Q,X)$, where X is an n-dimensional vector of input quantities. Thus, there is a duality between cost and production functions and this means that either of these functions can be used to describe the technology of the producer (Molyneux, Altunbas, Gardner, 1996, p. 160). 'Direct estimation of the production function is attractive when the level of output is endogenous. Estimation of the cost function is more attractive,

however, if the level of output is exogenous' (Christensen, Greene, 1976, p. 658). This last case is assumed as characteristic of health care.

5.1.1. Characteristics of cost functions

The total cost of production (*TC*) for the two-input case (labour – *L* and capital – *K*) can be defined in the following way:

$$TC = p_1 L + p_2 K \tag{1}$$

In the above equation p_1 and p_2 are the prices of labour and capital, respectively.

Several functional forms such as, for example, the Cobb-Douglas function, the CES function, the translog cost function and the hybrid translog cost function can be assumed for the econometric formulation of the above equation (Molyneux, Altunbas, Gardner, 1996, pp. 160-168).

The first widely used production function that allows substitution is the Cobb-Douglas (1928) production function where *Q* is output per period, *A* represents fixed inputs, including technology, *L* is labour input and *K* is capital input. α_i represents the elasticity of output with respect to inputs:

$$Q = AL^{\alpha_1} K^{\alpha_2} \tag{2}$$

The condition of cost minimisation, according to Pareto efficiency conditions (see Section 2.1.), implies the equality of marginal revenue products of both inputs and this can be formulated in the following way:

$$\frac{p_1 L}{\alpha_1} = \frac{p_2 K}{\alpha_2} \tag{3}$$

Using the above equations, the Cobb-Douglas cost function can be formulated as:

$$TC = \gamma Q^{1/r} p_1^{\alpha_1 / r} p_2^{\alpha_2 / r} \tag{4}$$

In the above equation $\gamma = r\left(A\alpha_1^{\alpha_1}\alpha_2^{\alpha_2}\right)^{-1/r}$ and $r = \alpha_1 + \alpha_2$. The parameter *r* is the sum of output elasticities with respect to inputs and therefore shows returns to scale. The latter can be defined as the elasticity of the cost function with respect to the level of output:

$$\frac{\partial \ln TC}{\partial \ln Q_i} \qquad 1 \le i \le m \qquad (5)$$

The measure that shows whether returns to scale are increasing, constant or decreasing (*ES*) can be formulated hence:

$$ES = \frac{1}{\frac{\partial \ln TC}{\partial \ln Q_i}} \qquad 1 \le i \le m \qquad (6)$$

If *ES* is greater than 1 increasing returns to scale are present, if it equals 1 constant returns to scale are present and returns to scale are decreasing if *ES* is lower than 1.

Elasticities of the cost function with respect to the input prices can be used to define the cost shares of all inputs (*S*) (Molyneux, Altunbas, Gardner, 1996, p. 150):

$$S_i = \frac{p_i X_i}{TC} = \frac{\partial \ln TC}{\partial \ln P_i} \qquad 1 \le i \le n \qquad (7)$$

Since the cost function *TC* is homogeneous of degree one in input prices, the cost shares must sum to unity.

To achieve the linear relationship, the cost function (4) must be transformed into the logarithmic form:

$$\ln TC = \ln \gamma + \left(\frac{1}{r}\right) \ln Q + \left(\frac{\alpha_1}{r}\right) \ln p_1 + \left(\frac{\alpha_2}{r}\right) \ln p_2 \qquad (8)$$

The duality conditions (see Section 5.1.) require that input prices be homogenous of degree one. This means that $\alpha_1 / r + \alpha_2 / r = 1$. With this restriction, the Cobb-Douglas cost function has the following form:

$$\ln TC - \ln p_2 = \ln \gamma + \left(\frac{1}{r}\right) \ln Q + \left(\frac{\alpha_1}{r}\right) (\ln p_1 - \ln p_2) \qquad (9)$$

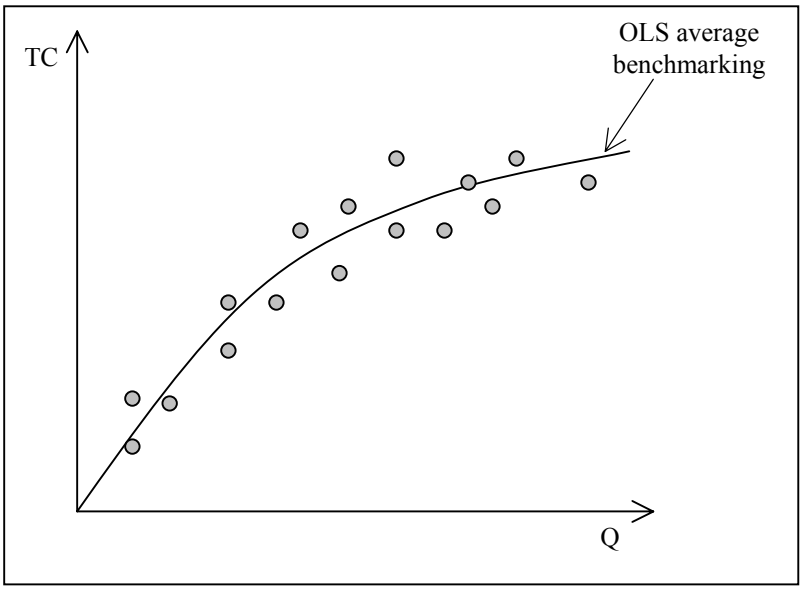
This cost function is in a normalised log-log functional form. Total cost (*TC*) and price of one input (p_1) are normalised by the price of another input (p_2). Such a functional form is also used in the econometric estimation of cost functions of basic health care providers in Slovenia in the following sections of the thesis.

However, this formulation of the cost function imposes two serious restrictions (Molyneux, Altunbas, Gardner, 1996, p. 161). First, the Cobb-Douglas cost function allows us only to estimate increasing, decreasing or constant cost curves. Therefore, this does not allow U-shaped cost curves. Second, the Cobb-Douglas function constrains the elasticity of substitution between inputs to equal unity. In order to avoid such restrictions, CES or translog functional forms can be assumed.

5.1.2. Cost efficiency measures

The typical econometric estimate of a cost function produces an average level that best fits the data (see Figure 19). This is inconsistent with the theoretical concept of cost or output, whereby the function traces out the least-cost locus for varying output levels or the maximum output for varying input levels (Vitaliano, Toren, 1994, p. 282).

Figure 19: A typical econometric estimate of a cost function



Source: Filippini, 2003

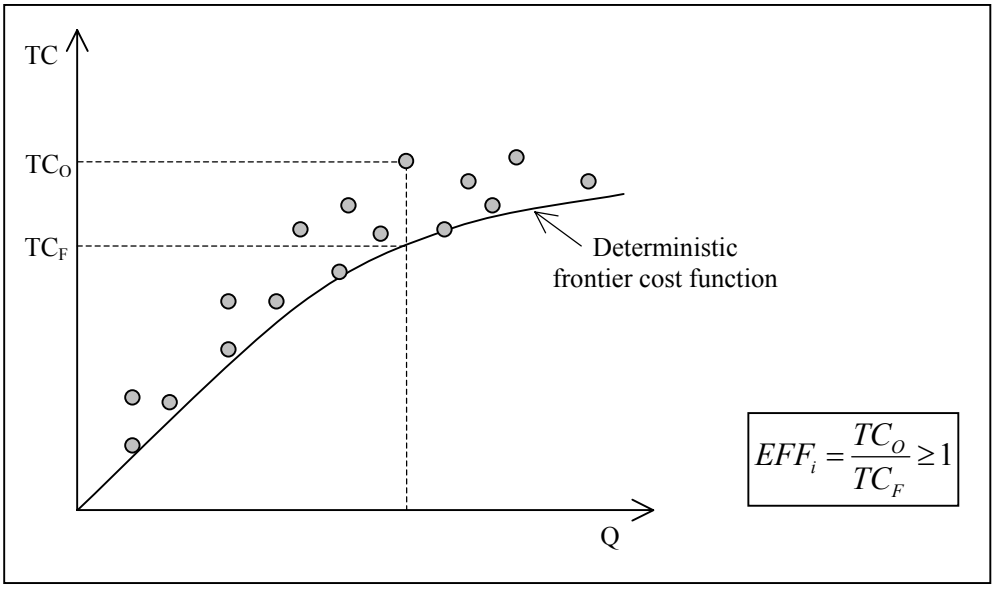
The paper by Farell (1957) was one of the first to try to make empirically operational the least-cost idea. Implementation of Farell's idea has evolved along three lines: data envelopment analysis (hereinafter: DEA), deterministic frontiers and stochastic frontiers (Schmidt, 1986). These techniques have often been employed to estimate the efficiency of health care providers. These methods can therefore be used to determine whether a certain production unit is efficient and, if not, the magnitude of inefficiency (Newhouse, 1994, p. 317).

DEA is a non-parametric linear programming technique first introduced by Farrell (1957) and later developed by Charnes, Cooper and Rhodes (1978) and Charnes, Cooper, Lewin and Rhodes (1995). DEA uses best-practice observations to trace out the least-cost locus (Vitaliano, Toren, 1994, p. 283). This means that DEA first identifies production units that are

producing a given number of outputs with the fewest number of inputs. These technically efficient units comprise a reference set or firms on the isoquant such as, for example, firms A, B, C and D in Figure 2 (Nyman, Bricker, 1989, p. 586).

This approach therefore estimates a deterministic frontier based on observed data (Zuckeman, Hadley, Iezzoni, 1994, p. 258). As shown in Figure 20, deterministic frontiers attribute all deviations from the frontier as measured inefficiency (*EFF*), thereby also confounding inefficiency and statistical noise (Vitaliano, Toren, 1994, p. 283). This means that no random measurement error is assumed in the DEA framework.

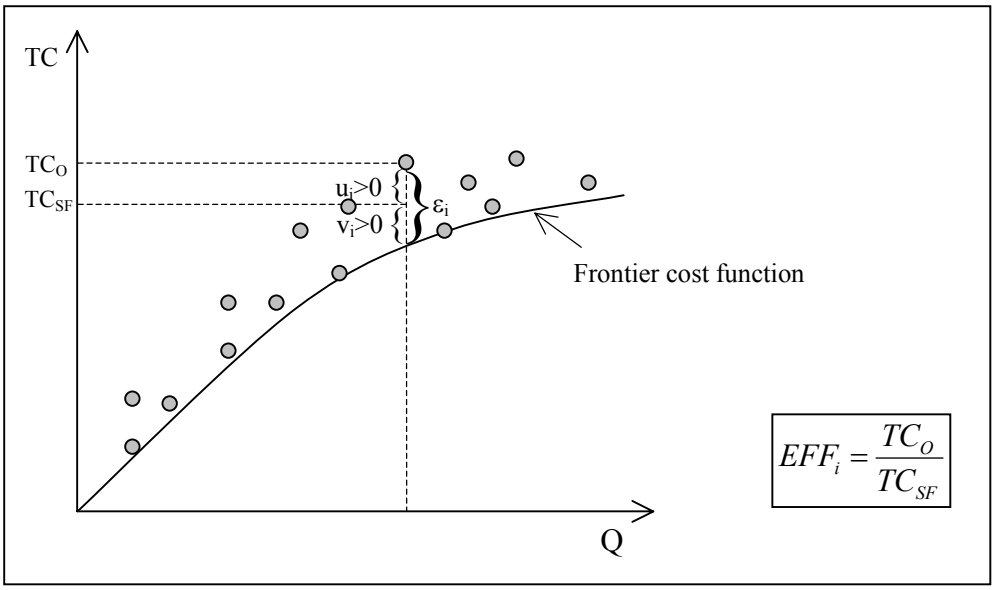
Figure 20: Deterministic frontier cost function



Source: Filippini, 2003

In contrast, stochastic frontier estimation does allow measurement error (see Figure 21) but the error (ε_i) is assumed to be composed of two parts, one reflects the effects of inefficiency (u_i) and the other captures the effect of noise (v_i) (Björkgren, Häkkinen, Linna, 2000, p. 195). In applying any empirical method, one must be aware of the fact that strong and non-testable assumptions are an important prerequisite of good results (Newhouse, 1994, p. 320). The abovementioned shortcomings of DEA and deterministic frontiers therefore render them less satisfactory than the stochastic frontier estimation.

Figure 21: Stochastic frontier cost function



Source: Filippini, 2003

5.1.3. The stochastic cost frontier model

A frontier cost function identifies the minimum costs at a given output level, input price and existing production technology. It is unlikely that all firms will operate at the frontier. Failure to attain the cost frontier implies the existence of technical and allocative inefficiency.

The stochastic frontier production function was first proposed by Aigner, Lovell and Schmidt (1977) and Meeusen and van den Broeck (1977). The original specification of the model has been used in various empirical applications but has also been altered and extended in a number of ways, including an extension of the methodology to cost functions (Coelli, 1996, p.3).

A firm may operate above the cost frontier for reasons beyond its control. Negative effects of strikes, for example, therefore cannot be regarded as inefficiency in the usual sense. The 'true' inefficiency is the excess of costs above the stochastic frontier which includes both 'ideal' and random disturbance (Vitaliano, Toren, 1994, p.283). Generally, the model of total cost (*TC*) can be written as follows:

$$TC_i = TC(Q_i, W_i, X_i) + v_i + u_i \qquad u_i \geq 0$$

In this specification Q measures outputs, W input prices, and X output descriptors at the i-th health care provider. $v_i + u_i$ is the composed error term. v_i is a normally distributed random error with a zero mean and u_i the inefficiency residual which is assumed to be positive. The

inefficiency term for health care providers is generally assumed to follow a half-normal[46] distribution. Alternate model specifications can employ other distributional assumptions for the inefficiency term. These include, for example, a truncated normal distribution[47] and an exponential distribution. A natural test of the existence of inefficiency in a data set is the distribution of the composed error term. If the composed error term is normally distributed with a zero mean, inefficiency is not present. In a cost model, the composed error term is positively skewed with a non-zero mean (Vitaliano, Toren, 1994, p.283).

The estimation of a cost function also requires the specification of a functional form. Table 9 shows the most common functional forms for cost functions.

Table 9: Functional forms for cost functions

Function	***Functional form***	***Elasticity***	***Number of parameters***
Linear	$C = \alpha + \sum_i \beta_i x_i$	Yes; $\beta_i \left(\frac{x_i}{y_i} \right)$	n+1
Log–log	$\ln C = \alpha + \sum_i \beta_i \ln x_i$	Yes; β_i	n+1
Translog	$\ln C = \alpha + \sum_i \beta_i \ln x_i + \sum_i \sum_j \gamma_{ij} (\ln x_i)(\ln x_j)$	No	$\frac{(n+1)(n+2)}{2}$

Notes:
C – total costs
x_i – input, output, input and/or output descriptors
Source: Filippini, 2003

A significant contribution to stochastic frontier estimation was the paper by Jondrow et al. (1982) that showed how to estimate the inefficiency observation by observation rather than just an overall average for the entire data set. In a stochastic frontier setting, predictions of individual firm cost efficiencies *(EFF_i)* are measured as the ratio of actual costs to the least-cost level (Coelli, 1996, p. 8):

$$EFF_i = \frac{E(C_i | u_i, X_i)}{E(C_i | u_i = 0, X_i)}$$

C_i is the cost of the *i-th* firm, which will equal C_i when the dependent variable is in its original units and will equal *exp(C_i)* when the dependent variable is in logs[48]. In the case of cost

[46] It assumes that most health care providers are gathered near the mean of zero inefficiency and a positive tail with a decreasing number of providers being more and more inefficient.
[47] Half-normal truncated above zero
[48] Predictions of individual firm technical efficiencies from estimated production functions are estimated in the same way.

frontier estimations, EFF_i can take a value between one and infinity[49]. The inefficiency terms combine both the technical and allocative inefficiency and the two elements unfortunately cannot be separated. Table 10 shows how efficiency measures are defined for various model specifications.

Table 10: Efficiency measures

Function	***Logged dependent variable***	EFF_i
Production	Yes	$\exp(-U_i)$
Cost	Yes	$\exp(U_i)$
Production	No	$(x_i\beta-U_i)/(x_i\beta)$
Cost	No	$(x_i\beta+U_i)/(x_i\beta)$

Source: Coelli, 1996, p. 8

There are several applications of these estimates to the health sector (Zuckerman, Hadley, Iezzoni, 1994; Vitaliano, Toren, 1994; Filippini, 1999; Tandon et al., 2000; Crivelli, Filippini, Lunati, 2001; Hollingsworth, 2003). They can be used, for example, to test the hypothesis that there is less inefficiency in more competitive markets. Application to reimbursement is, however, more problematic. One obvious difficulty is the output measurement (e.g. patient-days). 'The generic problem is the variation in quality of the product and its dimensionality; frontier techniques work best when the product is homogeneous and uni-dimensional' (Newhouse, 1994, p. 318). Unfortunately, variation in quality and dimension of the product is one of the distinguishing features of the health care industry. Another problem arises in attempting to estimate the cost functions of facilities such as hospitals or nursing homes. This is especially true for hospitals as they are multi-product firms and their cost functions are estimated as translog functions. The approximate number of parameters to be estimated is high (see Table 9) and the aggregation of both inputs and outputs found in existing studies is therefore not surprising. It does, however, emphasise the fact that measurement error may contribute significantly to the estimated inefficiency.

5.2. Data sources and description of variables

Data for econometrically estimating cost functions in the following analysis come from three sources. Financial data for the public providers stem from annual reports of the Association of Health Care Institutes while those for private providers are taken from annual reports of AJPES (Agency of the Republic of Slovenia for Public Legal Records and Related Services). All other data regarding the characteristics of health care services provided or other characteristics of health care providers included in this analysis are from the Health Insurance Institute of Slovenia.

[49] In the case of production frontiers, EFF_i can take a value between zero and one.

1. Using accounting data from original financial statements a more aggregate and analytical balance sheets and income statements were constructed and these were used in the analysis of 57 health centres. Analytical statements were constructed using data from the balance sheets of providers dated 31 December 2002 and from income statements for 2002. In a similar way analytical statements were also constructed for private practitioners. The analysis includes 23 private limited liability companies and one sole trader. Only for this sample of private providers of basic health care was data available from both AJPES and the Health Insurance Institute of Slovenia.

Data on the total costs of basic health care providers are also taken from these balance sheets and income statements.

2. In order to derive econometric estimations of cost functions, a measure of the quantity of services provided was constructed and this is referred to as *the sum of a weighted number of points assigned to health care services provided*. Health centres and private providers of basic health care services[50] record the quantity of services provided by type and this is part of their reports to the Health Insurance Institute of Slovenia. Every type of health care services is assigned a certain code and a certain number of points[51]. Different types of services also have different prices. Health centres report the quantities of basic, dental and emergency transport services separately. Considering that financial data is available jointly for all activities of a health centre, these types of services need to be aggregated in order to obtain a composite measure of a health centre's output. For private providers this is not necessary as only private providers of basic health care services are included in the analysis.

3. For each health centre a measure of quantity was first calculated just for basic health care. For basic health care a measure of quantity, i.e. *the sum of a weighted number of points assigned to basic health care services provided* (*q1*) was calculated in two stages. First, the total number of points for a particular type of basic health care service[52] was multiplied by the ratio between the price of this type of service and the price of the type of service coded 0021[53]. The ratio between the price of a selected type of service and a type of service coded 0021 was therefore used as a weight that either increased (where the price of a selected type of service was higher than for the type of service coded 0021) or decreased the total number of points for a particular type of service. Second, the weighted number of points was calculated in the same way as in the first stage for all types of services and these weighted numbers of points were then summarised for all types of basic health care services provided by each health centre.

[50] This refers only to private providers with concessions.
[51] This is similar to the German point system.
[52] Number of points assigned to one unit of service multiplied by the total quantity of service (e.g. a number of short visits to a general practitioner).
[53] In a list of codes No. 16 of the manual for reporting health care services provided this means a short visit to a physician.

The sum of the weighted number of points assigned to basic health care services provided was also calculated in the same way for private providers. For private providers this is a measure of total output. This is due to the fact that the analysis includes only private providers of basic health care services. Data were available for 23 private providers that are organised as limited liability companies and one private practitioner with the legal form of a sole trader.

4. In a similar way the measure of total quantity of dental services was constructed for each health centre. *The sum of a weighted number of points assigned to dental care services provided* (*q2*) was also calculated in two stages. First, the total number of points for a particular type of dental care service was multiplied by the ratio between the price of this type of service and the price of the type of service coded 0003[54]. Second, these weighted numbers of points were then summarised for all types of dental care services provided by each health centre.

5. Using the same procedure the *sum of a weighted number of points assigned to services of emergency transport* (*q3*) was also calculated. Here, the ratio between the price of each type of emergency transport service and the price of the type of service coded 0004[55] was selected as a weight.

6. Using the value of all basic health care services provided by each health centre and the sum of a weighted number of points assigned to basic health care services provided for each health centre, an average price of basic health care services was computed for every health centre. The average prices of dental care and emergency transport services were computed in the same way. The ratio between the average price of dental care services and the average price of basic health care services and the ratio between the average price of emergency transport services and the average price of basic health care services were then used as weights in order to summarise the sum of the weighted number of points assigned to basic health care services provided, the sum of the weighted number of points assigned to dental care services provided and the sum of the weighted number of points assigned to emergency transport services. This is how the measure of the total quantity of services provided by a health centre was constructed and it is referred to as the *sum of a weighted number of points assigned to health care services provided by health centres* (*services*).

This measure was used as a measure of the total quantity of health care services provided by health centres, i.e. their output. This measure of quantity was also used to calculate average costs.

[54] In a list of codes No. 16 of the manual for reporting health care services provided this means medical services.
[55] In a list of codes No. 16 of the manual for reporting health care services provided this means transport services.

7. In order to estimate cost functions the price of labour (*w*) was calculated by dividing annual gross wages by the average number of employees for each health centre. The price of capital was calculated in four different ways:
- as the sum of depreciation and cost of financing relative to total capital (*i1*);
- as the sum of depreciation and cost of financing relative to the sum of fixed assets and inventory (*i2*);
- as the difference between total cost and cost of labour relative to total capital (*i3*); and
- as the difference between total cost and the cost of labour relative to the sum of fixed assets and inventory (*i4*).

8. Some other characteristics of health centres and their business environment that can have an effect on cost efficiency were also observed for the purpose of this analysis. However, they were unavailable for private providers. These characteristics include the percentage of funds received from obligatory insurance (*insur*), the deficit of general practitioners by regions as estimated by the medical society (*def1*), the deficit of general practitioners by regions as estimated by the Health Insurance Institute (*def2*) and the number of referrals to specialists. The latter are included in the analysis in two ways:
- as the number of referrals (*refer*); and
- as the number of referrals relative to the total quantity of health care services provided (*refers*).

Dummy variables indicating whether managers of health centres have medical education (*ed1=0*) or not (*ed1=1*), whether managers have an education in business and economics (*ed2=1*) or not (*ed2=0*) and whether a health centre is located in a larger city (*city*) were also included in the analysis. Dummy variables indicating the location in one of 10 health regions – Celje (*ce*), Koper (*kp*), Kranj (*kr*), Krško (*krs*), Ljubljana (*lj*), Maribor (*mb*), Murska Sobota (*ms*), Nova Gorica (*ng*) and Novo mesto (*nm*) were also included. The health region Ravne was selected as the basis for comparison.

The number of different types of health care services was also included in the analysis (*activity*). This measure summarises the numbers of different types of basic health care services, different types of dental care services and different types of emergency transport services provided by each health centre.

5.3. Econometric estimation of cost functions

The econometric estimation of cost functions is based on the conclusions and hypotheses outlined in previous sections and summarised at the start of the fifth section of the thesis. As already mentioned it is restricted by the unavailability of data. The cost function analysed in this part of the analysis is estimated in a normalised logarithmic (log-log) form. This is consistent with the conditions outlined in Section 5.1. that cost functions should satisfy. Total costs are a function of input, i.e., labour and capital, prices and the quantities of output

produced. This functional form is used in estimation of the stochastic cost frontier function that allows us to estimate the measures of cost inefficiencies. The stochastic cost frontier function was estimated using the Limdep 7.0 computer programme.

The estimation of cost frontier functions has two parts. In the first part only public providers, i.e., 57 health centres, are included in the analysis. Data for some health centres are not very reliable. Nevertheless, these were not excluded from the analysis but this problem was taken into account to the maximum possible extent when interpreting the results. In the second part, the analysis includes both public and private providers of basic health care services. Due to missing data only 21 private providers organised as limited liability companies are included in the analysis. This part therefore enables an analysis of the effect ownership has on achieving efficient outcomes in health care.

5.3.1. Econometric estimation of the cost functions of health centres

1. In this section we report the econometric results obtained by estimating the cost function in which the dependent and independent variables are in logarithms and have been normalised. The dependent variable is normalised total cost (*ncost*). Information regarding the total cost of health centres was obtained from their income statements. For the first estimation, independent variables include only the sum of a weighted number of points assigned to health care services provided by a health centre (*service*) which is a measure of the health centre's output and normalised price of labour (*nw*). The measure of output was constructed using data collected by the Health Insurance Institute. Both total cost and the price of labour, i.e., the ratio between gross annual wages and average number of employees, were normalised with the price of capital. As Section 5.2. shows, the latter was calculated in four different ways. By normalising total cost and input prices by one of the input prices, the theoretical condition of linear homogeneity in input prices is imposed.

By estimating the impact of the two basic independent variables (output and normalised price of labour) and various combinations of other independent variables on normalised total cost the cost function was obtained that best explains the differences in normalised total costs among health centres.

The results (see Table 11) show that the normalised total cost of a health centre is a function of the normalised price of labour, the health centre's output and the number of different types of health care services provided (*activity*). The results also show a highly significant effect of the location in larger cities (*city*) and of the location in health regions Koper (*kp*) and Kranj (*kr*) on normalised total cost. The effects of the number of referrals to specialists (*refer*) and location in other health regions (*ce, krs, lj, mb, ms, ng, nm*) are not statistically significant.

Such estimations of cost functions were obtained using all four formulations of the price of capital. Adjusted R^2 is highest for the model that normalises total cost and the price of labour

by the fourth price of capital (*i4*). This price of capital is calculated as the difference between total cost and the cost of labour relative to the sum of fixed assets and inventory.

Table 11: Econometric estimation of a normalised log-log cost function of health centres

```
--> regress; Lhs=log(ncost); Rhs=one,log(nw),log(services),log(activity),city...

+----------------------------------------------------------------------+
| Ordinary    least squares regression    Weighting variable = none     |
| Dep. var. = LOGNCOST Mean=   13.77726247    , S.D.=   .8970441700     |
| Model size: Observations =      57, Parameters =   7, Deg.Fr.=     50 |
| Residuals:  Sum of squares= 1.306796758    , Std.Dev.=         .16167 |
| Fit:        R-squared=  .971000, Adjusted R-squared =          .96752 |
| Model test: F[  6,     50] =  279.03,    Prob value =          .00000 |
| Diagnostic: Log-L =     26.7215, Restricted(b=0) Log-L =     -74.1820 |
|             LogAmemiyaPrCrt.=   -3.529, Akaike Info. Crt.=      -.692 |
| Autocorrel: Durbin-Watson Statistic =   1.76620,   Rho =       .11690 |
+----------------------------------------------------------------------+
+---------+-------------+----------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+---------+-------------+----------------+--------+---------+----------+
 Constant -6.027605758      .66051037       -9.126   .0000
 LOGNW     .9822675333      .45770058E-01   21.461   .0000  8.8188903
 LOGSERVI  .7216430908      .48498494E-01   14.880   .0000  13.612582
 LOGACTIV  .4303841226      .88423653E-01    4.867   .0000  2.8764544
 CITY      .2770088111      .92406498E-01    2.998   .0042  .14035088
 KR        .8630515581      .17394370        4.962   .0000  .17543860E-01
 KP        .2558606035      .74994271E-01    3.412   .0013  .10526316
```

All these estimations show that normalised total cost is best explained by the cost function that includes the following variables as independent variables:

- normalised (by capital price *i4*) price of labour (*nw*);
- measure of output, i.e., the sum of a weighted number of points assigned to health care services provided by a health centre (*service*);
- number of different types of health care services provided (*activity*);
- a dummy variable indicating a location in larger cities (*city*); and
- dummy variables indicating a location in health regions Koper (*kp*) and Kranj (*kr*).

The adjusted R^2 for this cost function is 0.968. The effect of the normalised price of labour (*nw*) on cost is positive and highly significant. The effects of the quantity of services provided (*service*), of a location in larger cities (*city*) and of a location in health regions Koper (*kp*) and Kranj (*kr*) are also positive.

Estimations show that the elasticity of normalised total cost with respect to the normalised price of labour is close to 1. The elasticity of normalised total cost with respect to the output level which allows an estimation of returns to scale is 0.722, and the measure that shows whether returns to scale are increasing, constant or decreasing (*ES*) is therefore greater than 1.

$$ES = \frac{1}{\frac{\partial \ln \cos t}{\partial \ln services}} = \frac{1}{0.722} = 1.3857$$

Considering that *ES* is greater than 1 and equals 1.3857, increasing returns to scale are present in the production of health centres. This implies that health centres can lower their average costs by increasing their output level. The economies of scale are exhausted up to a capacity that enables the provision of the quantity of services that corresponds to a total of 4 million points.

The estimates also show that the provision of services in larger cities is more expensive. Total costs of those health centres located in larger cities are about 27% higher than the costs of other health centres. Total costs of health centres located in the Koper health region exceed the total costs of other health centres, with the exception of the Kranj health centre by more than 25%. Total costs of health centres located in the Kranj health region also exceed the total costs of other health centres with the exception of those located in the Koper health region by 86%.

The number of different types of health care services (*activity*) was also included in the analysis. This measure summarises the numbers of different types of basic health care services, different types of dental care services and the different types of emergency transport services provided by each health centre. This variable can be used to roughly estimate economies of scope. The reciprocal value of the elasticity of the normalised total cost with respect to the variable activity is 2.3255. This implies there are economies of scope present in health centres. 'Economies of scope generate cost savings from delivering multiple goods and services jointly through the same organisation rather than through specialised providers' (Molyneux, Altunbas, Gardner, 1996, p. 143). Savings generated by economies of scope are therefore only possible when multiple goods and services are provided and this certainly is a characteristic of a health centre's supply that includes basic health care, dental care and emergency transport services. It can therefore be assumed that health centres can generate cost savings from the joint delivery of various services rather than from delivery through separate specialised providers. There are said to be diseconomies of scope if the opposite applies. The estimated regression coefficient of the variable *activity* indicates that economies of scope exist in health centres and, consequently, health centres can cut their costs by increasing the number of different types of health care activities. The low value of the coefficient (0.43) indicates that there is a high degree of increasing returns to scope. The coefficient is positive and this implies that total costs increase as the number of different activities rises. However, the elasticity of total cost with respect to this independent variable is low and this implies a high degree of increasing returns to scope. It is important to note, however, that this conclusion is based on a very simple measure of economies of scope.

The normalised cost function was also estimated in the translog functional form. The regression coefficients so obtained are not in line with the theoretical assumptions and this form was therefore not used in further estimations.

2. The purpose of this analysis is not only to estimate the cost functions of health centres and identify the factors that determine their total cost. The aim is to explore cost (in)efficiency. This is why the stochastic cost frontier function was estimated assuming the normalised log-log functional form outlined at the beginning of this section (see Table 12). A frontier cost function identifies the minimum costs at a given output level, input price and existing technology. The error (ε) is assumed to be composed of two parts, one reflects the effects of inefficiency (u) while the other captures the effect of noise (v).

The stochastic cost function is estimated under three different assumptions regarding the distribution of the inefficiency term (u). It was assumed to follow, first, a half-normal distribution, second, a truncated normal distribution and, third, an exponential distribution. The latter has proved to be the most appropriate for estimating a stochastic cost frontier for health centres in Slovenia.

Table 12: Stochastic cost frontier function for health centres

```
--> frontier; Lhs=log(ncost); Rhs=one,log(nw),log(services),log(activity);Mod...

+----------------------------------------------------------------------+
| Limited Dependent Variable Model - FRONTIER   Regression             |
| Ordinary    least squares regression    Weighting variable = none    |
| Dep. var. = LOGNCOST Mean=   13.77726247    , S.D.=   .8970441700    |
| Model size: Observations =      57, Parameters =   4, Deg.Fr.=     53 |
| Residuals:  Sum of squares= 2.952474097    , Std.Dev.=         .23602 |
| Fit:        R-squared=  .934481, Adjusted R-squared =          .93077 |
| Model test: F[  3,     53] =  251.97,    Prob value =          .00000 |
| Diagnostic: Log-L =      3.4921, Restricted(b=0) Log-L =     -74.1820 |
|             LogAmemiyaPrCrt.=   -2.820, Akaike Info. Crt.=       .018 |
+----------------------------------------------------------------------+
+---------+-------------+----------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |b/St.Er.|P[|Z|>z] | Mean of X|
+---------+-------------+----------------+--------+---------+----------+
 Constant -6.924575808      .79554963       -8.704   .0000
 LOGNW     .9547095475      .66238508E-01   14.413   .0000  8.8188903
 LOGSERVI  .7932783353      .53724120E-01   14.766   .0000  13.612582
 LOGACTIV  .5158409378      .12658023        4.075   .0000  2.8764544

DFP iterations - current estimate of sigma is non-positive.
Normal exit from iterations. Exit status=0.

              +---------------------------------------------+
              | Limited Dependent Variable Model - FRONTIER |
              | Maximum Likelihood Estimates                |
              | Dependent variable             LOGNCOST     |
              | Weighting variable                  ONE     |
              | Number of observations               57     |
              | Iterations completed                 16     |
              | Log likelihood function        24.74190     |
              | Exponential frontier model                  |
              | Variances: Sigma-squared(v)=       .00283   |
              |            Sigma-squared(u)=       .03501   |
              +---------------------------------------------+
+---------+-------------+----------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |b/St.Er.|P[|Z|>z] | Mean of X|
+---------+-------------+----------------+--------+---------+----------+
          Primary Index Equation for Model
 Constant -7.795544691      .36288925      -21.482   .0000
 LOGNW     1.026747776      .44521456E-01   23.062   .0000  8.8188903
 LOGSERVI  .7986440856      .30064906E-01   26.564   .0000  13.612582
 LOGACTIV  .5073330940      .90491271E-01    5.606   .0000  2.8764544
          Variance parameters for compound error
 Theta     5.344668184      .70050755        7.630   .0000
 Sigmav    .5319191879E-01  .21050181E-01    2.527   .0115
```

This is how an estimation of the cost frontier function was derived in a log-log functional form with total cost (*ncost*) and the price of labour (*nw*) normalised by the fourth price of capital (*i4*). The effect of variables *services* and *activity* are highly statistically significant. All regression coefficients have the expected positive signs. Also in this estimation economies of scale exist and the *ES* that equals 1.252 is similar to the *ES* calculated in the first part of the

section. This estimate also shows that economies of scope exist. The reciprocal value of the elasticity of normalised total cost with respect to the variable *activity* equals 2.

The translog functional form has also been estimated. The signs of regression coefficients are, however, not in line with theoretical expectations and thus this functional form could not be applied.

3. By using the stochastic cost frontier estimated on the assumption of the normalised log-log functional form the inefficiency term (*u*) that is used as a measure of cost inefficiency was estimated. The mean cost inefficiency of health centres is 24.2%. The lowest cost inefficiency is 2.1% and the highest cost inefficiency is 206%.

In order to explain the causes of cost inefficiencies (see Appendix 1) only a limited set of data was available. In the analysis the effect of the location of health centres and of the education of managers on cost inefficiency was estimated. It was established that a location in a larger city has a statistically significant effect on the inefficiency term (*u*). Health centres located in larger cities (*city*) are therefore more cost inefficient. The same was also established for a location in the health regions Koper (*kp*) and Kranj (*kr*). The education of managers also has a statistically significant positive effect on the inefficiency term. This holds true if either economic education (*ed2*) or all non-medical education (*ed1*) is taken into account. It is shown that managers who do not have a medical education work in health centres that are less cost efficient. It was also established that a location in other health regions (exceptions are Kranj and Koper) does not explain inefficiency in a second-step regression.

To summarise, these estimations show that the costs of health centres are determined by the price of labour, the quantity of services provided and number of activities performed. They also show that health centres located in larger cities are less cost efficient and that the economic education of managers does not necessarily result in greater efficiency. Also, for health centres optimal size can be determined as regards both the number of different activities they perform and the level of their output. Reaching optimal size can significantly contribute to a decrease in the average costs of health centres.

4. However, the outlined analysis raises at least two issues. First, the interpretation of the variable *activity* is controversial. It is used to estimate a fairly rough measure of economies of scope. It is a simple non-weighted sum of the number of different types of activities performed by health centres. This is why in the next step of the analysis new variables measuring the quantity of different types of services are introduced. The sum of the weighted number of points assigned to health care services provided by health centres (*services*) was divided into three measures of quantity outlined in Section 5.2. (*q1*) represents the quantity of basic health care services, (*q2*) the quantity of dental care services and (*q3*) the quantity of emergency transport services. In this way the variable *activity* can be excluded from the analysis while the effect of different types of activities is included by introducing three

separate measures of quantity by types of care. All three measures of quantity remain heterogeneous considering that a particular type of care, for example, basic care consists of a large number of services. The method by which these measures were calculated is outlined in Section 5.2. Considering that emergency transport services are not provided by all health centres, the variable measuring the quantity of such services (*q3*) was replaced by a dummy variable (*d3*) indicating whether a health centre provides such services (*d3=1*) or not (*d3=0*).

Second, one problem of these estimations is the interpretation of the regression coefficient of the normalised price of labour (*nw*) that exceeds 1 (1.026) in the estimation of the cost frontier. Namely, this coefficient is used to define the share of gross wages in total costs and this share therefore cannot be greater than 1. This implies the disputable reliability of the estimation results. It can be assumed that the problem lies in the normalisation by the fourth price of capital (*i4*) that is also shown to have a statistically insignificant effect when estimating a cost function in a regular, non-normalised log-log functional form.

In the next stage of the analysis these new explanatory variables (*q1, q2, d3*) were included in our estimation of the cost function in a normalised log-log functional form. Again, total cost and the price of labour are normalised by the fourth price of capital (*i4*).

Table 13: Econometric estimation of a normalised log-log cost function of health centres using three separate measures of the quantity of services

```
--> regress; Lhs=log(ncost); Rhs=one,log(nw),log(q1),log(q2),city,KR,KP,D3$

+----------------------------------------------------------------------+
| Ordinary    least squares regression    Weighting variable = none     |
| Dep. var. = LOGNCOST Mean=   13.77726247    , S.D.=   .8970441700     |
| Model size: Observations =      57, Parameters =   8, Deg.Fr.=     49 |
| Residuals:  Sum of squares= 1.974620369    , Std.Dev.=         .20074 |
| Fit:        R-squared=  .956180, Adjusted R-squared =          .94992 |
| Model test: F[  7,     49] =  152.75,    Prob value =          .00000 |
| Diagnostic: Log-L =     14.9567, Restricted(b=0) Log-L =     -74.1820 |
|             LogAmemiyaPrCrt.=   -3.080, Akaike Info. Crt.=      -.244 |
| Autocorrel: Durbin-Watson Statistic =   1.75649,   Rho =       .12175 |
+----------------------------------------------------------------------+
+---------+-------------+----------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+---------+-------------+----------------+--------+---------+----------+
 Constant -5.448842663      .80043936       -6.807   .0000
 LOGNW     .9525013665      .57610313E-01   16.534   .0000  8.8188903
 LOGQ1     .6540469408      .71590017E-01    9.136   .0000  13.244019
 LOGQ2     .1595949092      .47674253E-01    3.348   .0016  12.375623
 CITY      .3030389556      .11641275        2.603   .0122  .14035088
 KR        .8397487732      .21649076        3.879   .0003  .17543860E-01
 KP        .3118288543      .91511571E-01    3.408   .0013  .10526316
 D3        .1372385284      .63597595E-01    2.158   .0359  .71929825
```

With such a cost function (see Table 13) 95% of the variability of normalised total costs (*ncost*) of health centres in Slovenia is explained. The effects of the normalised price of

labour (*nw*), quantity of basic health services (*q1*) and quantity of dental care services (*q2*) are statistically significant. The same holds for dummy variables that indicate the location of health centres in larger cities (*city*), a location in health regions Koper (*kp*) and Kranj (*kr*) and a dummy variable indicating the provision of emergency transport services (*d3*). The adjusted R^2 for this estimation is lower than for the previous estimation (see Table 11) using one aggregate measure of quantity (*services*) and the variable *activity*.

Also in this case the regression coefficients of the two quantity measures (*q1, q2*) show that increasing returns to scale exists for both types of care. The regression coefficient of the normalised price of labour (*nw*) is 0.952 and is lower than 1. It is, however, still very high and indicates that total costs are almost entirely determined by labour costs. Costs of capital, considering that homogeneity of degree one is assumed, constitute only about 5% of total costs. Taking into account that costs of labour, as indicated in the original financial statements of health centres, are about 70% of total costs the interpretation of this otherwise formally appropriate result is controversial.

5. Regardless of this shortcoming the stochastic cost frontier function was also estimated (see Table 14). Also here the log-log normalised (by the fourth price of capital) functional form was assumed. Measures of the quantity of basic health services (*q1*) and quantity of dental services (*q2*) and dummy variables indicating the provision of emergency transport services (*d3*), the location of health centres in larger cities (*city*) and health regions Kranj (*kr*) and Koper (*kp*) were also included in the estimation.

Table 14: Econometric estimation of a stochastic cost frontier function for health centres using three separate measures of quantity of services (version 1)

```
              +--------------------------------------------+
              | Limited Dependent Variable Model - FRONTIER |
              | Maximum Likelihood Estimates               |
              | Dependent variable             LOGNCOST    |
              | Weighting variable                  ONE    |
              | Number of observations               57    |
              | Iterations completed                 18    |
              | Log likelihood function        21.06313    |
              | Exponential frontier model                 |
              | Variances: Sigma-squared(v)=       .00880  |
              |            Sigma-squared(u)=       .02511  |
              +--------------------------------------------+
+---------+-------------+---------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |b/St.Er.|P[|Z|>z] | Mean of X|
+---------+-------------+---------------+--------+---------+----------+
          Primary Index Equation for Model
 Constant -7.051636207      .83927790       -8.402   .0000
 LOGNW     .9810660057      .61746811E-01   15.889   .0000  8.8188903
 LOGQ1     .7300681095      .68026832E-01   10.732   .0000  13.244019
 LOGQ2     .1754613227      .38274947E-01    4.584   .0000  12.375623
 CITY      .1002511023      .11122856         .901   .3674  .14035088
 KR        .9592325469      3605588.6         .000  1.0000  .17543860E-01
 KP        .2408404770      .62953673E-01    3.826   .0001  .10526316
 D3        .1693061283      .51211449E-01    3.306   .0009  .71929825
          Variance parameters for compound error
 Theta     6.310178099      1.5262692        4.134   .0000
 Sigmav    .9383162337E-01  .29493725E-01    3.181   .0015
```

In this estimation the effect of a location in the health region Kranj (*kr*) on normalised total cost (*ncost*) is statistically insignificant. A statistically insignificant effect is also characteristic of a location in larger cities (*city*). Other explanatory variables have the expected signs and have a statistically significant effect on normalised total cost. The regression coefficient of the normalised price of wages (*nw*) is 0.981. It is below 1 and therefore consistent with the condition of homogeneity of degree one in input prices that cost functions must satisfy.

6. Estimations of the stochastic cost frontier function with three separate measures of quantity of services show that dummy variables indicating a location in larger cities (*city*) and a location in the health region Kranj (*kr*) do not have a statistically significant effect on normalised total cost (*ncost*). This is why the formulation of the stochastic cost frontier function that explains the normalised total cost of health centres with the normalised price of labour (*nw*), measures of the quantity of basic health care services (*q1*) and dental services (*q3*) and dummy variables indicating the provision of emergency transport services (*d3*) and the location in the health region Koper (*kp*) were considered the most appropriate for estimating the cost inefficiencies of health centres in Slovenia (see Table 15).

Table 15: Econometric estimation of a stochastic cost frontier function for health centres using three separate measures of the quantity of services (version 2)

```
--> frontier; Lhs=log(ncost); Rhs=one,log(nw),log(q1),log(q2),KP,D3;Model=E;C...

+----------------------------------------------------------------------+
| Limited Dependent Variable Model - FRONTIER   Regression             |
| Ordinary    least squares regression    Weighting variable = none    |
| Dep. var. = LOGNCOST Mean=   13.77726247    , S.D.=   .8970441700    |
| Model size: Observations =      57, Parameters =   6, Deg.Fr.=     51 |
| Residuals:  Sum of squares= 3.185676373    , Std.Dev.=         .24993 |
| Fit:        R-squared=  .929305, Adjusted R-squared =          .92237 |
| Model test: F[  5,     51] =  134.08,    Prob value =          .00000 |
| Diagnostic: Log-L =      1.3255, Restricted(b=0) Log-L =     -74.1820 |
|             LogAmemiyaPrCrt.=   -2.673, Akaike Info. Crt.=       .164 |
+----------------------------------------------------------------------+
+---------+-------------+----------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |b/St.Er.|P[|Z|>z] | Mean of X|
+---------+-------------+----------------+--------+---------+----------+
 Constant -6.937132022      .86170452       -8.050   .0000
 LOGNW     .9328294831      .70990917E-01   13.140   .0000  8.8188903
 LOGQ1     .7744010480      .79387451E-01    9.755   .0000  13.244019
 LOGQ2     .1700148137      .58993299E-01    2.882   .0040  12.375623
 KP        .3619778310      .11102368        3.260   .0011  .10526316
 D3        .1244956473      .78132918E-01    1.593   .1111  .71929825

Normal exit from iterations. Exit status=0.

              +---------------------------------------------+
              | Limited Dependent Variable Model - FRONTIER |
              | Maximum Likelihood Estimates                |
              | Dependent variable             LOGNCOST     |
              | Weighting variable                  ONE     |
              | Number of observations               57     |
              | Iterations completed                 20     |
              | Log likelihood function        15.40178     |
              | Exponential frontier model                  |
              | Variances: Sigma-squared(v)=       .00502   |
              |            Sigma-squared(u)=       .04504   |
              +---------------------------------------------+
+---------+-------------+----------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |b/St.Er.|P[|Z|>z] | Mean of X|
+---------+-------------+----------------+--------+---------+----------+
          Primary Index Equation for Model
 Constant -7.416030256      .53425776      -13.881   .0000
 LOGNW     .9993814173      .63395480E-01   15.764   .0000  8.8188903
 LOGQ1     .7261702150      .64908479E-01   11.188   .0000  13.244019
 LOGQ2     .1933250307      .42874539E-01    4.509   .0000  12.375623
 KP        .2025792078      .57618559E-01    3.516   .0004  .10526316
 D3        .1896066210      .52019603E-01    3.645   .0003  .71929825
          Variance parameters for compound error
 Theta     4.712086357      .71742429        6.568   .0000
 Sigmav    .7086127643E-01  .28266444E-01    2.507   .0122
```

In the estimation of the stochastic cost frontier function all the mentioned explanatory variables have a highly statistically significant effect. The regression coefficient of the normalised price of labour is lower than 1. Its value is, however, very high (0.999).

This estimation was used to estimate returns to scale. Regression coefficients show that increasing returns to scale are characteristic of both the provision of basic and dental care services.

The minimum long-term average cost for these two types of care cannot be accurately determined with the estimates we obtained. However, they show that health centres can lower average costs if they increase the level of output to the quantity of basic health care services that corresponds to about 920,000 points. Health centres can also lower their average costs by increasing the quantity of dental services provided to the level that corresponds to approximately 1.5 million points.

7. The econometric estimation of the stochastic cost frontier enables an estimation of the inefficiency term (u) that is used as a measure of the cost inefficiency of health centres. The mean cost inefficiency of health centres is 27.6%. The lowest cost inefficiency is 2.9% while the highest cost inefficiency is 206.4%.

Second-stage regression that is used to explain the sources of health centres' inefficiency (see Appendix 2) shows that this inefficiency can at least party be explained by a location in larger cities and in the health region Kranj and in cases where managers without medical education are appointed. This especially applies when managers with an education in management and economics are appointed. The share of funds received from compulsory insurance also has an effect (P=0.063) on the inefficiency term. The same holds true for the deficit of general practitioners by regions as estimated by the medical society. The inefficiency term could not, however, be explained by the number of referrals although this was one hypothesis outlined at the beginning of Section 5.

Based on these estimations it can be concluded that conditions in larger cities give rise to a certain degree of inefficiency of health centres. The degree of inefficiency is also high for health centres in the health region Kranj. The impact of the education of managers on the inefficiency term shows that even managers with a background in economics and management are not enough to achieve the efficient management of health centres in situations where there are other reasons for their inefficiency. It has been shown that the inefficiency term is affected by the share of funds received from compulsory insurance. The higher the share of these funds, the lower the cost inefficiency of health centres. Apparently a higher share of funds from compulsory insurance enables health centres to achieve higher degrees of efficiency. About 10% of the variability in the inefficiency term is explained by the deficit of general practitioners by region in which health centres are located. Interestingly, this holds true only for the deficits that are estimated by the medical society. Such an effect cannot

be determined for the deficits estimated by the Health Insurance Institute of Slovenia. The higher the deficit of general practitioners (as estimated by the medical society) in a particular region the larger the cost efficiency of health centres located in this region. This is due to the better utilisation of labour, higher labour productivity and lower labour costs. The latter are, as already mentioned, the main determinant of the total cost of health centres.

5.3.2. Econometric estimation of the cost functions of private and public basic health care providers

In the next step of the analysis that part of the private sector that supplies basic health care services was included. This enables the comparison of cost efficiency between the two, i.e., public and private, sectors of basic health care providers.

The analysis is based on financial data from balance sheets and the income statements private practitioners report to AJPES and other data about private practitioners available from the Health Insurance Institute of Slovenia. The latter funds private practitioners with concessions. Data from the Health Insurance Institute was used to calculate measures of the quantity of services provided. A comprehensive data set was thereby constructed using financial statements and other data sources for both health centres and private providers. The analysis therefore includes 57 health centres and 21 privately-owned providers that are organised as limited liability companies.

The available data was used to estimate cost functions. Variables included in the estimation were the total costs of providers, the price of labour, the price of capital, the share of funds from compulsory insurance, the quantity of services provided and dummy variables indicating the regional location of providers and the type of sector, i.e., either public or private.

The measure of output of health centres is the sum of the weighted number of points assigned to health care services provided by health centres. This measure aggregates basic health care services, dental services and emergency transport services. The aggregate measure is used because the total costs of health centres are only available for all types of services provided. They are unfortunately unavailable separately by type of care. Given that private providers included in the analysis supply only basic health care, the measure of the output of private providers is the sum of the weighted number of points assigned to basic health care services provided.

1. Using the described data the basic specification of a cost function in a log-log normalised functional form was estimated for all, i.e., both public and private, basic health care providers (see Table 16). Best estimation results are obtained if total cost and the price of labour are normalised by the first price of capital (*i1*).

Table 16: Econometric estimation of a normalised log-log cost function of basic health care providers

```
--> regress; Lhs=log(ncost); Rhs=one,log(nw),log(services)$

+----------------------------------------------------------------------+
| Ordinary    least squares regression    Weighting variable = none     |
| Dep. var. = LOGNCOST Mean=   15.10875229    , S.D.=   1.739038710     |
| Model size: Observations =      78, Parameters =   3, Deg.Fr.=     75 |
| Residuals:  Sum of squares= 11.27051979    , Std.Dev.=         .38765 |
| Fit:        R-squared=  .951601, Adjusted R-squared =          .95031 |
| Model test: F[  2,     75] =  737.31,    Prob value =          .00000 |
| Diagnostic: Log-L =    -35.2310, Restricted(b=0) Log-L =    -153.3339 |
|             LogAmemiyaPrCrt.=   -1.858, Akaike Info. Crt.=       .980 |
| Autocorrel: Durbin-Watson Statistic =   1.62511,   Rho =       .18744 |
+----------------------------------------------------------------------+
+---------+-------------+----------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+---------+-------------+----------------+--------+---------+----------+
 Constant -4.256326162      .83472555       -5.099   .0000
 LOGNW     .7417248428      .86626347E-01    8.562   .0000  10.893948
 LOGSERVI  .8861855739      .30616954E-01   28.944   .0000  12.734090
```

These estimations show that 95% of the variability of the normalised total cost (*ncost*) of basic health care providers included in the analysis can be explained by the normalised price of labour (*nw*) and the quantity of services (*services*) provided. The effect of both explanatory variables is highly significant has the expected sign.

Some other variables mentioned at the start of this section were added to this basic cost function. A dummy variable indicating whether a provider is publicly- (*sector=1*) or privately-owned (*sector=0*) does not have a statistically significant effect on total cost.

2. This is why for further estimations the basic specification of the cost function in a normalised log-log functional form was used. Total cost and the price of labour are normalised by the price of capital (*i1*). This implies that homogeneity in input prices is assumed and this is line with the theoretical assumptions outlined in Section 5.1.

Such a specification was used to estimate a stochastic cost frontier function. The stochastic cost frontier function was estimated under three different assumptions regarding the distribution of the inefficiency term (*u*). It was assumed to follow either a half-normal distribution, a truncated normal distribution or an exponential distribution. The assumption of the half-normal distribution proved most appropriate for the estimation of a stochastic cost frontier function for basic health care providers in Slovenia.

Table 17: Econometric estimation of a stochastic cost frontier function for basic health care providers

```
--> frontier; Lhs=log(ncost); Rhs=one,log(nw),log(services);cost;res=u;list$

+---------------------------------------------------------------------+
| Limited Dependent Variable Model - FRONTIER   Regression            |
| Ordinary    least squares regression    Weighting variable = none   |
| Dep. var. = LOGNCOST Mean=   15.10875229    , S.D.=   1.739038710   |
| Model size: Observations =      78, Parameters =   3, Deg.Fr.=     75 |
| Residuals:  Sum of squares= 11.27051979    , Std.Dev.=         .38765 |
| Fit:        R-squared=  .951601, Adjusted R-squared =          .95031 |
| Model test: F[  2,     75] =  737.31,    Prob value =          .00000 |
| Diagnostic: Log-L =    -35.2310, Restricted(b=0) Log-L =    -153.3339 |
|             LogAmemiyaPrCrt.=   -1.858, Akaike Info. Crt.=       .980 |
+---------------------------------------------------------------------+
+---------+-------------+---------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |b/St.Er.|P[|Z|>z] | Mean of X|
+---------+-------------+---------------+--------+---------+----------+
 Constant -4.256326162      .83472555       -5.099   .0000
 LOGNW     .7417248428      .86626347E-01    8.562   .0000  10.893948
 LOGSERVI  .8861855739      .30616954E-01   28.944   .0000  12.734090
Normal exit from iterations. Exit status=0.

              +-------------------------------------------+
              | Limited Dependent Variable Model - FRONTIER |
              | Maximum Likelihood Estimates                |
              | Dependent variable             LOGNCOST     |
              | Weighting variable                  ONE     |
              | Number of observations               78     |
              | Iterations completed                 15     |
              | Log likelihood function       -31.53358     |
              | Variances: Sigma-squared(v)=       .02094   |
              |            Sigma-squared(u)=       .35962   |
              +-------------------------------------------+
+---------+-------------+---------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |b/St.Er.|P[|Z|>z] | Mean of X|
+---------+-------------+---------------+--------+---------+----------+
          Primary Index Equation for Model
 Constant -6.850304889      .94062940       -7.283   .0000
 LOGNW     .8284054334      .10434586        7.939   .0000  10.893948
 LOGSERVI  .9803616574      .41150075E-01   23.824   .0000  12.734090
          Variance parameters for compound error
 Lambda    4.144015955      1.3706148        3.023   .0025
 Sigma     .6168931880      .56156878E-01   10.985   .0000
```

3. The stochastic cost frontier function assuming the normalised (by the price of capital *i1*) log-log functional form and a half-normal distribution of the inefficiency term (u) is used to estimate measures of the cost inefficiencies of basic health care providers in Slovenia. The regression coefficient of the normalised price of labour is in line not only with theoretical assumptions but data on the actual share of labour costs in total costs of providers. Elasticity of total costs with respect to the output level is 0.98 and this implies *ES* is greater than 1. This means that increasing returns to scale are characteristic of basic health care providers.

The estimation of the inefficiency term (*u*) used as a measure of the cost inefficiency of basic health care providers shows that the mean cost inefficiency of providers is 72.3%. The lowest cost inefficiency is 5.6% and the highest cost inefficiency is 787%. This clearly shows that differences in cost efficiency among basic health care providers are significant.

Using second-stage regression the causes of these cost inefficiencies were analysed (see Appendix 3). In the analysis the effect of the location of basic health care providers in larger cities and in different regions on cost inefficiency was estimated. The effect of the share of funds from compulsory insurance and the effect of ownership was also estimated. Among the tested variables only the type of ownership (*sector*) has a statistically significant effect on the inefficiency of basic health care providers (see Table 18).

Table 18: Econometric estimation of the effect of type of ownership on the inefficiency term

```
--> regress; Lhs=eff; Rhs=one,sector$

| Fit:        R-squared=  .132213, Adjusted R-squared =          .12080 |
+---------+-------------+---------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+---------+-------------+---------------+--------+---------+----------+
 Constant  2.359053895      .21857772       10.793   .0000
 SECTOR   -.8700691476      .25569119       -3.403   .0011  .73076923
```

These estimations show that the type of ownership explains 12% of the variability of the inefficiency term. The type of ownership therefore has important implications for the efficiency of basic health care providers. Considering the positive sign of the regression coefficient for the dummy variable *sector* that indicates the type of ownership, it can be stated that publicly-owned health centres are more efficient than the private basic health care providers included in the analysis. The analysis only includes those private providers that are organised as limited liability companies. This conclusion can therefore be considered as valid only when comparing the efficiency of public health centres and those private basic health care providers that are organised as limited liability companies.

6. CONCLUSIONS

Characteristics of public health centres and private providers of basic health care as regards their cost efficiency can be summarised in the following conclusions and recommendations:

1. Financial data (see Table 8) indicate significant differences in efficiency among different basic health care providers. The analysis of liquidity indicates that the value of the current ratio ranges from 0 to 28 and the standard deviation equals 3.19. Days inventory in stock range from 0 to 160 with a standard deviation of 23.4. For the debt-to-total-capital ratio the standard deviation equals 1.13. The inefficiency term (*u*) of the stochastic cost frontier function that is used as a measure of cost inefficiency indicates that the mean cost inefficiency

of health centres is 24.2%. The lowest cost inefficiency is 2.1% and the highest cost inefficiency 206%. The analysis of both public and private providers of basic health care indicates that the mean cost inefficiency of providers is 72.3%. In this case, the lowest degree of inefficiency is 5.6% and the highest degree of inefficiency is 787%. This clearly shows that differences in cost efficiency among basic health care providers are noteworthy. These differences imply that by achieving greater efficiency significant cost savings could be generated by basic health care providers.

2. The total cost of public health centres is determined by the price of labour, the quantity of services provided and the number of activities performed.

3. Average costs of public health centres are determined by the quantity of health care services provided. This implies that health centres can lower their average cost by increasing their output level. Increasing returns to scale are therefore characteristic of health centres. However, economies of scale are exhausted up to the capacity that enables the provision of the quantity of services that corresponds to a total of 4 million points. There are also economies of scope present in health centres. It can therefore be concluded that health centres can generate cost savings by increasing the number of activities and joint delivery of these multiple services rather than by delivery through separate specialised providers. In Slovenia, some health centres are too small and do not employ the optimum level of capacities. It would therefore be reasonable for some public basic health care providers to merge and thus reach their optimal size and take advantage of both economies of scale and economies of scope.

4. The estimates also show that the economic education of managers does not necessarily result in greater efficiency.

5. Health centres located in larger cities are less cost efficient. Cost inefficiency is also characteristic of health centres located in the Kranj health region.

6. It has been shown that cost inefficiency is affected by the share of funds received from compulsory insurance. The higher the share of these funds the lower the cost inefficiency of the health centres. Apparently a higher share of funds from compulsory insurance enables health centres to achieve higher degrees of efficiency.

7. About 10% of the variability of cost inefficiency is explained by the deficit of general practitioners by the region in which health centres are located. Interestingly, this holds true only for the deficit that is estimated by the medical society. Such an effect cannot be determined for the deficit estimated by the Health Insurance Institute of Slovenia. The higher the deficit of general practitioners (as estimated by the medical society) in a particular region the larger the cost efficiency of health centres located in that region. This is due to the better utilisation of labour, higher labour productivity and lower labour costs. The latter are the main determinant of the total cost of health centres.

8. Total cost could not, however, be explained by the number of referrals. Based on empirical results we cannot state that health centres take financial and business criteria into consideration when referring patients to specialists. This supports the argument that the gatekeeping role of basic health care should be integrated to a greater extent with secondary outpatient care through reimbursement schemes. In other words, some forms of outpatient care could be financed out of capitation of general practitioners.

Basic health care providers can contribute to greater cost efficiency and prevent the over-use of specialist health care services with a well-designed programme for preventive care and their gatekeeping role. As regards cost containment, the gatekeeping role is very important given that specialist care is more expensive and greatly contributes to a health centre's average cost.

9. Publicly-owned basic health care providers are more cost efficient than the private basic health care providers included in the analysis of this thesis. These are 57 health centres and 21 private providers. The analysis includes only those private providers organised as limited liability companies. This conclusion can therefore be considered as valid only when comparing the efficiency of public health centres and those private basic health care providers that are organised as limited liability companies.

For private basic health care providers, decisions determining the level of efficiency are a matter of their own interest. However, the quantity of services funded by the Health Insurance Institute should be monitored more closely so as to prevent any increases in the income of private providers through increases in the prices of services (by unmonitored decreases in their quantity) which, in the absence of this type of supervision, is a realistic possibility given that capitation payment has also been implemented for private providers with a concession to provide these services.

REFERENCES

1. Aigner D. J., Lovell C. A. K., Schmidt P.: Formulation and Estimation of Stochastic Frontier Production Function Models. Journal of Econometrics, Amsterdam : Elsevier, (1977), 6, pp. 21 – 37.
2. Alchian A. A.: Some Economics of Property Rights. Santa Monica : Rand Corporation, 1961.
3. Allsop J., Mulcahy L.: Regulating Medical Work: Formal and Informal Controls. Buckingham : Open University Press, 1996. 230 p.
4. Arrow K. J.: Uncertainty and the Welfare Economics of Medical Care. American Economic Review, Nashville : American Economic Association, 53(1963), 5, pp. 941-973.
5. Bays Carson: Why Most Private Hospitals are Nonprofit. Journal of Policy Analysis and Management, Chichester : John Wiley & Sons, (1983), 2, pp. 366-385.
6. Bator Francis M.: The Anatomy of Market Failure. Quarterly Journal of Economics, Cambridge : MIT Press, 72(1958), 3, pp. 351-379.
7. Berndt Ernst R.: Medical Care Prices and Output. Culyer A. J., Newhouse J. P., eds., Handbook of Health Economics. Amsterdam : Elsevier Science, 2000, pp. 120-180.
8. Bhargava Alok, Jamison Dean T., Lau Lawrence J., Murray Christopher J. L.: Modelling the effects of health on economic growth. Journal of Health Economics, Amsterdam : Elsevier Science, 20(2001), 3, pp. 423-440.
9. Björkgren M.A., Häkkinnen U., Linna M.: Measuring Efficiency of Long-Term Care Units in Finland. Health Care Management Science, Dordrecht : Kluwer Academic Publishers, 4(2001), 3, pp. 193-200.
10. Boerma W. G. W. et al.: Health Care and General Practice across Europe. Utrecht : NIVEL, 1993.
11. Boerma W. G. W. et al.: Service profiles of general practitioners in Europe. British Journal of General Practice, London : British College of General Practitioners, 47(1997), pp. 481-486.
12. Boerma W. G. W., Fleming D. M.: The Role of General Practice in Primary Health Care. London : The Stationery Office, 1998. 121 p.
13. Buchholz W. B. et al.: Wettbewerb aller Krankenversicherungen kann Qualität verbessern und Kosten des Gesundheitswesens senken. Discussionpaper No. 247. Berlin : Deutsches Institut für Wirtchaftsforschung, 2001. 24 p.
14. Burns Lawton R. et al.: The Wharton School Study of the Health Care Value Chain. Burns Lawton R., ed., The Health Care Value Chain. San Francisco : A Wiley Company, 2002, pp. 3-26.
15. Charnes A., Cooper W. W., Rhodes E.: Measuring the efficiency of decision-making units. European Journal of Operational Research, Amsterdam : Elsevier, (1978), 2, pp. 429-444.
16. Charnes A., Cooper W.W., Lewin A.Y., Seiford L.M., eds.: Data Envelopment Analysis: Theory, Methodology and Applications. Boston : Kluwer, 1995. 528 p.

17. Christensen L. R., Greene W.: Economies of Scale in U.S. Power Generation. Journal of Political Economy, Chicago : University of Chicago Press, 84(1976), August, pp. 655-676.
18. Coase Ronald H.: The Problems of Social Costs. Journal of Law and Economics, Chicago : University of Chicago Law School, 3(1960), October, pp. 1-41.
19. Coelli Tim: A Guide to FRONTIER Version 4.1: A Computer Program for Stochastic Frontier Production and Cost Frontier Estimation. Armidale : University of New England, Centre for Efficiency and Productivity Analysis, 1996. 33 p.
20. Cornes Richard, Sandler Todd: The Theory of Externalies, Public Goods, and Club Goods. Cambridge : Cambridge University Press, 1986. 303 p.
21. Crivelli Luca, Filippini Massimo, Lunati Diego: Regulation, ownership and efficiency in the Swiss nursing home industry. Quaderno N. 01-04. Lugano : University of Switzerland, Economics Department, 2001. 27 p.
22. Cronin E., Normand C., Henthorn J. S., Hickman M., Davies S. C.: Costing model for neonatal screening and diagnosis of haemoglobinopathies. Archives of Disease in Childhood, Fetal and Neonatal Edition, London : Royal College of Paediatrics and Child Health, 79(1998), 3, pp. 161-167.
23. Cullis John G., Jones Philip R.: Rationing by Waiting Lists: An Implication. American Economic Review, Pittsburgh : American Economic Association, 76(1986), 1, pp. 250-256.
24. Cullis John G., Jones Philip R., Propper C.: Waiting Lists and Medical Treatment. Culyer A. J., Newhouse J. P., eds., Handbook of Health Economics. Amsterdam : Elsevier Science, 2000, pp. 1201-1250.
25. Cullis John G., West Peter A.: The Economics of Health: An Introduction. Oxford : Martin Robertson & Company Ltd., 1979. 309 p.
26. DeVany A. S., House D. R., Saving T. R.: The Role of Patient Time in the Pricing of Dental Services: The Fee-Provider Density Relation Explained. Southern Economic Journal, Stillwater : Southern Economic Association, 49(1983), 3, pp. 669-680.
27. Domberger S., Jensen P.: Contracting-out by the public sector: theory, evidence, prospects. Oxford Review of Economic Policy, Oxford : Oxford University Press, 13(1997), 4, pp. 67-78.
28. Enthoven, A.: Reflection on the Management of the NHS. London : Nuffield Provincial Hospitals Trust, 1985.
29. Evans R. G.: Supplier-induced Demand. Perlman M., ed., The Economics of Health and Medical Care. London : Macmillan, 1974, pp. 162-173.
30. Farrell M. J.: The measurement of productive efficiency. Journal of the Royal Statistical Society A, Oxford : Blackwell Publishing, 120(1957), 3, pp. 253-281.
31. Felder Stefan: Managed Care: Low Reputation but Most Effective. Dice Report, Journal for International Comparisons, Munich : Ifo Institute for Economic Research, 1(2003), 3, pp. 15-19.

32. Felder Stefan, Werblow Andreas: Swiss Social Health Insurance: Co-payments Work. Dice Report, Journal for International Comparisons, Munich : Ifo Institute for Economic Research, 1(2003), 3, pp. 43-46.
33. Feldstein Paul J.: Health Care Economics. Fifth Edition. Clifton Park (NY) : Thomson – Delmar Learning, 2002. 627 p.
34. Ferguson, C. E.: Microeconomic Theory. Homewood : Irwin, 1972. 565 p.
35. Filippini Massimo: Cost and Scale Efficiency in the Nursing Home Sector: Evidence from Switzerland. Quaderno N. 99-02. Lugano : University of Switzerland, Economics Department, 1999. 18 p.
36. Folland Sherman, Goodman Allen C., Stano Miron: The Economics of Health and Health Care. Third Edition. New Jersey : Prentice Hall, 2000. 667 pp.
37. Fuchs V. R.: The Supply of Surgeons and the Demand for Operations. Journal of Human Resources, Madison : University of Wisconsin Press, 13(1978), supplement, pp. 35-56.
38. Giuffrida Antonio, Gravelle Hugh: Measuring Performance in Primary Care: Econometric Analysis and DEA. Applied Economics, London : Taylor & Francis Ltd, 33(2001), 2, pp. 163-175.
39. Gordon Margaret S.: Social Security Policies in Industrial Countries. Cambridge : Cambridge University Press, 1988. 400 p.
40. Griffiths Alan, Wall Stuart: Intermediate Microeconomics: Theory and Applications. Second Edition. Harlow : Financial Times/Prentice Hall, 2000. 725 p.
41. Groenewegen Peter P., Dixon Jenifer, Boerma Wienke G. W.: The Regulatory Environment of General Practice: An International Perspective. Saltman Richard B., Busse Reinhard, Missialos Elias, eds., Regulating Entrepreneurial Behaviour in European Health Care Systems. Buckingham, Philadelphia : Open University Press, 2002, pp. 200-214.
42. Hall David: Public Enterprise in Europe. London : Public Services International Research Unit, University of Greenwich, 1998. 33 p.
43. Hansmann H.: The Role of Nonprofit Enterprise. The Yale Law Journal, New Haven : Yale University, 89(1980), 5, pp. 835-901.
44. Harris, J.: The Internal Organization of Hospitals: Some Economic Implications. Bell Journal of Economics, Santa Monica : The Rand Corporation, 8(1977), 2, pp. 467-482.
45. Henke Klaus-Dirk, Borchardt Katja: Reform Proposals for Health-care Systems. Dice Report, Journal for International Comparisons, Munich : Ifo Institute for Economic Research, 1(2003), 3, pp. 3-8.
46. Hollingsworth Bruce: Non-Parametric and Parametric Applications Measuring Efficiency in Health Care. Health Care Management Science, Dordrecht : Kluwer Academic Publishers, 6(2003), 4, pp. 203-218.
47. Jondrow J. et al.: On Estimation of Technical Inefficiency in the Stochastic Frontier Production Function Model. Journal of Econometrics, Amsterdam : Elsevier, 19(1982), 3, pp. 233-238.

48. Jorgensen D.W.: Econometric Methods for Modelling Producer Behaviour. Griliches Z., Intriligator M. D., eds., Handbook of Econometrics. Amsterdam : North-Holland, 1986, pp. 1841-1915.
49. Keber Dušan et al.: Zdravstvena reforma. Pravičnost, dostopnost, kakovost, učinkovitost (*The Health Reform: Justice, Accessibility, Quality, Efficiency*). Ljubljana : Ministrstvo za zdravje, 2003. 348 p.
50. Kessel R. A.: Price Discrimination in Medicine. Journal of Law and Economics, Chicago : University of Chicago Press, 1(1958), 2, pp. 20-53.
51. Kornai J., Eggleston K.: Welfare, Choice, and Solidarity in Transition. Cambridge : Cambridge University Press, 2001. 365 p.
52. Kumaranayake Lilani et al.: How do countries regulate the health sector? Evidence from Tanzania and Zimbabwe. Health Policy and Planning, Oxford : Oxford University Press, 15(2000), 4, pp. 357-367.
53. Laffont, J. J., Tirole, J.: A Theory of Incentives in Procurement and Regulation. Cambridge MA : MIT Press, 1993. 705 p.
54. Le Grand Julian: Equity, efficiency and rationing of health care. Nicholas Barr, ed., Economic Theory and the Welfare State, Volume III, Benefits in Kind. Cheltenham, Northampton : Edward Elgar Publishing, 2001, pp. 133-146.
55. McGuire T. G.: Physician Agency. Culyer A. J., Newhouse J. P., eds., Handbook of Health Economics (Volume 1B). Amsterdam : Elsevier Science, 2000, pp. 462-517.
56. McPake Barbara: User charges for health services in developing countries: a review of economic literature. Social Science and Medicine, Amsterdam : Elsevier, 36(1993), 11, pp. 1397-1405.
57. McPake Barbara, Kumaranayake Lilani, Normand Charles: Health Economics: An International Perspective. London : Routledge, 2002. 260 p.
58. Meeusen W., van den Broeck J.: Efficiency Estimation from Cobb-Douglas Production Functions with Composed Error. International Economic Review, Oxford : Blackwell Publishing, 18(1977), 2, p. 435-444.
59. Molyneux P., Altunbas Y., Gardner E.: Efficiency in European Banking. Chichester : John Wiley & Sons, 1996. 354 p.
60. Mossialos et al.: Voluntary health insurance in the European Union. Report prepared for the Directorate General for Employment and Social Affairs of the European Commission. London : European Observatory on Health Care Systems and LSE Health and Social Care, London School of Economics and Political Science, 2002. 181 p.
61. Mukamel D. B., Mushlin A. I.: Quality of Care Information Makes a Difference: An Analysis of Market Shares and Price Changes Following Publication of the New York State Cardiac Surgery Reports. Medical Care, Washington : Medical Care Section, American Public Health Association, 36(1998), 7, pp. 945-954.
62. Musgrave Richard A., Musgrave Peggy B.: Public finance in theory and practice. 5th edition. New York : McGraw-Hill, 1989. 627 p.

63. Newhouse Joseph P.: Toward a Theory of Nonprofit Institutions: An Economic Model of a Hospital. American Economic Review, Nashville : American Economic Association, 60(1970), 1, pp. 64-75.
64. Newhouse Joseph P.: The Demand for Medical Care Services: A Retrospect and Prospect. van der Gaag J., Perlman P., eds., Health, Economics, and Health Economics. Amsterdam : North-Holland Publishing Company, 1981, pp. 85-102.
65. Newhouse Joseph P. and the Insurance Experiment Group: Free for All? Lessons from the RAND Health Insurance Experiment. Cambridge, MA : Harvard University Press, 1993. 592 p.
66. Newhouse Joseph P.: Frontier Estimation: How Useful a Tool for Health Economics?. Journal of Health Economics, Netherlands : Elsevier Science, 13(1994), 3, pp. 317-322.
67. Nyman John A., Bricker Dennis L.: Profit Incentives and Technical Efficiency in the Production of Nursing Home Care. The Review of Economics and Statistics, Cambridge : The MIT Press, 71(1989), 4, pp. 586-594.
68. Osterkamp Rigmar, Eller Markus: How Decentralised is Government Activity? Dice Report, Journal for International Comparisons, Munich : Ifo Institute for Economic Research, 1(2003), 1, pp. 32-35.
69. Osterkamp Rigmar, Eller Markus: Functional Decentralisation of Government Activity. Dice Report, Journal for International Comparisons, Munich : Ifo Institute for Economic Research, 1(2003a), 3, pp. 36-42.
70. Palm Willy, Nickless Jason: Access to Healthcare in the European Union: The consequences of the Kohl and Decker judgements. Eurohealth, London : European Observatory on Health Care Systems and LSE Health and Social Care, London School of Economics and Political Science, 7(2001), 1, pp. 13-15.
71. Pauly Mark V., Satterthwaite M. A.: The Pricing of Primary Care Physicians' Services: A Test of the Role of Consumer Information. Bell Journal of Economics, Santa Monica : The Rand Corporation, 12(1981), 2, pp. 488-506.
72. Pauly Mark, Redisch Michael: The Not-for-Profit Hospital as a Physicians' Cooperative. American Economic Review, Nashville : American Economic Association, 63(1973), 1, pp. 87-99.
73. Peacock Stuart, Segal Leonie: Capitation funding in Australia: Imperatives and impediments. Health Care Management Science, Dordrecht : Kluwer Academic Publishers, 3(2000), 2, pp. 77-88.
74. Phelps Charles E.: Information Diffusion and Best Practice Adoption. Culyer A. J., Newhouse J. P., eds., Handbook of Health Economics. Amsterdam : Elsevier Science, 2000, pp. 223-264.
75. Phelps Charles E.: Health Economics. Third Edition. Boston : Addison Wesley, 2003. 671 p.
76. Pindyck Robert S., Rubinfeld Daniel L.: Microeconomics. 4th Edition. Upper Saddle River (N.J.) : Prentice Hall, 1998. 726 p.
77. Pope Gregory C., Burge Russell T.: Economics of Scale in Physician Practice. Medical Care Research and Review, London : Sage Publications, 53(1996), 4, pp. 417-440.

78. Porter Michael E.: Competitive Strategy. New York : The Free Press, 1980. 396 p.
79. Pratt J. W., Wise D. A., Zeckhauser R.: Price Differences in Almost Competitive Markets. Quarterly Journal of Economics, Cambridge (MA) : The MIT Press, 93(1979), May, pp. 189-211.
80. Rico Ana, Puig-Junoy Jaume: What can we learn from the regulation of public utilities?. Saltman Richard B., Busse Reinhard, Mossialos Elias, eds., Regulating entrepreneurial behaviour in European health care systems. Buckingham (England), Philadelphia : Open University Press, 2003, pp. 73-90.
81. Saltman Richard B., Busse Reinhard: Balancing regulation and entrepreneurialism in Europe's health sector: theory and practice. Saltman Richard B., Busse Reinhard, Mossialos Elias, eds., Regulating entrepreneurial behaviour in European health care systems. Buckingham (England), Philadelphia : Open University Press, 2003, pp. 3-52.
82. Schmidt P.: Frontier production functions. Econometric Reviews, New York : Marcel Deckler, 4(1986), 2, pp. 289-328.
83. Schneider Friedrich: Privatisation in OECD Countries: Theoretical Reasons and Results Obtained. Dice Report, Journal for International Comparisons, Munich : Ifo Institute for Economic Research, 1(2003), 3, pp. 24-29.
84. Scott Anthony: Economics of General Practice. Culyer A. J., Newhouse J. P., eds., Handbook of Health Economics (Volume 1B). Amsterdam : Elsevier Science, 2000, pp. 1176-1200.
85. Scrivens Ellie: Accreditation and the regulation of quality in health services. Saltman Richard B., Busse Reinhard, Mossialos Elias, eds., Regulating entrepreneurial behaviour in European health care systems. Buckingham (England), Philadelphia : Open University Press, 2003, pp. 91-105.
86. Senjur Marjan: Makroekonomija (*Macroeconomics*). Maribor : MER Evrocenter, 2001. 423 p.
87. Tajnikar Maks: Mikroekonomija s poglavji iz teorije cen (*Microeconomics and Selected Chapters from Price Theory*). Ljubljana : Ekonomska fakulteta, 2001. 469 p.
88. Tajnikar Maks, Došenovič Petra: Transitional Adjustment of the Public Sector – The Case of the Health Care System in Slovenia. ICES 2003 – Second International Conference of the Faculty of Economics in Sarajevo: From Transition to Development – Globalisation and Political Economy of Development in Transition Economies. Sarajevo : Faculty of Economics in Sarajevo, University of Sarajevo, 2003. 18 p.
89. Tajnikar Maks, Došenovič Petra: Stroškovna učinkovitost izvajalcev osnovne zdravstvene dejavnosti v Sloveniji (*Cost Efficiency of Basic Health Care Providers in Slovenia*). Ljubljana : Ekonomska fakulteta, Inštitut za javni sektor, 2004. 83 p., 110 p. (appendices).
90. Tandon A., Murray C. J. L., Lauer J., Evans D.: Measuring overall health system performance for 191 countries. (GPE Discussion Paper No. 30). Geneva : World Health Organization, 2000. 23 p.
91. Vitaliano Donald F., Toren Mark: Cost and Efficiency in Nursing Homes: A Stochastic Frontier Approach. Journal of Health Economics, Amsterdam : Elsevier Science, 13 (1994), 3, pp. 281-300.

92. Weisbrod B. A.: Toward a Theory of the Voluntary Non-Profit Sector in a Three-Sector Economy. Phelps S. Edmund, ed., Altruism, Morality, and Economic Theory. New York : Russell Sage Foundation, 1975, pp. 171-195.
93. Weisbrod B. A.: Collective-consumption Services of Individual-consumption Goods. Quarterly Journal of Economics, Cambridge : MIT Press, 78(1964), 3, pp. 471-477.
94. Wille E.: GKW: Reformbedarf bei der Beitragsgestaltung. Wirtschaftsdienst, 80(2000), 5, pp. 263-265.
95. Zuckerman S., Hadley J., Iezzoni L.: Measuring Hospital Efficiency with Frontier Cost Functions. Journal of Health Economics, Amsterdam : Elsevier Science, 13(1994), 3, pp. 255-280.
96. Zwanziger J., Melnick G. A., Bamezai A.: The Effect of Selective Contracting on Hospital Costs and Revenues. Health Services Research, London : BioMed Central, 35(2000), 4, pp. 849-868.

SOURCES

1. The Basics about Group Purchasing Organizations. [URL: http://www.higpa.org/about/about_faqs.asp], Arlington : Health Industry Group Purchasing Association, 27.12.2003.
2. Co-payments for Health Care. Dice Report, Journal for International Comparisons, Munich : Ifo Institute for Economic Research, 1(2003), 4, p. 64.
3. Filippini Massimo: Measuring productive efficiency and regulation. Lecture given at the Faculty of Economics in Ljubljana, 2003. 29 p.
4. Government Finance Statistics Yearbook. Washington D.C. : International Monetary Fund, 2001. 508 p.
5. The Health Care Systems in Germany, Cost factor and branch of the future. Volume II. Progress and Growth Markets, Financing and Remuneration. Special Report. Bonn : Advisory Council for the Concerted Action in Health Care, 1998. 80 p.
6. Health Insurance in Europe: 1998 data. [URL: http://www.cea.assur.org/], Paris : Comité Européen des Assurances, 27.12.2003.
7. The World Health Report 2000. Health Systems; Improving Performance. Geneva : World Health Organization, 2001. 205 p.
8. Zakon o zdravstveni dejavnosti (*Law on Health Services*) (Uradni list RS, št. 9/92)
9. Zdravstveni statistični letopis 2001 (*Health Statistics Yearbook 2001*). Ljubljana : Inštitut za varovanje zdravja Republike Slovenije, 2003. 382 p.

APPENDICES

Appendix 1: Explaining the inefficiency term (u)

```
--> regress; Lhs=eff; Rhs=one,city$

| Fit:        R-squared=  .119480, Adjusted R-squared =          .10347 |
+---------+--------------+----------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+---------+--------------+----------------+--------+---------+----------+
 Constant  1.188745848      .52321112E-01   22.720   .0000
 CITY      .3815296451      .13965915        2.732   .0084  .14035088
```

```
--> regress; Lhs=eff; Rhs=one,KR$

| Fit:        R-squared=  .389574, Adjusted R-squared =          .37848 |
+---------+--------------+----------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+---------+--------------+----------------+--------+---------+----------+
 Constant  1.210315946      .40750020E-01   29.701   .0000
 KR        1.822741595      .30765590        5.925   .0000  .17543860E-01
```

```
--> regress; Lhs=eff; Rhs=one,KP$
| Fit:        R-squared=  .128381, Adjusted R-squared =          .11253 |
+---------+--------------+----------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+---------+--------------+----------------+--------+---------+----------+
 Constant  1.195175509      .51025068E-01   23.423   .0000
 KP        .4476244173      .15726982        2.846   .0062  .10526316
```

```
--> regress; Lhs=eff; Rhs=one,ed1$
| Fit:        R-squared=  .126293, Adjusted R-squared =          .11041 |
+---------+--------------+----------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+---------+--------------+----------------+--------+---------+----------+
 Constant  1.210179288      .49646819E-01   24.376   .0000
 ED1       .6101770285      .21640546        2.820   .0067  .52631579E-01
```

```
--> regress; Lhs=eff; Rhs=one,ed2$
| Fit:        R-squared=  .195722, Adjusted R-squared =          .18110 |
+---------+--------------+----------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+---------+--------------+----------------+--------+---------+----------+
 Constant  1.209949219      .47198387E-01   25.635   .0000
 ED2       .9218225209      .25197044        3.658   .0006  .35087719E-01
```

```
--> regress; Lhs=eff; Rhs=one,CE$
| Fit:        R-squared=  .019890, Adjusted R-squared =          .00207 |
+---------+--------------+----------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+---------+--------------+----------------+--------+---------+----------+
 Constant  1.262525287      .54645932E-01   23.104   .0000
 CE       -.1647415540      .15593595       -1.056   .2954  .12280702
```

```
--> regress; Lhs=eff; Rhs=one,KRS$
| Fit:        R-squared=  .007388, Adjusted R-squared =         -.01066 |
+---------+--------------+----------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+---------+--------------+----------------+--------+---------+----------+
 Constant  1.250061227      .52917369E-01   23.623   .0000
 KRS      -.1475798214      .23066146        -.640   .5250  .52631579E-01
```

```
--> regress; Lhs=eff; Rhs=one,MB$

| Fit:        R-squared=  .006273, Adjusted R-squared =         -.01179 |
+---------+--------------+----------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+---------+--------------+----------------+--------+---------+----------+
 Constant  1.251709979      .53955684E-01   23.199   .0000
 MB       -.1073436566      .18217536        -.589   .5581  .87719298E-01
```

```
--> regress; Lhs=eff; Rhs=one,MS$
| Fit:        R-squared=  .000297, Adjusted R-squared =         -.01788 |
+---------+--------------+----------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+---------+--------------+----------------+--------+---------+----------+
 Constant  1.240479293      .53604709E-01   23.141   .0000
 MS        .2585769473E-01  .20235334         .128   .8988  .70175439E-01
```

```
--> regress; Lhs=eff; Rhs=one,NG$
| Fit:        R-squared=  .004966, Adjusted R-squared =         -.01313 |
+---------+--------------+----------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+---------+--------------+----------------+--------+---------+----------+
 Constant  1.248662383      .52981873E-01   23.568   .0000
 NG       -.1210017760      .23094263        -.524   .6024  .52631579E-01
```

```
--> regress; Lhs=eff; Rhs=one,NM$
| Fit:        R-squared=  .010547, Adjusted R-squared =         -.00744 |
+---------+--------------+----------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+---------+--------------+----------------+--------+---------+----------+
 Constant  1.253110751      .53329195E-01   23.498   .0000
 NM       -.1541405714      .20131330        -.766   .4471  .70175439E-01
```

```
--> regress; Lhs=eff; Rhs=one,LJ$
| Fit:        R-squared=  .008541, Adjusted R-squared =         -.00949 |
+---------+--------------+----------------+--------+---------+----------+
|Variable | Coefficient  | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+---------+--------------+----------------+--------+---------+----------+
 Constant  1.266365682      .62231519E-01   20.349   .0000
 LJ       -.7622740964E-01  .11074180        -.688   .4941  .31578947
```

Appendix 2: Explaining the inefficiency term (u)

Fit: R-squared= .119163, Adjusted R-squared = .10315					
Variable	Coefficient	Standard Error	t-ratio	P[|T|>t]	Mean of X
Constant	1.220459490	.54438219E-01	22.419	.0000	
CITY	.3963702918	.14531028	2.728	.0085	.14035088

Fit: R-squared= .358739, Adjusted R-squared = .34708					
Model test: F[1, 55] = 30.77, Prob value = .00000					
Variable	Coefficient	Standard Error	t-ratio	P[|T|>t]	Mean of X
Constant	1.244168146	.43448772E-01	28.635	.0000	
KR	1.819568939	.32803104	5.547	.0000	.17543860E-01

Fit: R-squared= .086800, Adjusted R-squared = .07020					
Variable	Coefficient	Standard Error	t-ratio	P[|T|>t]	Mean of X
Constant	1.248394144	.52800782E-01	23.643	.0000	
ED1	.5262290188	.23015327	2.286	.0261	.52631579E-01

Fit: R-squared= .144233, Adjusted R-squared = .12867					
Variable	Coefficient	Standard Error	t-ratio	P[|T|>t]	Mean of X
Constant	1.247205939	.50646637E-01	24.626	.0000	
ED2	.8232073642	.27037905	3.045	.0036	.35087719E-01

Fit: R-squared= .021901, Adjusted R-squared = .00412					
Variable	Coefficient	Standard Error	t-ratio	P[|T|>t]	Mean of X
Constant	1.298175167	.56788536E-01	22.860	.0000	
CE	-.1798330413	.16205002	-1.110	.2719	.12280702

Fit: R-squared= .001763, Adjusted R-squared = -.01639					
Variable	Coefficient	Standard Error	t-ratio	P[|T|>t]	Mean of X
Constant	1.264854191	.64707619E-01	19.547	.0000	
REFERAL	.1778543924E-05	.57069753E-05	.312	.7565	6317.6491

Fit: R-squared= .061304, Adjusted R-squared = .04424					
Variable	Coefficient	Standard Error	t-ratio	P[|T|>t]	Mean of X
Constant	11.94881891	5.6315708	2.122	.0384	
INSUR	-.1102354809	.58164353E-01	-1.895	.0633	96.817544

Fit: R-squared= .115687, Adjusted R-squared = .09961					
Variable	Coefficient	Standard Error	t-ratio	P[|T|>t]	Mean of X
Constant	1.179562974	.62069364E-01	19.004	.0000	
DEF1	-.4190452176E-01	.15622096E-01	-2.682	.0096	-2.3035088

Fit: R-squared= .000679, Adjusted R-squared = -.01749					
Variable	Coefficient	Standard Error	t-ratio	P[|T|>t]	Mean of X
Constant	1.275746382	.53790668E-01	23.717	.0000	
DEF2	.5299860279E-02	.27409268E-01	.193	.8474	.64912281E-01

Fit: R-squared= .007781, Adjusted R-squared = -.01026					
Variable	Coefficient	Standard Error	t-ratio	P[|T|>t]	Mean of X
Constant	1.223193453	.96733421E-01	12.645	.0000	
REFERALS	9.720818059	14.801814	.657	.5141	.54416156E-02

Appendix 3: Explaining the inefficiency term (u)

Fit: R-squared= .132213, Adjusted R-squared = .12080					
Variable	Coefficient	Standard Error	t-ratio	P[|T|>t]	Mean of X
Constant	2.359053895	.21857772	10.793	.0000	
SECTOR	-.8700691476	.25569119	-3.403	.0011	.73076923

Fit: R-squared= .000262, Adjusted R-squared = -.01289					
Variable	Coefficient	Standard Error	t-ratio	P[|T|>t]	Mean of X
Constant	1.574117415	1.0632582	1.480	.1429	
INSUR	.1567978011E-02	.11106755E-01	.141	.8881	95.101282

Fit: R-squared= .026788, Adjusted R-squared = .01398					
Variable	Coefficient	Standard Error	t-ratio	P[|T|>t]	Mean of X
Constant	1.656617731	.12863478	12.878	.0000	
CE	.5196079382	.35925739	1.446	.1522	.12820513

Fit: R-squared= .011432, Adjusted R-squared = -.00158					
Variable	Coefficient	Standard Error	t-ratio	P[|T|>t]	Mean of X
Constant	1.684869424	.12778010	13.186	.0000	
KP	.3740559149	.39899325	.937	.3515	.10256410

Fit: R-squared= .003852, Adjusted R-squared = -.00926					
Variable	Coefficient	Standard Error	t-ratio	P[|T|>t]	Mean of X
Constant	1.704217907	.12647501	13.475	.0000	
KR	.2472109489	.45601214	.542	.5893	.76923077E-01

Fit: R-squared= .000009, Adjusted R-squared = -.01315					
Model test: F[1, 76] = .00, Prob value = .97941					
Variable	Coefficient	Standard Error	t-ratio	P[|T|>t]	Mean of X
Constant	1.723967210	.12499461	13.792	.0000	
KRS	-.1429498819E-01	.55196124	-.026	.9794	.51282051E-01

Fit: R-squared= .018524, Adjusted R-squared = .00561					
Variable	Coefficient	Standard Error	t-ratio	P[|T|>t]	Mean of X
Constant	1.822447432	.14632244	12.455	.0000	
LJ	-.3095454905	.25845695	-1.198	.2348	.32051282

Fit: R-squared= .010571, Adjusted R-squared = -.00245					
Variable	Coefficient	Standard Error	t-ratio	P[|T|>t]	Mean of X
Constant	1.751793356	.12518145	13.994	.0000	
MB	-.4455238647	.49442712	-.901	.3704	.64102564E-01

Fit: R-squared= .002828, Adjusted R-squared = -.01029					
Variable	Coefficient	Standard Error	t-ratio	P[|T|>t]	Mean of X
Constant	1.736355923	.12481831	13.911	.0000	
MS	-.2558748901	.55118275	-.464	.6438	.51282051E-01

Fit: R-squared= .031113, Adjusted R-squared = .01836					
Variable	Coefficient	Standard Error	t-ratio	P[|T|>t]	Mean of X
Constant	1.669190272	.12473245	13.382	.0000	
NG	.7025702016	.44972924	1.562	.1224	.76923077E-01

Fit: R-squared= .001092, Adjusted R-squared = -.01205					
Variable	Coefficient	Standard Error	t-ratio	P[|T|>t]	Mean of X
Constant	1.738921691	.13329537	13.046	.0000	
CITY	-.9412534556E-01	.32650563	-.288	.7739	.16666667

Appendix 4: Summary in Slovene

Analiza slovenskega primarnega zdravstvenega varstva, ki jo prikazujemo v magistrski nalogi, obsega analizo stroškovne učinkovitosti slovenskih zdravstvenih domov in zasebnikov, ki delujejo v osnovnem zdravstvenem varstvu in smo lahko zanje pridobili ustrezne podatke. Domnevali smo, da je zaradi javnega in neprofitnega značaja velikega dela slovenskih izvajalcev osnovnega zdravstvenega varstva smiselno proučevati njihovo učinkovitost le kot tako imenovano stroškovno učinkovitost. Z njo ugotavljamo dejavnike, ki vplivajo na oblikovanje stroškov izvajalcev, in pri tem poizkušamo ugotavljati tiste dejavnike, ki povzročajo nižjo učinkovitost pri posameznih izvajalcih osnovnega zdravstvenega varstva.

Pri razlagi in analizi učinkovitosti v zdravstvenem varstvu lahko izhajamo iz splošne opredelitve učinkovitosti v gospodarstvu, ki temelji na tako imenovanih Paretovih pravilih učinkovitosti. Kot prikazujemo v drugem poglavju magistrskega dela, je lahko podlaga za razumevanje uporabe Paretovega sistema učinkovitosti v zdravstvu splošna produkcijska funkcija v zdravstvu, ki teče od dobaviteljev preko izvajalcev do bolnikov in njihovega zdravja. Na teh mestih se namreč uresničuje vseh pet načel učinkovitosti po Paretu, lahko pa nastajajo tudi ovire za uresničevanje teh načel in za nastanek neučinkovitosti znotraj zdravstvenega varstva. Slednja lahko nastaja kot tehnična neučinkovitost, ki izvira iz neobstoja privatne lastnine in tržnega načina gospodarjenja, in kot alokacijska neučinkovitost, ki izhaja iz nepopolne konkurence, nepopolnih in asimetričnih informacij, javnih dobrin in eksternalij.

Učinkovitost v zdravstvu moramo torej iskati na poti od sredstev za zdravstveno varstvo do zdravja. V bistvu se o učinkovitosti odloča v zdravstvu na šestih področjih. Tako je prvo področje, na katerem lahko nastaja neučinkovitost v zdravstvu, problem odnosa med privatno lastnino in drugimi oblikami lastnine izvajalcev in plačnikov zdravstvenega varstva. Z vidika Paretovih načel učinkovitosti je smiselno domnevati, da uveljavljanje privatne lastnine povečuje učinkovitost izvajalcev in plačnikov. Učinkovitost je tako tudi v zdravstvu povezana z razgrajevanjem državne lastnine, njeno delno privatizacijo in izpostavljanju vplivu konkurence privatne lastnine. Konkurenca med državnim in privatnim sektorjem v zdravstvu pa lahko poveča učinkovitost enega in drugega.

Drugič, učinkovitost je povezana v zdravstvu z učinkovitim upravljanjem in organiziranjem izvajalcev, plačnikov in dobaviteljev. Smiselno je domnevati, da izvajalci ne dosegajo optimalne velikosti, da ne dosegajo maksimalne učinkovitosti znotraj svoje proizvodnje in da njihova struktura ponudbe ni usklajena s strukturo povpraševanja. Konkurenca in definirana lastnina zahtevata poseben tip organizacije, ki je v osnovi podjetniška. Zato smemo domnevati, da lahko večja učinkovitost izhaja iz podjetniške organizacije izvajalcev, plačnikov in delno celo države.

Tretjič, neučinkovitost v zdravstvu se pojavlja tudi zaradi odsotnosti tržnega gospodarjenja in konkurence, pri tem pa je smiselno domnevati, da nastajajo problemi neučinkovitosti v zdravstvu zaradi razmer na trgu delovne sile zdravstvenih delavcev, zaradi monopolizacije trga dobaviteljev in zaradi neobstoja trga storitev zdravstvenega varstva. Konkurenca je povsod zunanja prisila, ki nagrajuje učinkovitejše in stroškovno učinkovitejše, in sicer ne glede na to, ali se potem to izraža v nižji ceni ali bolj raznoliki in kakovostni ponudbi. Obstajajo vsaj štiri tekme, v katere moramo vključiti izvajalce in organizacije zdravstvenega varstva. Gre za tekmo med izvajalci za denar, tekmo za bolnika, tekmo med dobavitelji za izvajalce in tekmo med zavarovalnicami za zavarovanca.

Četrtič, stališča o vplivu trga in konkurence na učinkovitost zdravstvenega varstva vodijo do nujnosti nastajanja določenih oblik, ki nadomeščajo ali dopolnjujejo trg v sistemu zdravstvenega varstva. Tržne spodbude in odsotnost prevladujočega profitnega motiva v zdravstvu nadomešča ali dopolnjuje sistem stimuliranja, ki je ključen za doseganje učinkovitosti v zdravstvenem varstvu. Sestavljen pa mora biti iz sistema dodatne selekcije na strani povpraševanja in sistema stimuliranja učinkovitega upravljanja in minimizacije stroškov na strani ponudbe izvajalcev zdravstvenega varstva, ki se uresničuje skozi sistem plačevanja. Odsotnost trga, neusklajenost med individualno in družbeno učinkovitostjo in uveljavljanje splošnih načel zdravstvenega varstva pa zahteva ustrezno regulacijo s strani države. Tako lahko domnevamo, da mora država zaradi uresničevanja splošnih načel zdravstvenega varstva regulirati obseg, vrste in kakovost zdravstvenih storitev, organiziranost plačnikov v skladu z načeli zdravstvenega varstva, zaradi odsotnosti tržnega mehanizma in ustreznih ravnotežnih cen vplivati na lokacijo produkcijskih dejavnikov v zdravstvenem varstvu ter v primerih nepopolnih in asimetričnih informacij, eksternalij in javnih dobrin v zdravstvenem varstvu vplivati tudi na obseg storitev in na lokacijo produkcijskih faktorjev. Regulirati mora tudi odnos med izvajalci ter dobavitelji, zlasti dobavitelji zdravil, in zagotavljati ustrezno akreditacijo izvajalcev.

V magistrski nalogi torej izvore stroškovne neučinkovitosti iščemo na področju lastnine, organizacije in upravljanja, trga in konkurence, sistema stimulacij na strani povpraševanja in ponudbe ter sistema regulacije osnovnega zdravstvenega varstva, kar prikazujemo v tretjem poglavju naloge.

V četrtem poglavju je analiza dejavnikov stroškovne neučinkovitosti poglobljena s pregledom značilnosti osnovnega zdravstvenega varstva v Sloveniji. To je tudi podlaga za ekonometrično analizo stroškovne učinkovitosti izvajalcev osnovnega zdravstvenega varstva, ki jo prikazujemo v petem poglavju.

Naveden ekonometrični pristop temelji na določanju stohastične mejne stroškovne funkcije (ang. stochastic frontier cost function) in daje parametrično ponazoritev proizvodne tehnologije skupaj z ocenjeno napako. Ta napaka se razbija na del, ki je slučajna napaka, in del, ki se pripisuje neučinkovitosti. Analiza napak torej omogoča razlikovanje sistematičnih

napak od nesistematičnih. Pri tem izhajamo iz domneve, da so nesistematične napake posledica vpliva različnih dejavnikov, ki vplivajo na stroškovno učinkovitost. Ta metoda merjenja učinkovitosti je pogosto uporabljena v raziskavah s področja učinkovitosti zdravstvenega sektorja.

Analizo izvajalcev osnovnega zdravstvenega varstva z vidika stroškovne učinkovitosti smo v magistrski nalogi strnili z naslednjimi sklepi in priporočili:

1. Poslovni podatki zdravstvenih domov v Sloveniji kažejo na velike razlike v učinkovitosti gospodarjenja znotraj posameznih izvajalcev. Tako lahko pri likvidnosti ugotovimo, da kratkoročni koeficient likvidnosti niha med 0 in 28, standardni odklon pa je 3,19. Najnižja vrednost dni vezave zalog je 0, najvišja 160, standardni odklon pa je 23,4. V primeru stopnje dolgovno-kapitalskega razmerja pa znaša standardni odklon 1,13. Slovenski zdravstveni domovi so v povprečju neučinkoviti, merjeno z neučinkovitostim členom iz mejne stroškovne funkcije, na ravni 24,2%, od učinkovite meje najmanj odstopa zdravstveni dom na ravni 2,1% in najbolj zdravstveni dom na ravni 206%. Če upoštevamo tako javne zdravstvene zavode kot zasebnike v osnovnem zdravstvenem varstvu, ki smo jih zajeli v naši analizi, ugotovimo, da je povprečna neučinkovitost, merjena z neučinkovitostim členom iz mejne stroškovne funkcije, med vsemi izvajalci 72,3%, da od učinkovite meje najmanj odstopa izvajalec na ravni 5,6% in najbolj izvajalec na ravni 787%, kar pomeni, da obstaja zelo velik razpon učinkovitosti med izvajalci osnovnega zdravstvenega varstva, ki smo jih zajeli v naši analizi.

2. Celotni stroški v zdravstvenih domovih so odločilno povezani s ceno dela, pa tudi z obsegom storitev in številom dejavnosti posameznega zdravstvenega doma.

3. Povprečni stroški v zdravstvenih domovih so povezani z obsegom storitev. Povečevanje števila storitev v zdravstvenih domovih vodi glede na podatke iz slovenskih zdravstvenih domov do zmanjševanja povprečnih stroškov. Obstaja pozitivna ekonomika obsega, ki jo je moč izkoriščati s širjenjem velikosti dejavnosti v zdravstvenem domu. V slovenskih zdravstvenih domovih obstajajo tudi visoke ekonomike skupne dejavnosti, tako da lahko zdravstveni domovi znižujejo svoje stroške na ta način, da povečujejo število dejavnosti. V nekaterih primerih so torej zdravstveni domovi premajhni, da bi lahko polno izkoriščali delitev dela in izrabo zmogljivosti. Zato bi bilo smiselno javne zdravstvene domove združevati tako, da bi dosegali optimalno velikost z ustrezno ekonomiko obsega in ekonomiko skupne dejavnosti.

4. Direktorji, ki niso po izobrazbi zdravniki, vodijo zdravstvene domove z višjimi povprečnimi stroški. Njihova izobrazba sama po sebi ni dovolj, da bi lahko zagotovila stroškovno učinkovitejše poslovanje zdravstvenih domov.

5. Zdravstveni domovi, ki delujejo v večjih mestih so stroškovno manj učinkoviti. Stroškovno neučinkovito delujejo tudi zdravstveni domovi v zdravstveni regiji Kranj.

6. Stroškovna učinkovitost izvajalcev je odvisna tudi od deleža sredstev financiranja, ki ga zdravstveni domovi pridobijo iz naslova obveznega zdravstvenega zavarovanja. Zdravstveni domovi, ki izvajajo dejavnosti, ki so v večji meri financirane iz sredstev obveznega zdravstvenega zavarovanja, poslujejo stroškovno učinkoviteje.

7. Neučinkovitost lahko pojasnjujemo tudi s pomočjo deficita zdravnikov v regiji, kjer deluje zdravstveni dom. Takšno odvisnost lahko ugotovimo zgolj v primeru, ko upoštevamo izračune deficita zdravnikov, ki jih je pripravila stroka. Ne moremo pa ugotoviti takšne odvisnosti v tistih primerih, ko deficit ugotavlja Zavod za zdravstveno zavarovanje Slovenije. Čim večji je deficit zdravnikov v neki regiji po mnenju stroke, tem višja je stroškovna učinkovitost v zdravstvenih domovih, kar verjetno opozarja na boljšo izkoriščenost dela, večjo produktivnost dela in nižje stroške dela, ki v veliki meri opredeljujejo celotne stroške v zdravstvenem domu.

8. Napotitve nasploh ne vplivajo na višino povprečnih stroškov. Na podlagi empirične analize bi lahko dejali, da zdravstveni domovi ne upoštevajo v celoti finančnih in poslovnih kriterijev pri napotitvah. To govori v prid trditvi, da bi bilo smiselno funkcijo vratarstva v osnovnem zdravstvenem varstvu povezati z večjim obsegom financiranja sekundarnega ambulantnega varstva preko osnovnega. Vsaj sedanje obnašanje izvajalcev osnovnega zdravstvenega varstva govori v prid predlogu, da bi se zunajbolnišnični del sekundarnega zdravstvenega varstva v celoti financiral iz sredstev glavarine splošnih zdravnikov.

Ob ustrezno urejenem preventivnem delu in prvem vstopu izvajalci osnovnega zdravstvenega varstva s svojo osnovno zdravstveno dejavnostjo lahko preprečijo stroškovno neučinkovitost in pretiran vstop v specialistično zdravstveno varstvo, vključno z bolnišničnim varstvom. Ta vidik vratarstva je zelo pomemben, ker je specialistično zdravstveno varstvo dražje in v večji meri prispeva k povprečnim stroškom poslovanja zdravstvenih domov.

9. Zdravstveni domovi v javni lasti so učinkovitejši od zasebnih izvajalcev osnovnega zdravstvenega varstva, ki smo jih zajeli v našo analizo. Glede na to, da smo v analizo zajeli zgolj družbe z omejeno odgovornostjo, moramo ta sklep seveda omejiti le na odnos med javnimi zdravstvenimi domovi in tistimi izvajalci zasebnega sektorja v osnovnem zdravstvenem varstvu, ki so organizirani kot družbe z omejeno odgovornostjo in so zajeti v naši analizi. Gre za 57 zdravstvenih domov in 21 zasebnikov – družb z omejeno odgovornostjo.