HEALTHCARE SYSTEMS AND HOSPITAL BED USE

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Healthcare systems and hospital bed use

Gezondheidszorgsystemen en het gebruik van ziekenhuisbedden

(met een samenvatting in het Nederlands)

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Contents

1 INTRODUCTION

1.1 Roemer's Law

In 1959, Roemer investigated the development of the use of hospital care in an area in the United States where hospital capacity had expanded rapidly over a short period of time (one year) (Roemer, 1961). He found that the number of admissions and the length of stay had both increased, although there was no evidence of a change in morbidity in the hospital service area; neither was there any evidence of under-service before the increase in hospital capacity. This observation became known in health services research as Roemer's law: a bed built is a bed filled. Roemer's law is only an empirical generalization. It does not provide any information about the conditions under which the law is valid.

Early research revealed support for Roemer's Law. Studies into the relationship between hospital bed supply and hospital bed use showed that higher supply led to higher use (Wennberg and Gittelsohn, 1973; Harris, 1975). The need for healthcare appeared to be expandable; when more service is available, more is 'needed' (Evans, 1990). In the search for explanations the discussion arose whether high supply areas were over-serviced or low supply areas under-serviced. Over-servicing would imply that unnecessary treatments were being carried out. This led to the idea of supplier induced demand introduced by Evans in 1974 (Andersen and Mooney, 1990). Because of patients' relative ignorance, hospitals and physicians could provide treatments that patients would not have chosen had they been better informed (Donaldson and Gerard, 1994; Labelle et al., 1994). It appears to be difficult to determine whether care is appropriate or not (Chassin and Kosekoff, 1987). There may be different treatment alternatives and physicians may disagree about the appropriateness of a given treatment, resulting in variations in use. Ascertaining the appropriateness of a treatment for a given patient may not be straightforward. Wennberg called this professional uncertainty (Wennberg et al., 1982). There may be uncertainty in the appropriate treatment for an individual patient; there may also be different opinions about the appropriate treatment for certain conditions. So, although individual physicians may feel certain about treatments, there may be uncertainty at regional or country level. As a result, different decisions in comparable situations may fall within the boundaries of

what is considered medically acceptable (Vayda, 1973; Evans, 1984; Ham, 1988; McPherson, 1990; Evans, 1990; Mooney, 1994). Where multiple options in medical decision making appear, physicians may have the opportunity to pursue other goals besides purely medical considerations (Flierman, 1991; Delnoij, 1994).

Further research into the relationship between hospital bed supply and hospital bed use revealed that Roemer's Law is not always valid. Van Doorslaer and Van Vliet (1989) hypothesised that differences in hospital bed use were the result of differences in the health status of the population. Their re-examination of several studies into the effect of hospital bed supply revealed that after controlling for health status there was still an effect of hospital bed supply on length of stay. Sloan and Valvona (1986) found that although a higher supply led to longer stays, the occupancy rate fell. Schieber et al. (1991) found that more beds did not necessarily lead to greater use and they pleaded for the development of an elaborated model of the mechanisms determining hospital bed use. The perception gained strength that healthcare system characteristics also influence hospital bed use. Evidence was found for the influence of physician and hospital financing systems. For physicians, the fee-for-service system provides more incentives for administering procedures than a fixed income (Vayda, 1973; Ham, 1988). For hospitals, a variety of financing systems exist, influencing hospital bed use differently. In a per diem system, where each day of hospitalization is reimbursed by a fixed amount, there is an incentive to keep patients hospitalized longer, because the later days of stay are less care intensive (Evans, 1984). According to Evans, reimbursing hospitals with fixed, non work-related amounts (global budget, capitation based budget) gives them the maximum incentive to control unnecessary hospital use (1984). Hurst also concluded that global budgets were an effective system for containing costs (Hurst, 1991). McPherson (1988), however, warned against the incentive to under-provide in order to minimize expenditure. In systems where hospitals are reimbursed by episode of care, there is an incentive to determine the least resource intensive procedure with a satisfactory outcome (Evans, 1984). Gay and Kronenfeld found that fewer procedures were administered in such hospitals(1990). According to Custer et al. (1990), the removal of hospital incentives to over-supply resulted in fewer procedures (Vayda, 1973; Gay and Kronenfeld, 1990; Mooney, 1994; Delnoij, 1994; Gaynor and Anderson, 1995). Beside various financing systems, the development of alternatives for inpatient treatment, such as day surgery and hospital-at-home also influence the use of hospital beds.

Another import approach to the investigation of hospital bed use is the research into variations in medical decision making. This type of research focuses on geographical variations in the delivery of healthcare. The supply of healthcare facilities (hospital beds, physicians) is only one of the determinants of variation. Other determinants can be found at macro and micro level. At macro level, the healthcare system characteristics provide relevant conditions for variations (Ham, 1988; Sanders et al., 1988). At micro level, physician preferences, local standards, uncertainty and the question of what is appropriate care all lead to variations (Ham, 1988; Evans, 1990; Westert, 1992; Mooney, 1994; Westert and Groenewegen, 1999).

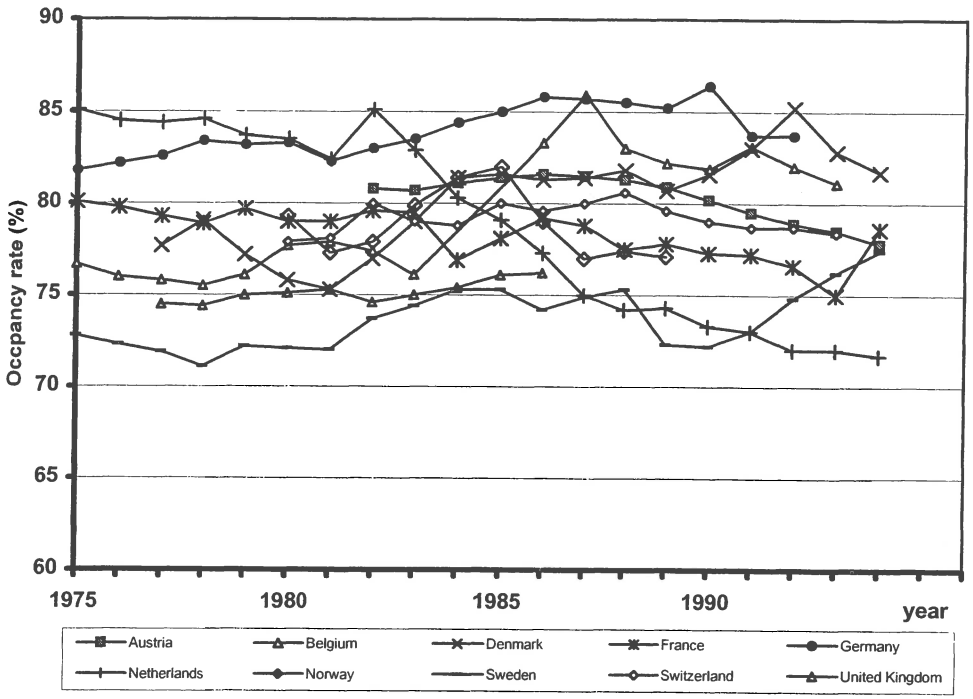
We can conclude that hospital bed use is not only influenced by the health situation of the population served. Medical decision making is not always straightforward, so that professionals have room for choice for different treatments and the opportunity to take non medical factors into account. This room for choice may lead to variations. Healthcare system characteristics, including hospital bed supply, provide opportunities and constraints under which medical decisions are made. These opportunities and constraints may influence the medical decision making process.

In Europe, in the last few decades healthcare systems have been subjected to considerable change, notably in the supply of hospital beds and hospital financing systems. These changes affect the opportunities and constraints for medical decision making, although it is not clear which direction these changes take. Neither are the aggregated effects yet clear (Schieber et al., 1991; Wiley et al., 1999; Westert and Groenewegen, 1999). Previous research included healthcare system characteristics, but provided explanations on the basis of retrospective observations rather than theoretical considerations. Most of the literature is based on research within one or two countries, so variation among healthcare system characteristics studied is limited, since most healthcare systems in Europe coincide with national boundaries. The effect on hospital bed use of hospital bed reduction - the trend in Europe - has not yet been studied. Clearly, Roemer's law as an empirical generalization of what happens with expanding bed supply gives no guidance. Thus, the aim of this study is to enhance insight into the effect of hospital bed reduction and healthcare system characteristics on the use of remaining hospital beds, in Europe.

1.2 A closer look into hospital bed use

A bed built is a bed filled, according to Roemer's Law. But what is filled? A hospital bed can be used for 365 days a year. In Europe, not more than one patient at a time occupies a bed. When used all 365 days, the occupancy rate should be 100%. Registration artefacts in patient days applied in some countries yield in theory an even higher occupancy rate. When one patient is discharged in the morning and a new patient is admitted in the afternoon, both patients may count for one hospital bed day for the same bed. In practice, hospital occupancy remains well below 100%. Evans (1984) posed the hypothesis that the hospital industry is in full capacity at well below 100% occupancy. Other research studies indicate maximum occupancy rates of between 85 and 90% (Madden, 1999; Bagust et al., 1999). Some beds are kept empty for emergencies, maintenance and cleaning. Inefficient planning of elective procedures may also lead to lower occupancy rates. When we look at the development in occupancy rates in the last few decades in Europe, we find no clear pattern (see Figure 1.1).

Figure 1.1 Acute care hospital occupancy rates in Europe (1975-1994)

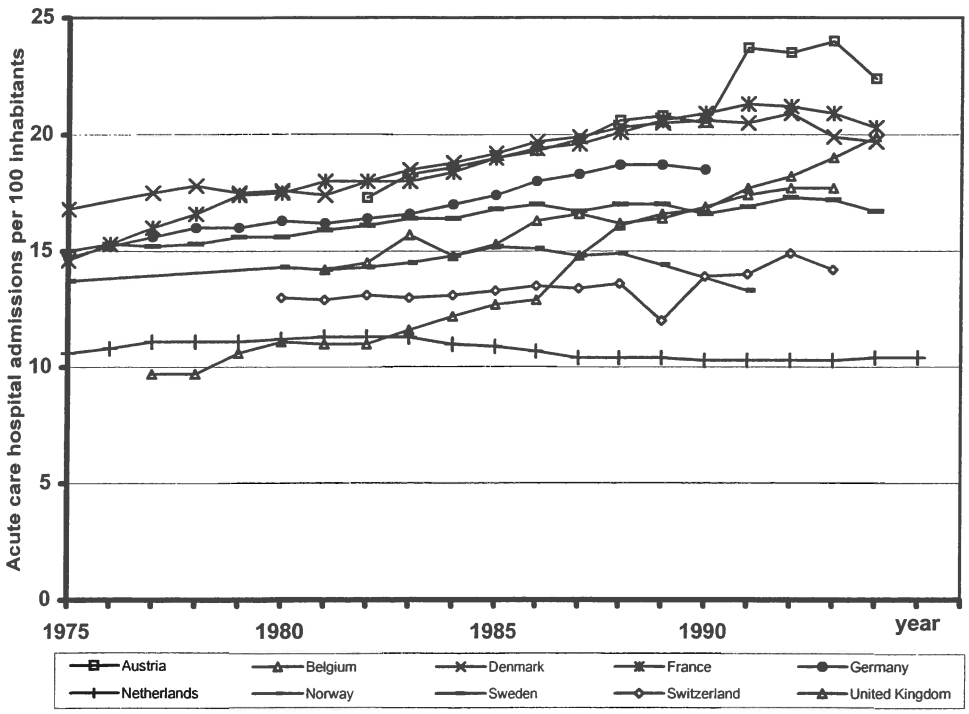


source: OECD health data files 1999

In most countries the overall occupancy rate is rather stable. Deviant patterns were found in The Netherlands, where occupancy rates are falling, and in Ireland, where occupancy rates are increasing. In The Netherlands, occupancy rates began to fall when the obligation for hospitals to maintain a minimum occupancy rate of 90% was abolished.

The occupancy rate consists of two components: the number of people admitted, and the length of their stay. In almost all countries in Europe, the overall admission rate has increased (see Figure 1.2). Between 10 and 20% of the European population is admitted to hospital each year. The population of The Netherlands, with on average 10% of the population hospitalized each year, is admitted to hospital the least often. The Austrians, the French and the Danish have the highest risk of being hospitalized. The differences between the countries remain constant over time. For the United Kingdom, a different pattern is observed: admissions have increased more than elsewhere. A new development is a decreasing trend in admission rates for some countries (France, The Netherlands, Norway); The Netherlands was the first country where this decline was observed.

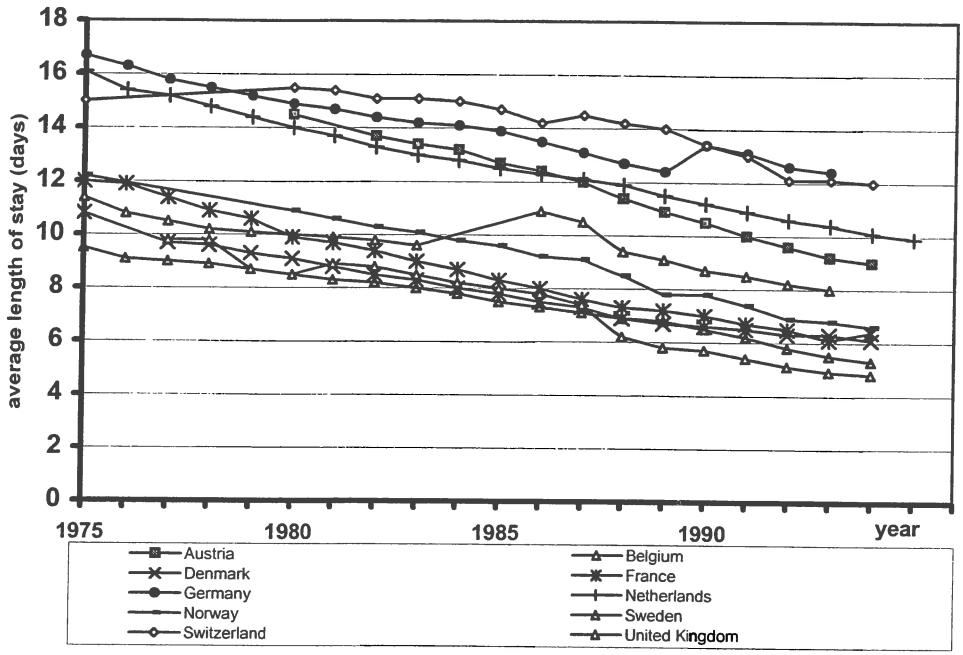
Figure 1.2 Acute care hospital admissions in Europe (1975-1994)



Source: OECD Health Data Files 1999

The length of stay showed a sharp decline in all countries, although the differences between countries continued (see Figure 1.3). German citizens are kept hospitalized for the longest time, while the United Kingdom and Sweden show the shortest average hospital stays. The differences between countries are substantial. The largest difference is found between the UK and Germany, where, on average, patients in Germany stay seven days longer in hospital than patients in the UK.

Figure 1.3 Average length of stay in acute care hospitals in Europe (1975-1994)



source: OECD health data files 1999

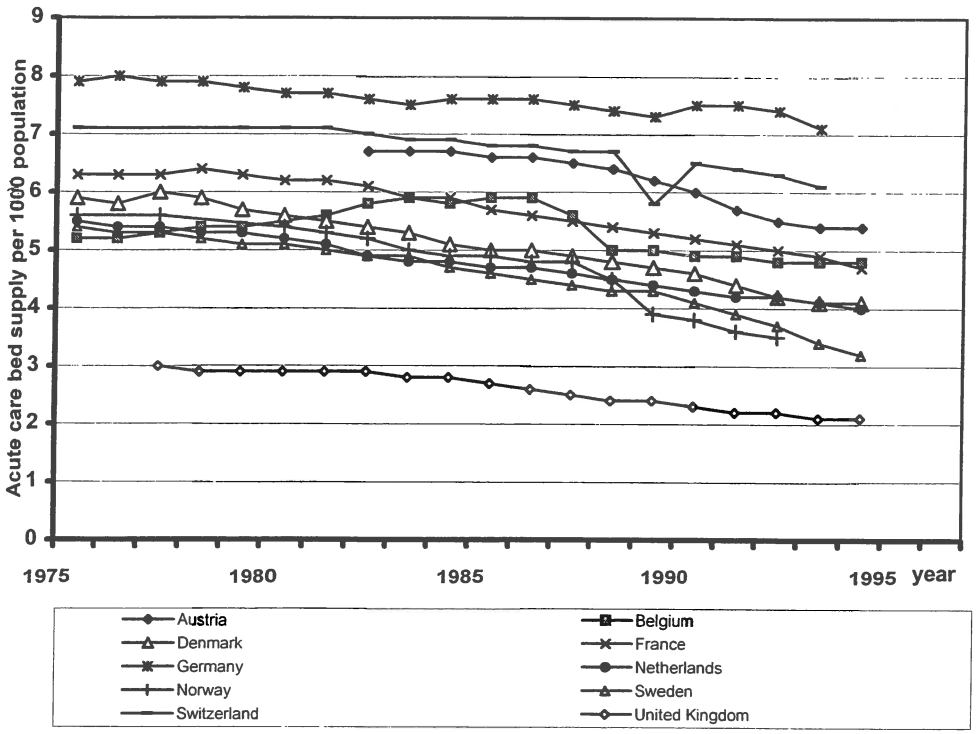
The factors occupancy rate, admission rate and average length of stay are interdependent. For instance, given an equal bed supply, longer stays must lead either to higher occupancy rates or lower admission rates. A study of hospital bed use must therefore include all three factors. Similarly, a change in bed supply must lead to a change in at least one of the hospital bed use factors.

1.3 Developments in healthcare systems

From World War II, the hospital sector has been characterized by an enormous expansion in volume accompanied by an explosion in costs. After the oil crisis in the 1970s and the subsequent recession in the early 1980s, several European countries introduced healthcare reforms to reduce the growing share of healthcare costs in their national budgets (Hurst, 1991; Saltman and Figueras, 1998). The underlying assumptions for restrictive measures in the hospital sector were that hospital care took an important share of the total costs and that the very availability of beds seemed to be an incentive for their utilization. In the hospital sector this led to cost containment measures falling roughly into two categories: measures concerning hospital bed supply, and measures concerning hospital financing.

We first discuss the results of hospital bed supply policy. The reform measures consisted of constraints imposed on production facilities through the closure of acute care beds, or production agreements between care providers and purchasers (government or health insurance funds). Production agreements are agreements concerning, for example, the number of treatments or maximum amounts compensated for by health insurance companies. Bed reduction measures were not implemented simultaneously in all European countries. From 1960 the universal trend in bed supply was initially expansion, but sooner or later all West European countries switched towards a decreasing supply. In some countries the reductions started in the 1970s, while others encountered this turning point in the 1980s (see Figure 1.4). The largest decline was in Sweden, where the number of hospital beds was halved over 23 years. The smallest decline was in Germany, where about 18% of the beds were abolished over a period of 20 years. The average decline was 26% (1.5 beds per 1000 population) in all the West European countries in an average of 19 years. Remarkably, no convergence or divergence of bed supply levels between countries can be observed; the differences in absolute bed supply remained. In due course, Germany acquired the highest bed supply and the United Kingdom the lowest. Production agreements between provider and government or health insurance funds may lead to beds being kept empty, because production quotas have been reached. As a result, occupancy rates may drop. The impact of this policy cannot be illustrated by an analysis of existing health data statistics.

Figure 1.4 Acute care hospital bed supply in Europe (1975-1994)



Source: OECD Health Data Files 1999

An interesting observation is that the decline in the average length of stay and occupancy rate for some countries commenced at an earlier point in time than the bed reductions (Belgium, France, Austria). This difference indicates that other factors beside bed supply influence bed use. Apparently other conditions besides hospital bed supply determine hospital bed use. A goal of this study is to gain insight into the relative importance of these factors.

Second, almost every European country has changed its hospital financing system in the past two or three decades. Two important financing reforms have been implemented. First, in many countries the global budget was introduced. In the global budget system, a hospital receives a fixed amount of money based on the (health) characteristics of the population the hospital serves. The prospective and fixed character of this financing system should make it easier to contain national hospital costs. A second financing system reform, the Diagnosis Related Groups system (DRG system), was imported from the United States. In this system, hospitals receive a fixed amount for each patient,

depending on the diagnosis. The objective of this system is to encourage hospitals to use the most cost-effective treatments.

1.4 Research problem

Roemer's law gives an idea of what happens with hospital care in a situation of expansion of the system, but it does not answer the question what happens when the supply of hospital care is subject to reductions. Neither does the law indicate the conditions under which it is valid. The review of the literature above makes it clear that, in the last few decades, the conditions under which hospital production is achieved have changed markedly. To date, no study has taken into consideration both the empirical facts of hospital bed reduction and healthcare system reforms to explain hospital bed use. An elaboration of the 'law' towards a more general theory of what happens to the use of hospital beds when both hospital supply is changing and healthcare systems are reformed would therefore be useful. Of course, Roemer's law only provides an empirical generalization and provides no explanation for this observation. In the literature, explanations for observations made were mainly sought retrospectively, although several studies mentioned the need for an elaborated model of the underlying mechanisms that determine hospital bed use. To date, no such model has been developed. Another deficiency found in the literature is that often no distinction is made in the parts played by the different actors within the hospital. Hospitals are led by hospital management, while the hospitalization decision is taken by physicians. Management and physician interests do not necessarily coincide. The question of what happens in the case of conflicting interests arises. In this study we developed a theoretical framework containing both hospital bed supply and healthcare system characteristics. We explain the effect of these characteristics on hospital bed use by elaborating the decision making process of hospital management and physicians. The research questions of this study were as follows:

1. *How does the relationship between hospital bed supply and hospital bed use vary with time and place?*
2. *What are the effects of different healthcare system characteristics on hospital bed use?*
3. *Can variations in hospital bed use be accounted for by the effects of opportunities and constraints provided by healthcare system characteristics and hospital bed supply on the decision making process by medical specialists and hospital management?*

The main topic of this research includes change over time, so a longitudinal approach is required. Hospital bed reduction is an ongoing process that cannot be divided into a before and after. The inclusion of healthcare system characteristics requires variations in healthcare systems. Changes in healthcare systems in different countries do not necessarily occur simultaneously, so a longitudinal cross-sectional approach was chosen. Data on hospital bed use and supply were collected from national statistics and the OECD (Organization for Economic Cooperation and Development) health data files. Healthcare system characteristics were obtained via literature research; both primary sources (legal texts, for example) and secondary sources (healthcare system descriptions, for example) were consulted.

The scientific interest of this project lies in the theoretical approach and the modelling of the underlying mechanism that influences the use of hospital care in a behavioural model that can be used to formulate new hypotheses. One advantage of such a model is that unintended effects of (policy) changes in healthcare systems may be explained and possibly predicted. It is also of interest to investigate whether existing data bases, such as the OECD health data base, can be used to account for the effects of healthcare system reforms.

For this study, we used an approach based on sociology and economics. The research problem concerns the impact of institutions (in this case healthcare systems) on a societal sector. The macro phenomenon, the impact of healthcare systems on hospital bed use, was examined from its effects on the individual behaviour of physicians and hospital management. We assume that both actors are rational and goal seeking. Individuals are seen as self interested actors whose rational behaviour is aimed at utility maximization, given their preferences and constraints (according to rational choice theory, elaborated by Coleman (1990) and Lindenberg (1983)). Previous research has demonstrated the usefulness of rational choice theory in explaining the behaviour of a corporate actor, such as hospital management (Chassin and Kosekoff, 1987). In the next section the use of rational choice theory in the analysis of the research problem is described. Boudon's model of social change was used to structure the description of the decision making process. This model describes how the social environment influences the decision making process and how the outcome of this process leads to changes in the social environment and the interaction process. The discussion features the model's three main components: the relevant constraints provided by the healthcare system; the decision making process, taking into account both actors

(physicians and hospital management); the outcome at macro level (the use of hospital beds).

1.5 A theoretical framework for hospital bed use

The Boudon model of social change

Boudon provided a framework that is particularly useful in describing the processes of social change. Boudon's framework has three components; the environment, the interaction system, and the outcomes. The outcome is the phenomenon we seek to explain; in this study, hospital bed use. The interaction system is the central element and consists of the actors whose behaviour leads to the events to be explained. The actors in the interaction system cannot make choices freely; they are constrained by the conditions enforced by the environment. The environment consists of the institutional context (in our case, the healthcare system), the economic situation, and the historical development. The behaviour within the interaction system results in certain outcomes.

Outcome

Hospital bed use is the result of admission and discharge decisions and consists of hospital bed days. Components of hospital bed use are average length of stay, admission rate and occupancy rate. There is however another important outcome: in some cases, bed production may not be realized. When inpatient care cannot be provided, alternatives may be sought. Such alternatives may result in waiting lists (postponed hospitalization), alternatives to inpatient treatment (day surgery), or no treatment at all.

Interaction system

Physicians decide about hospital admission or discharge. The hospital provides the necessary facilities for hospitalization (beds, operating theatre, nursing personnel). The hospital management (a management team, a board of directors, etc.) is in charge of this facilitating firm. To predict the behaviour of the actors, we need to know the goals each of them seeks to achieve.

The main assignment of both hospital and physician is to improve patients' health. In the art of medicine, there is often debate about the appropriate treatment for a patient. When type or course of treatment is uncertain, there is room for considerations other than medical interest (Wennberg et al., 1982; Ham, 1988; McPherson, 1990; Andersen and Mooney, 1990; Mooney, 1994). We

assume that hospitals strive for financial solvency and a good public image. Financial solvency is necessary for an organization to survive and a good public image is necessary to attract patients. Evans (1984) pointed out that developing a behavioural model for the hospital is not easy, because the boundaries of what the hospital comprises may not be clear and may differ between healthcare systems, depending on who is included in the structure. The variation can range from complete vertical integration (physician, hospital as an organization and owner in one structure) to a collection of smaller firms in which physician and hospital are both firms that interact with each other. We dealt with this problem by defining the hospital management (a management team, a board of directors, for example) as the decision maker for the hospital. The hospital management tries to achieve the goals mentioned, irrespective of the type of organization. We assume that physicians strive for a balance between a reasonable income, work load, and social approval (Flierman, 1991; Delnoij, 1994). Social approval can be acquired from peers and from satisfied patients.

The actors - hospital management and physicians - depend on each other, because the hospital provides the facilities required for patient hospitalization, while the hospital depends on physicians for patients to fill the beds. The question of whose incentives will prevail then arises. If there is a convergence of interests, the incentives of both actors will fortify each other. In the case of interest divergence, the question of power becomes relevant: which actor has the power to ensure that that actor's incentives predominate? The formal relationship between the actors determines whose incentives prevail. In Europe, there are two types of relationships: physicians as salaried employees of the hospital, and physicians as independent entrepreneurs who hire hospital facilities. In the case of physicians who are salaried employees of the hospital, the hospital will have more formal power over them than when they are independent entrepreneurs (Burns et al., 1989)

There is a third actor who plays a part in the decision making process: the patient. The interaction between patient and physician can be characterized by information asymmetry. Patients cannot judge the choices their physicians make because they lack the necessary medical knowledge. Patients would find it difficult to estimate the effectiveness of a proposed treatment. They have to trust their physicians to choose the best possible solution for them. This relationship is described in the literature as imperfect agency. A patient chooses a physician to be the patient's agent, but does not have enough

information to evaluate the physician's decision, while the patient depends on the information obtained from the physician in making choices (Evans, 1984; Mooney, 1994). If physician incentives are contradictory to patient interests and the physician allows these incentives to prevail, the patient will remain unaware of the fact. We therefore treat the patient as a passive actor in these analyses.

Environment

The decisions leading to hospital use (admission and discharge) are taken on a micro level, among hospital, physician, and patient. However, these decisions depend on the situation - healthcare system characteristics - within which the actors find themselves. Healthcare system characteristics have an important impact on the individual actors-hospital, physician, and patient. The healthcare system provides regulations and laws concerning access to hospital care, the availability of facilities, and reacts to the financial consequences of using healthcare services. Differences in healthcare systems imply different sets of restrictions on behaviour at the individual level and therefore evoke different reactions in situations with similar characteristics at the individual level (patients with certain illnesses and comparable health status, for example). This can be an important source of geographical variations in the use of hospital care.

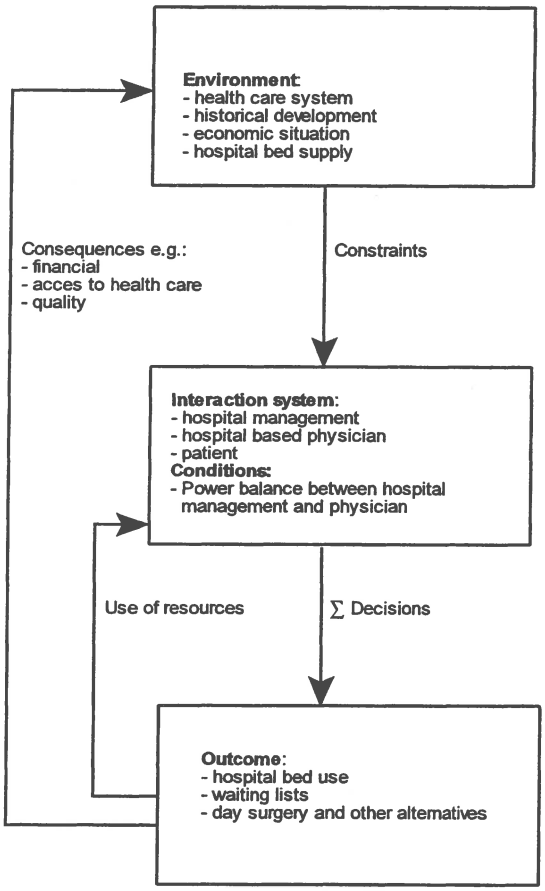
The healthcare system is dynamic rather than rigid and unchangeable and is determined by its history. The infrastructure that provides facilities (buildings, personnel) cannot be changed overnight (hospitals cannot be closed or built in a day). Changes can originate from healthcare reforms, initiated by governments as an answer to economic developments or through pressure from other interest groups (patients, health insurance companies, and so forth), but can also result from technological changes. In the past few years procedures that require no or only short hospitalization have been developed, as for example for meniscus extirpation, where formerly the treatment of meniscus defects required almost a week of inpatient care.

In addition to healthcare system characteristics and historical developments, the economic situation also influences hospital bed use. In the last few decades of the previous century, the economic situation for the hospital sector can be characterized by cost containment. Considerations of cost containment induced many changes in healthcare organization.

Interdependencies

The description of the environment, decision making process, and outcome indicated that the healthcare system imposes constraints on the options for hospital management and physicians. The outcomes of the decision making processes at micro level result in hospital bed use as a macro level phenomenon. There are also feedback interdependencies between the factors. Only one person at a time can occupy a bed, so hospital bed use restricts the opportunities for hospital and physician to admit patients. Hospital bed use brings financial consequences which may cause policy makers to react and introduce changes in the healthcare system. In Figure 1.5, the factors and the mutual dependencies are displayed graphically.

Figure 1.5 Theoretical framework for explaining hospital bed use



Fitting the research questions into the model

The first two research questions relate to the effect of the environment on hospital bed use with the interaction system not yet specified. Hospital bed supply is influenced by restrictions imposed by healthcare system characteristics (via the interaction system). The third research question explicitly addresses the interaction system and the decision making process. The issue of the power relationship between physicians and hospital management fits into this question. The theoretical framework demonstrates that the three research questions cannot be answered independently. Answers to all three questions are necessary to obtain an understanding of the effects of healthcare systems on hospital bed use.

1.6 Outline of this book

In each empirical chapter, the hypotheses generated on the basis of the theoretical framework are stated. The next three chapters address the environment. In chapter 2, a cross-sectional longitudinal study into the effect of hospital bed supply and healthcare system characteristics on hospital bed use is described. Chapter 3 discusses healthcare reform implementation problems and the consequences for health services research. In Chapter 4, the effect of changing the hospital financing system is reported in detail. Hungary, where the financing system changed from open-end budgeting to a Diagnosis Related Groups system, served as a case study. Chapter 5 is devoted to the interaction system. The question of the divergent interests of hospital management and physicians was addressed in a study into the effects of hospital bed reductions in France. Chapter 6 focuses on the outcome: one of the options for alternatives for hospitalization was studied, in this case day surgery. Chapter 7 summarizes the main findings of this study and discusses the results.

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2 THE EFFECT OF HOSPITAL BED REDUCTION ON THE USE OF BEDS

A comparative study of ten European countries

By : Madelon Kroneman, Jacques J. Siegers
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Summary

In Europe, the reduction of acute care hospital beds has been one of the measures to restrict hospital expenditure. This study aims to gain insight into the effect bed reductions have on the use of the remaining beds. We predicted increasing occupancy rates, decreasing admission rates and shorter length of stays. In addition, we expected that various characteristics of healthcare organisation such as the hospital financing system and the physician remuneration system would influence the way bed reductions were managed. We used data from the OECD health data files of 10 north-western European countries. The data were analysed on the basis of pooled time series model (using LIMDEP). We found that occupancy rates are not influenced by bed reductions. Admission rates do indeed decrease, and the length of stays become shorter. In the short term, bed reductions may lead to longer stays, possibly due to shifts of less severe cases to waiting lists or day surgery. Hospital financing systems influence hospital bed use, but do not lead to different reactions to hospital bed reductions. For physician remuneration systems, we were unable to test the hypothesis, owing to data problems.

2.1 Introduction

In Europe in recent decades, acute care hospital bed reductions have been one of the measures to restrict hospital id expenditure (Wiley et al., 1999; Mossialos and Le Grand, 1999; Saltman and Figueras, 1998). If fewer beds become available, this is likely to influence the use of the remaining beds. When governments try to control the hospital sector they assume that interventions in the healthcare system will impact on hospital production. This implies that the way healthcare systems are organised affects the use of hospital beds. The impact of bed reductions may therefore differ according to the characteristics of different healthcare systems. The aim of this study is to gain insight into the effect bed reductions have on the use of the remaining beds.

Previous research has highlighted a relationship between bed supply and bed use (Wennberg and Gittelsohn, 1973; Väänänen et al., 1967; Roemer, 1961). This relationship became known as Roemer's law: a bed built is a bed filled. In particular, variations in length of stay between countries appear to depend on not only variations in case-mix, but also on factors such as hospital bed supply and the organisation of the healthcare system. (Wiley et al., 1999; Westert, 1992; Van Noordt et al., 1992; Van Doorslaer and Van Vliet, 1989). These findings also support the importance of including healthcare system characteristics in a study on the effect of hospital bed reductions.

For this study, two research questions were formulated:

1. *What is the effect of reducing acute care hospital beds on the use of remaining beds?*
2. *Do differences in healthcare systems lead to differences in the effect of acute care hospital bed reductions on hospital bed use?*

2.2 Strategies to manage bed reductions

In this section we will discuss the strategies employed by hospital management and hospital specialists who have to deal with reductions in hospital bed supply. Firstly, we will consider the strategies of the hospital management and secondly the strategies of the specialists.

Roemer's law can be interpreted as follows: all available and all new capacity will always be used. This implies a maximum occupancy no matter the number of hospital beds. However, a 100% occupancy rate is seldom reached. According

to Evans (1984), the hospital industry is at full capacity well below 100% occupancy rate. Differences in occupancy rates between countries may evolve from different institutional settings. In Europe considerable variations are found in occupancy rates[1]. The highest occupancy rate since 1970 is found in the Netherlands, with 89.9 % of the beds occupied in 1970. On the other hand, Ireland (1985), Sweden (1978) and again the Netherlands (1994) had the lowest rate, about 70%. Accordingly, substantial variations exist between countries and within countries. In the case of a well-developed hospital sector with a lot of beds, bed reductions might merely be a reflection of overcapacity, originating from previous years of growth. This would contradict Roemer's Law and is also not very likely because of the existing waiting list problems in most European countries (Smit and Kroneman, 1999). On the other hand, variations in occupancy might reflect efficiency problems, meaning that in some healthcare systems, hospitals are at full capacity at a lower rate than in others. Hence we arrive at a first possible strategy for managing bed reductions: increasing occupancy rates. This option has the fewest consequences for the number of hospital bed days produced. This might be achieved by reducing the share of beds kept empty for emergency cases, maintenance or cleaning, or by more efficient planning. Based on the assumption that hospitals want to maintain their service level (either because they do not want to turn away patients or because of concerns over reputation and competition (Gaynor and Anderson, 1995)), this would be the most attractive option. However, this option is limited to a certain maximum, whatever that rate may be. Assuming that hospitals are functioning at their maximum occupancy rate despite differences between countries, then hospital bed reductions must affect the daily routine of admitting and discharging patients.

A second strategy is to reduce average length of stay, by either making use of new technologies or discharging patients at an earlier stage of recovery. A third strategy is to maintain the average length of stay and treat fewer patients, resulting in longer waiting lists or substitution by other forms of care (e.g., substitution from short-stay care to middle- or long-stay care or to ambulatory or day care). To summarise, the following answer to the first research question can be formulated:

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[1] The figures presented in this paragraph come from the OECD health data files 1998/1999

Hypothesis 1:
In the case of bed reductions in a country, hospitals react by:
1. increasing occupancy rates;
2. reducing the average length of stay; and/or
3. decreasing admissions.

In hypothesis 1, the effect of the healthcare system is not yet incorporated. The preferred strategy depends on the circumstances in which hospital and physician have to act, such as initial bed supply, opportunities for substitution and financial incentives. The point of departure is that the hospitals have already adjusted their behaviour to attain an optimal situation, given the incentives their healthcare system provides. Accordingly, as a result of changing circumstances like bed reductions, a new optimum will have to be sought.

Since reforms in most countries also relate to the financing system of the hospital sector, we have opted to focus on the financial restrictions of hospitals and physicians. Two hospital financing systems and their expected influence on hospital bed use will be discussed here: per diem rates and global budget systems. For each system a description will be given and the reaction to a reduction in hospital beds will be discussed. It is assumed that hospitals have already achieved the optimum situation considering the incentives of the financing system. Changing conditions, like hospital bed reductions, therefore have to lead to adaptations in behaviour.

In a per diem system, hospitals receive a certain amount of money for each produced bed day. This amount can be set either prospectively or retrospectively. There are no limitations on the number of bed days produced by a hospital. Per diem systems provide an incentive to keep patients hospitalized as long as possible, since the later days of hospitalization are less care intensive and therefore less costly than the first days (Barnum et al., 1995). Consequently, in a per diem system, length of stay will already be as long as possible. When bed reductions occur, we assume that these hospitals will try to affect the length of stay as little as possible. This will result in an increase in occupancy rate. If maximum occupancy is reached, a decrease in admissions will occur (fewer patients can be admitted, which may result in longer waiting lists).

A global budget system can be characterised as a system in which hospitals receive a prospective budget. In most of the countries under review, the prospective budget is related to either historical expenditure by the hospital or to demographic characteristics. Normally, budget excesses are not allowed. The global budget provides an incentive to keep the patient' s stay as short as possible, because each extra day of care will add to the costs of the hospital. The admission rate will be kept as low as possible, since the number of patients is not directive for the hospital's income (Barnum et al., 1995). Of course this also depends on the parameters within which the global budget is based. However, in most countries implementing global budgets, the budget is determined by either historical costs or demographic characteristics.

How will these global budget financed hospitals react to decreasing bed supply? Whatever choice these hospitals make, it does not affect remuneration, so other incentives may prevail. Since releasing patients earlier might result in a sicker patient population in the hospital (the first days of an admission are more care intensive than the last days) this is not a likely choice. Decreasing the number of admissions will save costs; increasing occupancy rates will not. Therefore the most probable strategy will be to reduce the number of admissions.

Besides these two systems, other financing systems are found. A now-abolished system consisted of open end financing. Hospitals could claim expenses on the basis of hospital consumption without any limits (this in contrary to the per diem system, where at least the price of one hospital bed day was fixed). More recently introduced systems are the diagnosis-related group system (DRG system) and the contract-based care system. In a DRG system, cases are classified into diagnosis and/or intervention groups. For each group a fixed payment level is settled for hospital stay, irrespective of, for instance, the actual duration (Sanderson et al., 1998; Barnum et al., 1995). A shorter stay is therefore more profitable. From a financial point of view, it is profitable to have as many admissions as possible with the shortest possible length of stay (Barnum et al., 1995). In a contract-based care environment, providers (hospitals) and payers (mostly third party payers) make a contract concerning the volume and conditions of hospital care. Both systems have been introduced in several countries but neither has nation-wide validity or sufficient time series and were therefore excluded from this study. In summary, the following answer to the second research question can be formulated as far as hospital financing system is concerned:

Hypothesis 2:
In the case of reductions in acute care hospital bed supply, the preferred strategy of a hospital will be:

a. In the case of a per diem hospital financing system in a country, the occupancy rate will increase, there will be no effect on length of stay and admissions will decrease.
b. In the case of a global budget hospital financing system in a country, length of stay will decrease, the number of admissions will drop and occupancy rates will not rise, but may even decline.

Table 2.1 Overview of hypothesis 2: The effect of bed reductions within different hospital financing systems

	hospital financing system	
hospital output parameter	per diem	global budget
occupancy rate	++	0 (--)
length of stay	0	--
admission rate	--	--

The second set of financial incentives to be discussed here is the remuneration of hospital based physicians. If bed reductions occur and physicians do not change the way they treat their patients (i.e. fail to alter the length of stay), fewer admissions can be carried out. For physicians paid fee-for-service, this has a direct influence on the level of their income. To maintain their income, they will have either to increase occupancy rates or shorten length of stay in order to be able to carry out as many procedures as before without changing the number of admissions. For salaried doctors, no effect is to be expected on the level of their income. They gain, however, in leisure time, since fewer services can be provided (fewer patients can be admitted where the same length of stay is maintained). Therefore, we expect fewer admissions and no change in length of stay and occupancy rates. On the basis of the expected effects of the different remuneration systems, we have formulated the following hypothesis:

Hypothesis 3:
In the case of reductions in acute care hospital bed supply, the preferred strategies in different physician remuneration systems will be:

a. In the case of fee-for-service remuneration, the occupancy rates will increase, the average length of stay will decrease, and there will be no effect on number of admissions.
b. In the case of salaried physicians there will be no effect on occupancy rates or length of stay. The number of admissions will diminish.

Table 2.2 Overview of hypothesis 3: The effect of bed reductions within different physician remuneration systems

	physician remuneration system	
hospital output parameter	fee-for service	salary
occupancy rate	++	0
length of stay	--	0
admission rate	0	--

2.3 Data and research design

In order to study differences in healthcare systems, hospital data of different countries are required. In this study, the data of the OECD-healthcare database 1999 have been used. The study is limited to the north-western European countries. The database consists of time series on acute care hospital supply and use from 1960 until 1995. For Spain, Italy and Greece, in the OECD-healthcare database no data are available on bed supply. Consequently, these countries were excluded from the analysis. For Portugal, no data are available between 1975 and 1986. Portugal was therefore also excluded. The last two countries excluded are Finland and Austria. Following a period of bed decline, both countries show a sudden increase of about 0.5 beds per 1000 inhabitants, after which bed reductions continue again. This more probably reflects a redefinition of hospital bed counting than a real increase in hospital beds.

The development in hospital bed supply, the financing systems of hospitals and hospital based physicians of the West-European countries are displayed in table 2.3.

Table 2.3 Hospital bed supply data and hospital and physician financing systems

Country	Bed data available since[a]	Bed-reductions since[b]	Acute care beds/ 1000 at top[c]	Reduction in beds/ 1000[c]	Financing system Hospitals[d]	Financing system physicians[d]
Belgium	1974	1987	5.9	1.1	until 1982: per diem since 1982: global budget	fee-for-service
Denmark	1975	1978	6.0	1.9	global budget	salaried
France	1974	1982	6.2	1.5	until 1985: per diem since 1985: mixed (global budget and per diem)	mixed (salaried and fee-for-service)
Germany	1960	1977	8.0	0.9	until 1986: per diem since 1986: global budget	salaried
Ireland	1978	1978	5.9	2.6	until 1980: per diem since 1980: global budget	salaried
Netherlands	1960	1975	5.7	1.7	until 1983: per diem since 1983: global budget	fee-for-service
Norway	1980	1980	5.4	1.9	since 1980: global budget	salaried
Sweden	1973	1973	5.5	2.3	until 1982: open end since 1982: global budget since 1990: mixed (global budget and DRG)	salaried

-Table 2.3-

Country	Bed data available since[a]	Bed-reductions since[b]	Acute care beds/ 1000 at top[c]	Reduction in beds/ 1000[c]	Financing system Hospitals[d]	Financing system physicians[d]
Switzerland	1980	1982	7.1	1.0	until 1990: per diem	salaried
United Kingdom	1977	1983	2.9	0.9	global budget until 1991 since 1991: no nation-wide system partly contract based care	salaried

[a] For some countries earlier bed supply data were available in the OECD-database, but no corresponding hospital bed use data. These hospital bed supply data were omitted.

[c] If bed reductions started from the first year of available data, this year was defined as the starting year for bed reductions. In reality bed reductions may have started earlier.

[c] The top-supply gives the acute care bed supply in the year before the start of bed reductions. The figure for reductions displays the change between start of reductions and final supply in 1994.

[d] A justification of the characterization of financing system is recorded in Appendix A.

To identify the influence of bed supply on the use of these beds, a pooled time series analysis was applied in a two-factor model. The two-factor pooled regression model enables controlling for systematic differences between countries (first factor) and for time-effects (second factor). We opted for the fixed effect model, because the countries differ systematically. Besides this, the results of the fixed model were more robust (when countries were omitted from the analysis) than the results of the random model.

For each country, the longest possible time series of the dependent variable (either average length of stay, number of admissions per 100 inhabitants or occupancy rate) was selected for which bed capacity figures were also available. Hospital bed use can be described as a function of hospital beds, change in hospital beds, hospital financing system and physician remuneration system. With the introduction of the variable 'hospital beds', we control for differences in hospital bed supply level between countries (Germany has twice as many beds as the United Kingdom), and with the introduction of the variable 'change in hospital beds' we introduced the volume of the bed reductions. Change in hospital beds was defined as the difference in hospital beds compared to the year before. We opted for the change after one year because hospital bed reductions will be felt at once. If a bed does not exist anymore you can no longer use it. Besides, the variable 'hospital beds' can be interpreted as the long-term effect of hospital bed reductions within countries. Summarising, we can state that the variable 'change in hospital beds' includes the short-term effect of hospital bed reductions and 'hospital beds' the long-term effect.

Since we deal with effects over time, all kinds of events will interfere with the expected development. Of particular relevance is the effect of the development in medical technology. Progress in medical technology makes it possible to shorten length of stay for certain illnesses or to perform procedures in outpatient settings. This leads to changes in average length of stays. On the other hand, in most European countries the percentage of elderly in the population is increasing. Elderly people, especially the very old, have a high risk of health problems that need long and complex treatments. To control for changes in demand we used the percentage of the population older than 65 as a proxy for demand for hospital care. The development in medical technology was estimated by means of the presence of advanced medical equipment (the exact composition of the technology index is described in appendix B). In summary:

bed_use_{it} = f ($beds_{it}$, $beddiff_{it}$, $hosp\_fin_{it}$, $phys\_fin_{it}$, $tech\_ind_{it}$, $elderly_{it}$, $beddiff_{it}$*$hosp\_fin_{it}$, $beddiff_{it}$*$phys\_fin_{it}$)

bed_use_{it} = hospital bed use. Hospital bed use consists of three parameters, occupancy rate (%), average length of stay and number of admissions per 100 inhabitants, each for country i at year t[1]

$beds_{it}$ = absolute number of beds per 1000 inhabitants for country i at year t

$beddiff_{it}$ = difference in bed supply between year t and year t-1 for country i

$hosp\_fin_{it}$ = hospital financing system. Two dummies are introduced: perdiemit for per diem payment system and budgetit for global budget hospital financing system. The reference category consists of all other systems.

$phys\_fin_{it}$ = physician financing system 0 = salaried, 1 = fee-for-service

$tech\_ind_{it}$ = technology index for country i at year t

$elderly_{it}$ = percentage population 65 years and older for country i at year t

i = country i

t = year t

The analysis has been run with the program LIMDEP. The choice for LIMDEP is based on the fact that LIMDEP does not require balanced data (the length of the time series for each country can vary) in the pooled time series design.

2.4 Results

For most European countries the bed supply trend from 1960 to 1995 is first increasing and later decreasing (a decreasing trend is defined as having at

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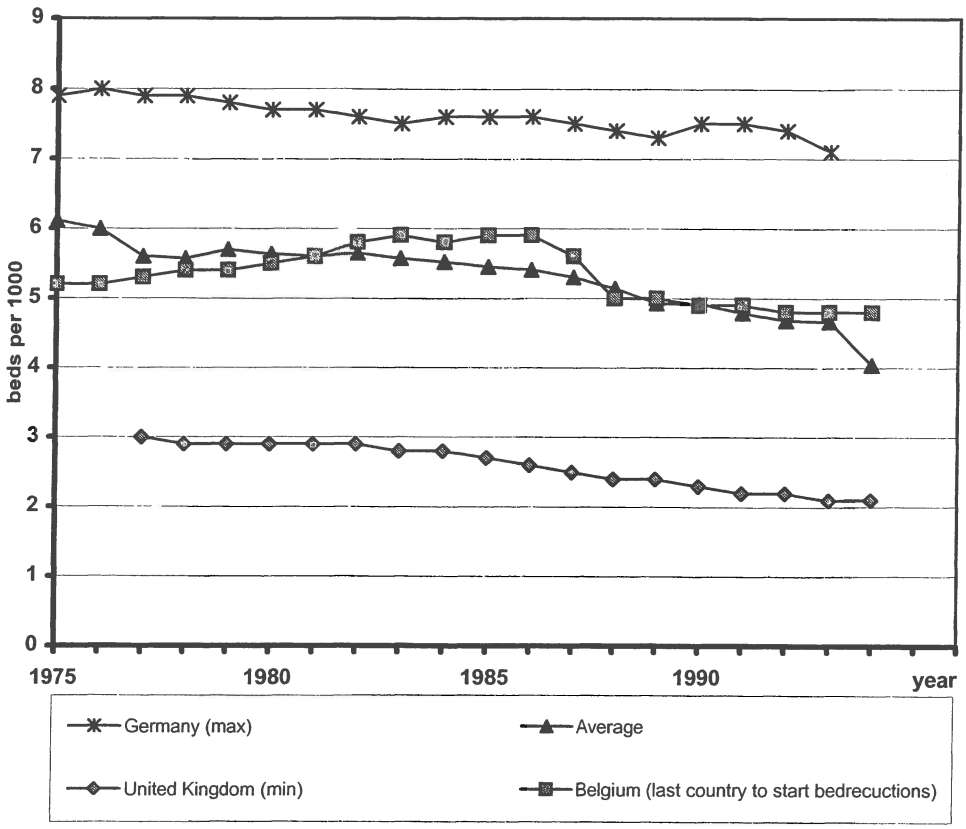
[1] When testing the hypothesis, the mutual dependency between the hospital bed use variables should be taking into account. For instance, changes in length of stays may influence admission rate and length of stay should be included as an explaining variable in the regression equation for admission rate. A useful method to overcome this problem is the use of seemingly unrelated regression analysis (SUR). In this method, none of the dependent variables appears in the other equations. The dependency between the variables is taken into account by using a two step estimation procedure, where in the first step the covariance of the disturbance terms is estimated. In the second step, all parameters of the system are estimated as if it was one large equation. However, when in each regression equation, as in our model, the same explanatory variables are included, the results of SUR are the same as those of normal regression analysis. Therefore we present the results of ordinary regression analysis.

least three successive years of diminishing bed supply). Roughly we can state that hospital bed policy in Western Europe has resulted in one bed less per 1000 inhabitants, every 10 years, with Sweden and Norway showing the strongest reductions and Germany the least. There is a considerable spread in the time when the hospital bed reductions started. The first countries were Sweden ('73), and the Netherlands ('75). The last country was Belgium, where bed reductions started in 1987. Hospital bed reduction is not restricted to higher supplied countries. In the United Kingdom, which has the lowest bed supply, a considerable bed reduction is also found (see Figure 2.1).

Figure 2.1 Hospital bed supply in Europe from 1975 until 1994 (minimum, maximum, average and last country to start bedreductions)

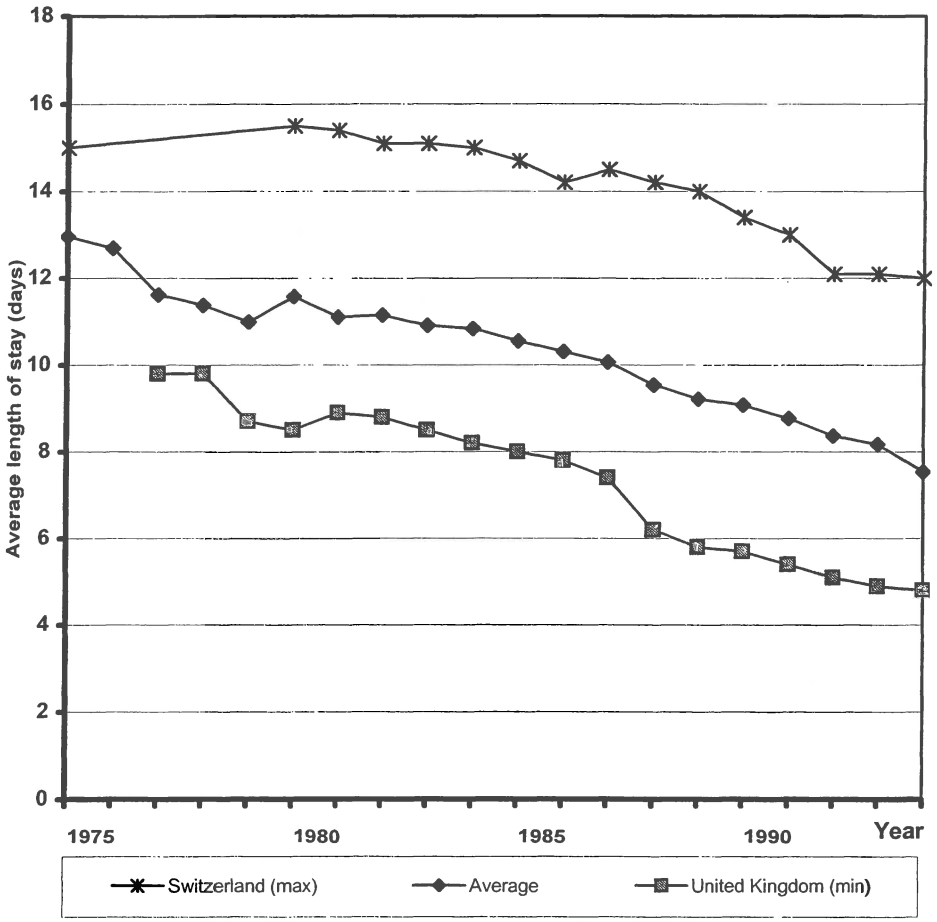


Source: OECD Health Data Files 1999

When we look at the trend in length of stay and number of admissions, we see that the first is decreasing and the latter is increasing (see Figures 2.2 and 2.3). We also see that these trends already existed before the introduction of bed reductions. The occupancy rate shows a rather whimsical pattern (see Figure 2.4). There is no corresponding trend among the countries.

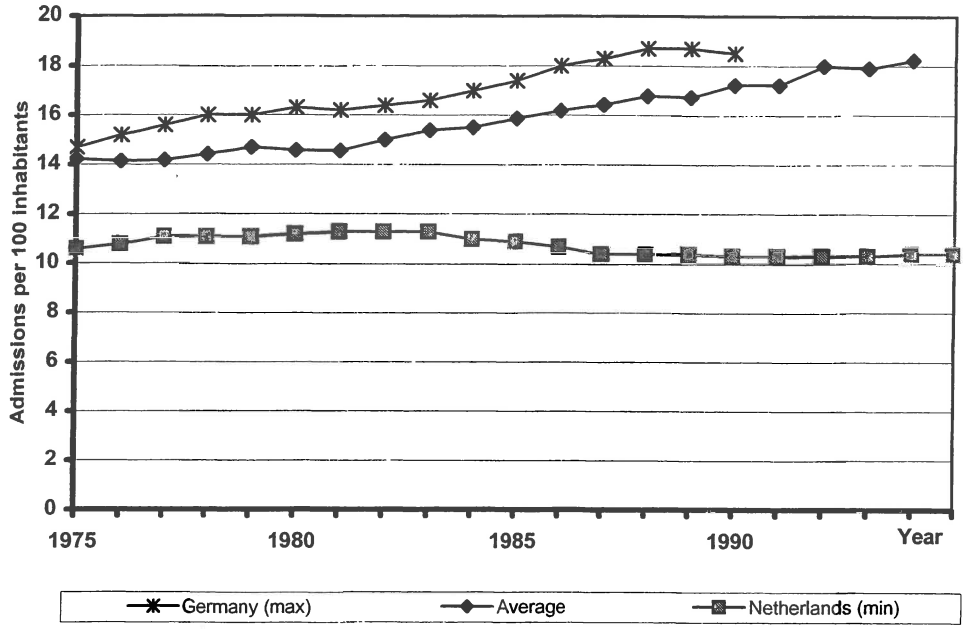
The results of the pooled time series analyses are displayed in Table 2.4. The physician financing system is not yet included in these analyses, due to problems with multi-collinearity.

Figure 2.2 Acute care hospital length of stay in Europe from 1975 until 1994 (minimum, maximum and average)



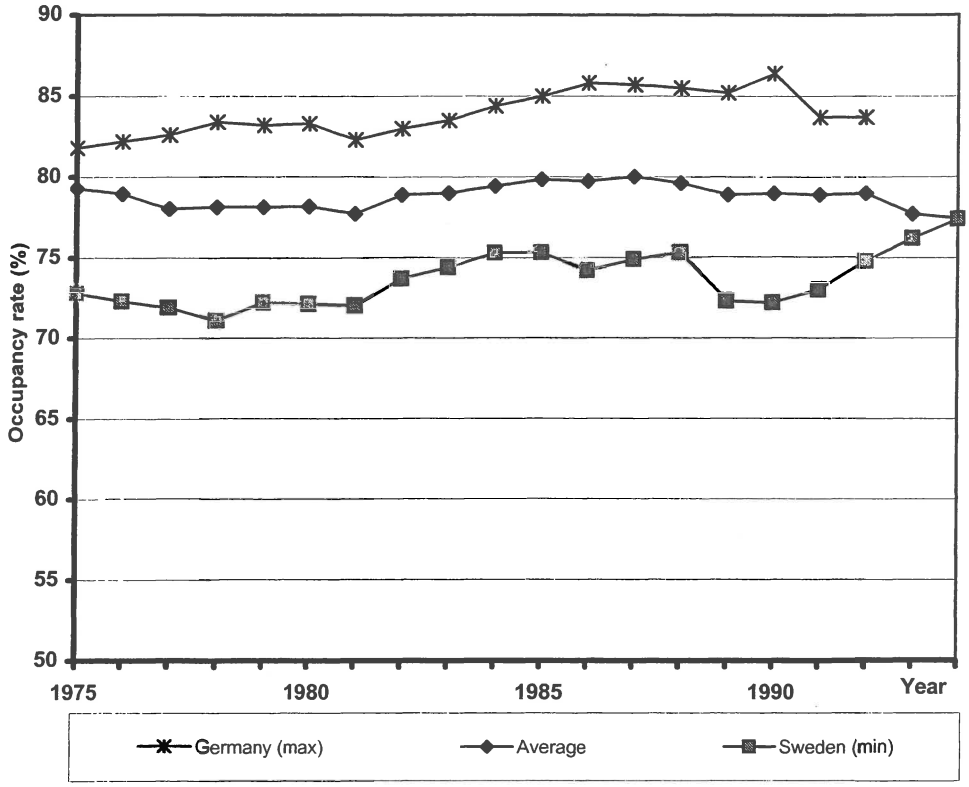
Source: OECD Health Data Files 1998

Figure 2.3 Acute care hospital admissions in Europe from 1975 until 1994 (minimum, maximum and average)



Source: OECD Health Data Files 1999

Figure 2.4 Acute care hospital occupancy rates in Europe from 1975 until 1994 (minimum, maximum and average)



Source: OECD Health Data Files 1999

Table 2.4 Pooled regression analysis to explain hospital bed use

Dependent variables[a]	Independent variables	Complete model		Model **without** interaction effects	
		B-coefficients[b]	(t-values)	B-coefficients[b]	(t-values)
Occupancy					
(n=196)	beds	0.95	(0.43)	0.85	(0.71)
	bed reduction	-0.42	(-0.02)	-2.37	(-1.03)
	per diem	**6.23**	(3.38)	**6.13**	(4.44)
	budget	2.39	(1.35)	1.95	(1.60)
	per diem * bed reduction	1.30	(0.07)		
	budget * bed reduction	-4.15	(-0.22)		
	technology index	**0.20**	(1.98)	**0.23**	(2.32)
	elderly	**-1.95**	(-3.43)	**-1.96**	(-3.46)
	constant	96.26	96.26	96.74	96.74
	adjusted R^2	0.64	0.64	0.64	0.64
Average length of stay					
(n=204)	beds	**1.27**	(6.87)	**1.24**	(6.81)
	bed reduction	2.17	(0.77)	**0.80**	(2.09)
	per diem	**1.21**	(4.09)	**1.13**	(4.96)
	budget	**0.96**	(3.68)	**0.82**	(4.73)
	per diem * bed reduction	-0.90	(-0.32)		
	budget * bed reduction	-1.74	(-0.62)		
	technology index	0.01	(0.03)	0.01	(0.32)
	elderly	0.06	(0.58)	0.05	(0.52)
	constant	2.59	2.59	2.86	2.86
	adjusted R^2	0.99	0.99	0.99	0.99

-Table 2.4-

Dependent variables[a]	Independent variables	Complete model B-coefficients[b]	Complete model (t-values)	Model **without** interaction effects B-coefficients[b]	Model **without** interaction effects (t-values)
Admission rate					
(n=208)	beds	**2.84**	(6.33)	**2.87**	(6.44)
	bed reduction	3.22	(0.51)	1.49	(1.58)
	per diem	-0.42	(-0.60)	-0.55	(-0.99)
	budget	**-1.74**	(-2.94)	**-1.78**	(-4.38)
	per diem * bed reduction	-2.63	(-0.40)		
	budget * bed reduction	-1.18	(-0.18)		
	technology index	0.03	(0.61)	0.02	(0.49)
	elderly	0.15	(0.65)	0.16	(0.69)
	constant	-1.04	-1.04	4.18	4.18
	adjusted R^2	0.88	0.88	0.88	0.88

[a] n= number of valid observations (sum of observations for each year within each country)
[b] Underlined B-coefficients: significance level $p < 0.05$

Roemer's Law can be interpreted as all available beds used to a maximum. Apparently this theorem is still valid. There is no effect of beds on occupancy rates and the more beds, the longer patients stay in the hospital and the more patients are admitted. Surprisingly, there is scarcely any effect of hospital bed reductions on hospital bed use. We can conclude that hypothesis 1a, bed reductions leading to higher occupancy rates, is not valid. The validity of hypothesis 1b and 1c, describing the effect on average length of stay and admission rates is not straightforward. We will return to this issue in the conclusion and discussion section.

There was no interaction effect between financing systems and hospital bed reductions in the preceding year. The financing system as such, however, does influence hospital bed use. Per diem paid countries show higher occupancies and longer stays compared to countries with other financing systems. A global budget system leads to more admissions compared to other financing systems. Summarising, we can conclude that hospital financing systems influence hospital bed use. However, for the different financing systems, in the case of bed reductions we could not identify different strategies for managing these reductions. Therefore, hypothesis 2 could not be confirmed.

We also carried out a pooled time series analysis on the model with main effects only. The results did not differ significantly from the results of the complete model. One interesting difference is the significance of the effect of bed reductions on length of stay in the model with main effects. Here bed reductions in the preceding year lead to longer stays instead of the predicted shorter stays.

In the case of the physician financing system, there was a problem of multi-collinearity between the country- specific effects and physician financing system and between hospital financing system and physician financing system, as a result of which the two-factor model was unsuitable. To solve this problem we selected data series in each subcategory of hospital financing system (per diem and budget) and physician remuneration system (fee-for-service and salary), and we applied multivariate regression analyses on each data series individually. The independent variables in the regression equations were bed reductions and technology index. For some countries, the technology index showed a high correlation with the proportion of elderly, which is the reason that the latter variable was omitted. The regression analyses were carried out with correction for auto-correlation (Prais-Winston method). In these analyses

too, the effect of bed reductions on hospital bed use was negligible. Only in Switzerland was a significant effect found: more bed reductions leading to fewer admissions. In Germany, in a similar situation of per diem hospital payments and salaried physicians, this effect did not occur. However, the German time series for the per diem period were much earlier (1960-1985) than the Swiss time series (1980-1995) and bed reductions in Germany started only in 1977. Based on the above analyses we can neither confirm nor reject hypothesis 3, although the results point in the direction of no effect of physician remuneration system on strategies to manage hospital bed reductions.

2.5 Conclusion and discussion

We commenced this study with the question as to whether hospital bed reductions affect the use of the remaining acute care hospital beds. This study shows that in general, fewer hospital beds lead to shorter stays and fewer admissions. Short-term hospital bed reductions (reductions compared to the year before) do not give rise to extra adaptations in admission and discharge policies. We can conclude that in all countries in this study, fewer hospital beds are managed with both strategies of fewer admissions and earlier discharge. Perhaps this can be explained as follows: countries that reduce beds adapt to similar admission and discharge policies as countries that already have this lower level of beds. Interestingly, the result in the model without interaction effects is that average length of stay increases when beds are reduced compared to the previous year. A possible explanation for this effect is that less severe cases are postponed, leaving more severe cases to increase the average length of stay. It is striking that technological development and population ageing do not lead to changes in admission and discharge policies. Occupancy rates increase with advanced technological development. This may be due to more efficient planning, made possible with new information technology, which lead to fewer vacancies of hospital beds (assuming that advances in medical technology and information technology show a similar pattern). A larger proportion of elderly in society resulting in lower occupancy rates is somewhat more difficult to explain. It is possible that the increasingly older population has given way to the creation of more facilities especially for the elderly, such as nursing homes and home care. In that case elderly patients may be discharged earlier to other institutions, and hospitals consequently do not need to reserve space for elderly that cannot be discharged because they still need extra care after treatment.

It is interesting that the literature about hospital bed reductions contains no indication about the optimal number of beds, given a population's health status. The number of hospital beds in a country is mainly a policy issue. Quality of care measured in life expectancy in the various countries does not correlate positively with the number of beds (correlations computed for diverse years showed negative correlations between life expectancy of males or females at birth and hospital bed supply; data source: OECD health data files 1999). Quality of care can of course also be expressed in terms of experienced quality of health. This is, however, beyond the scope of this study.

The second research question in this study relates to the effect of hospital financing systems on hospital bed reductions. The results show that hospital financing systems do not have a specific effect on how hospital bed reductions are managed. However, they do influence hospital bed use in general. In per diem systems higher occupancies and longer stays were registered. This is independent of the hospital bed volume. In budget systems, patients stayed shorter. So if administrations want to influence hospital bed use, hospital payment systems can be used to achieve this goal.

In summary, we may state that bed reductions do not influence hospital bed use as predicted in hypothesis 1 (increasing occupancy rates, declining length of stay and decreasing admission rates). Accordingly, this hypothesis can be rejected. In fact, bed reductions even result in longer hospital stays, which may be due to the shift of less severe cases to waiting lists. If we interpret 'bed reductions' as short term effect (since the variable is defined as the change compared to the year before), and 'hospital beds' as the long term effect of change in hospital beds, hypothesis 1 is still partly valid. The absolute number of beds is directive for admission rates and length of stay: fewer beds lead to shorter stays and fewer admissions. Occupancy rates are not influenced by number of beds. Hospital financing systems do not influence the way hospital bed reductions are managed. Consequently, hypothesis 2a and 2b giving the effect of the per diem system and global budget system on bed reductions could not be confirmed. Hospital financing systems, however, do influence hospital bed use, independently of hospital bed reductions. Hypothesis 3, concerning the physician remuneration system, could neither be confirmed nor rejected.

This study has several limitations. The first limitation concerns the data from the OECD health data files. These data are unfortunately neither complete nor perfect (see for instance Rublee and Schneider, 1991). In particular, the

comparability of the data is questionable. Is an acute care hospital bed in France the same as in Sweden in terms of the care provided to patients in such beds? This problem may be alleviated to some extent by studying the development in trends over years, as we did in this study, instead of comparing absolute figures between countries. The practical reasons for using the OECD healthcare database are the easy accessibility and the long period of time covered. Besides this, efforts have been undertaken to make the data comparable. Accordingly, although conclusions have to be considered with caution, we gave the data the benefit of the doubt.

A second significant limitation is that not all determinants of hospital bed use were available. There are two more important phenomena that influence hospital bed use. The first of these is the waiting list. A waiting list can act as a buffer, helping to manage hospital bed reductions and preventing hospital actors from changing their behaviour in the case of bed reductions. The registration of waiting lists appears to be fraught with difficulty, because of double registration in different hospitals, drop outs, and administrative problems, such as which waiting list should be recorded (waiting for the first consultation or for the procedure) and what should be registered: number of persons or length of wait. None of the countries in this study have a national unambiguous registration of waiting lists. Secondly, day surgery and outpatient procedures can be used as a substitute for inpatient care. In that case, admissions can be reduced without influencing the service level of the population. However, there is debate in the literature, as to whether day surgery will serve as a substitute for or a supplement to inpatient care (Morgan and Beech, 1990; Haworth and Balarajan, 1987).

Another limitation is that the analyses are carried out at a high level of aggregation (country level). Within countries too, variations exist in hospital bed use, leaving space for aggregation bias. Van Doorslaer and Van Vliet (1989) examined several studies concerning the relationship between bed supply and bed use and they found no evidence for aggregation bias. However, the explanatory variables in their study were more related to patient characteristics than to institutional characteristics. They found evidence for decreasing variation and increasing multi-collinearity, resulting in the disappearance of supply effects. Hence, the fact that we found effects in this study may indicate that these effects are really significant. However, the problem of multi-collinearity also appeared in this study. In some countries, there was a high (negative) correlation between the number of hospital beds, technological

development and ageing. This made it difficult to reveal the effects of each individual regressor on hospital bed use for individual countries. A further result was the failure to analyse the effect of physician payment systems. A final critical note concerns the reliability of official statistics. Do bed reductions reflect real bed reductions or only administrative reductions? Kroneman and Van der Zee(1997) have already illustrated the differences between official policy and reality. For instance, in Belgium from 1963 until 1982 officially superfluous beds (so called black beds) were also still in use, resulting in more than 100% occupancy rates of the legal beds. Due to such phenomena, hospital bed reductions might be less strong than official statistics indicate.

So far this research has analysed data at macro level. To gain further insight into the mechanisms that are used to manage bed reductions, more research should be carried out at meso or micro level. For instance in Germany, substantial hospital bed reductions are still planned. In the Netherlands, too, hospital bed reductions are still taking place, mainly as a side effect of hospital mergers. An evaluation of the effects of these reductions, including alternatives for inpatient care like day surgery and effects on waiting lists would increase the understanding of the relationship between hospital bed supply and hospital bed use.

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Appendix A: Description of hospital and physician financing systems

Global budgets are based on many different financing parameters, like historical costs, demographic characteristics, production parameters etc. In this project, a financing system was defined as a global budget when the budget was limited (cap) and prospectively set. Systems were overproduction was reimbursed only partially (like in Belgium) were also defined as global budget.

Belgium

Before 1983, Belgium hospitals were financed by per diem system. In 1983 this system was changed in a prospective budget. It was still based on per diem rates, but the number of days were negotiated prospectively. The rates were based on historical costs. In 1986, the basis of historical costs was changed and the rates became based on the average rate in a group of similar hospitals. A gradual adjustment from historical budget towards peer group-budget was provided for. In 1994, still 40% of the budget was based on historical costs (Bond van Christelijke Mutualiteiten, 1996; Hermesse, 1995; OECD, 1992). The hospital based physicians are paid fee-for-service (Hermesse, 1995; Schneider et al., 1992; Schneider et al., 1992).

Denmark

Hospitals in Denmark are financed by global budgets (OECD, 1994; Holst, 1992).

The hospital based physicians receive salaries (OECD, 1994; Krukemeyer, 1985).

France

Before 1985 a per diem system existed for all hospitals. In 1985 this system changes into a global budget system for the public hospitals. 70% of the French hospital beds can be found in public hospitals. Therefore, the French financing system since 1985 is defined as a global budget system (CREDES, 1999; Duriez et al., 1996; Sourty-Le Guellec, 1995).

The hospital based physicians in the public sector receive salaries. The private sector physicians receive fee-for-service. In full-time equivalents, approximately 25% of the hospital based doctors is working in the private sector.

Therefore, the choice of the French physician financing system was set to mixed (CREDES, 1999; Duriez et al., 1996; Sourty-Le Guellec, 1995).

Germany

The hospital financing system in Germany is based on per diem prices. Since 1986 these prices are set prospectively. Expected production (days) and rates are negotiated with sickness funds. A surplus of days is reimbursed by 25% of the actual rate, shortfall of days are reimbursed by 75% of actual payment. Since payment appears to be restricted to some extend and the budget is negotiated beforehand, the system is defined as a global budget system since 1986 (Graig, 1993; GAO, 1993; Henke, 1990; Leidl, 1987).
German physicians who work in hospitals receive a salary (Graig, 1993; Henke, 1990).

Ireland

Since 1980 hospitals receive a global budget. At the end of the eighties, the budget was strongly cut. There are private hospitals that receive fees from private insured patients. The share of private hospitals however is small. Some experiments with DRGs were planned for the nineties (Abel-Smith and Mossialos, 1994; Schneider et al., 1992; OECD, 1992; Schneider et al., 1992; Krukemeyer, 1985).
The physicians in the public and not-for-profit hospitals receive salaries (Schneider et al., 1992; Schneider et al., 1992).

The Netherlands

Before 1983 a per diem system existed. In 1983 a global budget system was introduced. In the first years the budget was based on historical costs, since 1988 the budget is based on a mixture of population size, supply and production characteristics.
Physicians in the Dutch hospitals are paid fee-for-service.

Norway

Since 1980 in Norway a system of global budgets exists, based on a mix of population size, age distribution and mortality rates. Since 1991, a DRG-experiment has started in 4 hospitals (OECD, 1994; Magnussen and Solstad, 1994; Wiley, 1992).
The physicians receive salaries (Krukemeyer, 1985).

Sweden

Sweden has a long tradition of global budgets. However, before 1980 shortages were simply transported to the next budget. Since the eighties, tighter cost control was introduced and budgets became restrictive. Cost control is the responsibility of the counties. In some counties (7 from the 23) DRGs are used as financing system since 1992. Since the other counties still is financed by global budgets, this system is defined as a mixed system after 1992 (Paulson, 1995; OECD, 1994; Wiley, 1992).

Hospital based physicians receive salaries. Before 1970, additional income could by gained by private practice. Since 1970 this is restricted to after working hours. In 1987 this source of income is even further restricted (Wennstrom, 1992; Blomqvist, 1992). The impact of the income through private practices appears to be low, therefore, the Swedish physician financing system is defined as a salary system.

Switzerland

The Swiss hospitals are paid for 40-60% of their running costs according to a per diem system. This system exists only for Sick Fund patients, but 80% of the population is insured either voluntary or compulsory by sick funds. The remaining costs are paid by the cantons, who are entitled to do so by law. So there is a per diem system with an open end character (Ministerie van Sociale Zaken, 1995; Güntert, 1994; OECD, 1994).

Hospital specialists are employed by the hospitals but can treat private patients outside working hours (Vreugdenhil and De Bruine, 1992).

United Kingdom

Since 1946 the hospital budget is based on population size with adjustments for mortality rates. In 1991 a system of internal competition is introduced. Hospitals become independent NHS trusts that set their own prices in a competitive market in which money should follow the patient. The basis on which hospitals set their prices is not clear. When developments tend to result in chaos, state authorities interfere (Klein, 1995; OECD, 1992; Maynard, 1990; Bevan and Perrin, 1987).

In U.K. the hospital based physicians receive salaries. Full time doctors are allowed to increase their income with private patient fees with not more the 10% of their NHS-salary. Part-time doctors do not have this restriction. However, only 12% of the population is privately insured (Graig, 1993; Schneider et al., 1992; OECD, 1992; Schneider et al., 1992).

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Appendix B Technology index composition

The technology index was composed as follows. We started with the following bench marks:

* The development of technology is a monotonous increasing trend
* Studying the introduction and spread of medical equipment can approximate the development of medical technology of a country
* The acquisition of (expensive) technological equipment depends on the available budget. The more money available for health care, the more equipment can be purchased. This is revealed in the high correlation (> 0.9) between the number of CT-scanners in a country and the total expenditure on health care in that same country (source: OECD-health data files 1999).
* The moment of introduction of a technological innovation depends on the technology propensity of a country. Some countries introduce innovations sooner than others. When studying for instance the number of CT-scanners in diverse countries at one point in time, the difference between number of CT-scanners per million inhabitants indicates the difference in technological development stage (phase dislocation). We assume that the introduction of new equipment in each country follows the same pattern. Finally a saturation for the specific equipment is reached. In the mean time, new technological equipment will be developed, that again shows the same pattern of introduction. We therefore assume that the number of CT-scanners and MRIs at a certain point of time give a ranking of the phase dislocation of the introduction of new technology between the countries.
* CT-scanners and MRIs are considered advanced technological equipment. The choice for this equipment is also a practical one. For each country in this study the number of CT-scanners and MRIs in 1990 was available in the OECD health data files 1999. For other equipment only few data were available. Besides this, for CT-scanners for some countries more extensive time series were available, which made it possible to establish the relationship between CT-scanners and health care expenditure.

For 1990, for all countries included in this study the number of CT-scanners and MRIs is known. There are on average six times as much CT-scanners as MRIs. The technology index for 1990 is therefore determinded by means of the number of CT-scanners per 1000 inhabitants plus the number of MRIs, with the number of MRIs weighted by a factor 6. The development through time is

determined by means of the development of total health care expenditure of a country. This is justified by the high correlation between health care expenditure and the number of CT-scanners in those countries where both figures are available. The expenditures of the year 1990 are fixed as 100% and the number of equipment in the years before and after is computed by means of the percentage of expenditure in that year compared to the year 1990.

In formula: Technology-indext = number of equipment in 1990 * (expenditures in year t / expenditures in year 1990)

The total health care expenditure of a country is expressed in $ purchasing power parities.

3 HEALTH POLICY AS A FUZZY CONCEPT

Methodological problems encountered when evaluating health policy reforms in an international perspective

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Summary

Investigating health policy reforms at a national level, is a troublesome task, since it is difficult to establish exactly when a certain policy change took place and it is also difficult to determine the content of the reform. In this paper three main causes are distinguished that contribute to the 'fuzziness' surrounding reforms. Firstly, ordinary mistakes occur, even experts err. Secondly, in some countries responsibility for (part of the) healthcare system is delegated to the regional level, causing regional variations which lead to uninterpretable effects at country-level healthcare system descriptions. Thirdly policy reforms are often not a straightforward process. Implementations can be characterized as a gradual process which can be disturbed at any point in time. For example, the use of framework legislation, effects of public discussions and law enforcement problems contribute to the fuzziness. To strengthen the validity of information from secondary sources (often the best available and linguistically accessible sources) the use of primary sources and expert consultation highly recommended, respectively giving insight in formal rules and initial intentions of policy measures and in the impact of reforms at performance level. The fuzziness can be captured into an index (reform implementation index), containing the gathered information and thus facilitating statistical analyses controlling for process-information.

Keywords: healthcare systems, comparative research, methodology, healthcare policy

3.1 Introduction

The steady expansion and improving quality of the OECD health database files simplifies international comparative health studies and makes them more attractive to use. The international health data file has become a popular research tool through the desire to connect the wave of healthcare reforms undertaken throughout the industrialized world to the OECD time series to establish their effect (OECD, 1987; Godt, 1987; OECD, 1992; Wiley, 1992; OECD, 1993; Kemenade and Jong, 1993; OECD, 1994; Saltman, 1994; Scheffler, 1994; Lüschen et al., 1995). However, making connections between a data file and health reforms is not without problems, as the authors of this paper discovered during their international comparison of the relationships between hospital utilization, planning and budgeting. Sources contradicted each other, or were insufficiently specific, and even official documents were not always decisive about the exact time schedule of the reforms. Apparently 'health policy' is a rather 'fuzzy' concept. In the first part of this paper a set of possible causes of this 'fuzziness' is described; in the second part possible solutions to deal with the fuzziness are discussed.

3.2 Causes of fuzziness

The reasons why it is difficult to establish exactly when a certain policy change took place can be divided into three categories.

The first is the most simple: ordinary mistakes or misunderstandings; even experts err. The second applies to the relevance of the national level and of national data to the analysis of healthcare policy developments; in some countries the regional level is more appropriate. The third regards the introduction of a deliberate vagueness in policy making, resulting in an emphasis on the process rather than the content of policy making.

Mistakes, errors and misunderstandings

The first category of causes of obscurities evolves from simple mistakes or misunderstandings which are sometimes reinforced by uncritical copying of sources. An example was found in Rosa and Launois' description of the French healthcare system published in 1990 (Rosa and Launois, 1990). They characterize the hospital payment system in France as a per diem system, although in the mid eighties the per diem system was replaced by a global budget system.

An example of an unavoidable cause of discrepant dates is what may be called the '31st December effect'. A parliament may ratify a reform in the month of December and put into effect some months later, in the following year. As a result, both dates are found in the literature in connection with the reform. An example is the German Krankenhaus-Kostendämpfungsgesetz (Hospital Cost Containment Act) of December 1981 (Beske, 1982).

Regionalization

A second type of source leading to problems in finding out what is going on in a country lies in the implicit assumption that there is a national healthcare system and a national healthcare policy. However, there is an increasing trend to delegate responsibilities to regional levels. These responsibilities may include main line health policy issues. An example of this can be found in Switzerland, where each canton is responsible for its own healthcare system. Another example is found in the US, where part of the healthcare system is regulated at the national level (Medicaid and Medicare), while other parts are left to state level. Delegation of responsibility to lower level authorities was also found in Germany. Here, the planning and financing of hospital investments is now the responsibility of the Bundesländer; the Federal state is no longer responsible. In Sweden, the hospital financing system is regulated by the counties, where DRG style financing systems as well as block contracts are to be found (Paulson, 1995). The national level is evidently not the right analysis unit for evaluating healthcare reforms; the regional level should be used.

Vaguely defined national policies

The next type of obscurity source stems from the nature of most major reforms. This is where the 'fuzziness' comes in. The implementation of a reform is often not a straightforward process with clear changes evident from one day to the next. Implementation can better be characterized as a gradual process, a process which can be disturbed at any point between implementation and enforcement.

Phasing and adapting

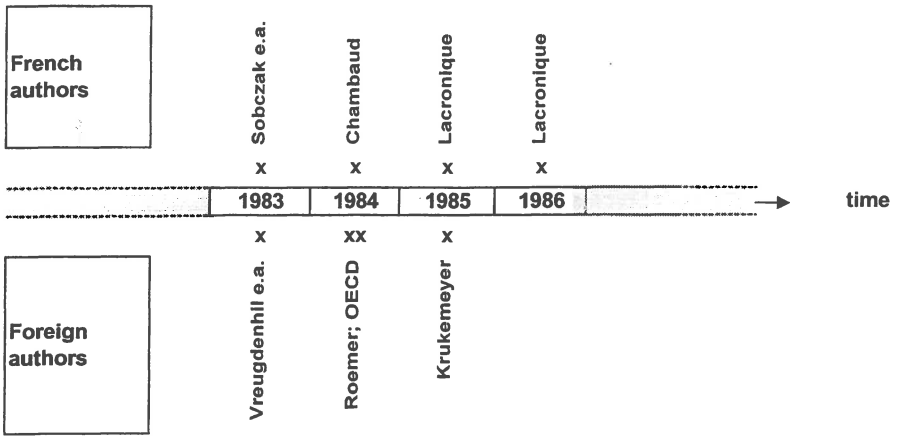
Complex and drastic reforms are often introduced step by step, mostly with the objective of avoiding the confrontation of healthcare providers with sudden changes in their financial resources. An example can be found in Hungary with the introduction of the DRG system for hospital reimbursement. The new administrative system was introduced in 1992. But, in that year, the system was only used to register output. The amount of money the hospitals received was

still based on the old system; in casu number of beds. In 1993, hospitals were recompensed according to the new system. Deviations in budgets were compensated for according to the previous budget, to avoid hospitals having to face large deviations from their customary turnover. Now, in 1996, these corrections are still in operation. So, in practice, the new financing system has not yet been put into effect, since the financial consequences are yet to be rigorously applied.

In France, too, there appears to have been a gradual introduction of the global budget system. It is not, however, clear from the literature the extent to which the budget system was introduced in each year. The earliest date mentioned is 1983 (Sobczak et al., 1988; Vreugdenhil and De Bruine, 1992), the last date referred to is 1986. One publication alluded to January 1986 (OECD, 1992). Such a detailed date might lead one to believe that this was the correct date. Unfortunately, a second publication (Krukemeyer, 1985), gave January 1985 as the date on which the system was introduced. A second reasonable assumption might be that French authors were better informed and more able to give reliable information than foreign authors. However, French authors seem to be even less conclusive about the exact date of introduction than their foreign counterparts, as can be seen from Figure 3.1. Some references suggest a gradual introduction. The OECD report on health reforms (OECD, 1992) and Aiach and Delanoe (Aiach and Delanoe, 1989) for instance state that the budget system came into effect in 1984 for larger hospitals and in 1985 for the remainder. According to Aiach and Delanoe(Aiach and Delanoe, 1989), the law was passed by parliament in 1983. One is led to deduce that there must have been a gradual implementation of the global budget system.

In the Netherlands, the basis of reforms is currently formulated in policy documents outlining the direction of the reform. Implementation is planned step by step. An example is the 'Dekker Plan', published in 1987. This plan aimed to abolish the distinction between the public and private insurance systems by introducing statutory insurance for everyone. However, successive government changes led to the plan being amended and it may now never be implemented completely. This kind of process can lead to misunderstandings concerning the state of implementation. In his book on health insurance, Glaser writes that 'every Dutch citizen is now required to enrol under statutory health insurance' (Glaser, 1991). His informants during his visits in 1986 and 1987 were apparently convinced that this plan would eventually be carried out. Time, however, has decided differently.

Figure 3.1 An overview of years of introduction of the global budgeting system in France mentioned by different sources



Increasing use of 'framework legislation'

Another type of obscurity source arises from the use of framework legislation. Framework laws contain only major principles; further implementation is effected by inconspicuous ministerial or royal decrees. An example is the Dutch Health Facility Act on the planning of health services. (The 'Wet voorzieningen gezondheidszorg'). Parliament passed this law in 1982, but, apart from some small experiments and one decree regulating the establishment policy for General Practitioners, the law was never properly implemented. So, in formal terms, there has been a healthcare services planning law in existence since 1982, but in practice the situation has not changed. However, Meyer-Lie (Meyer-Lie, 1986), in his comparative health services study published in 1986, describes the Health Facility Act as actually having been implemented completely, his sources being official documents and two visits.

The foreshadow of the future

The next phenomenon can be characterized as 'foreshadowing the future' and has previously been described by Groenewegen (Groenewegen, 1994). As a result of discussions of future reforms in politics, the parties concerned try to maintain control by anticipating forthcoming changes (Groenewegen, 1994). Again, a clear example can be found in the Netherlands. As a result of the public debate concerning compulsory basic insurance for all Dutch citizens together with voluntary additional insurance in which healthcare insurers (both private and public) were to be obliged to compete, public and private health

insurance funds gave urgent attention to a large scale merge which would strengthen their market position and limit competition. So, in place of the 53 public health insurers and 82 private health insurance companies of 1986, we now find, 8 years later, some 80 health insurers, most of a mixed public/ private character. The proposed changes in the compulsory insurance system have, however, been postponed and at this moment it is not clear whether they will ever be introduced. In Sweden a similar foreshadow of the future was also experienced with the introduction of a guaranteed limited waiting time of not more than three months for certain surgical procedures. The waiting lists shortened during the period while the guarantee was still under discussion and this reduction continued into the period between the proposal being put before parliament and being put into effect (Hanning, 1996).

Deliberate vagueness in order to create broad support or in other words: governing by magic and managing by speech.
Governments are sometimes deliberately vague in order to gain broad political support. An example of such an approach is Germany's Concerted Action in Health Care (Konzertierte Aktion im Gesundheitswesen). 'Concerted Action' is a committee consisting of representatives from all sectors of healthcare. The decision making process is based on consensus. No sanctions are imposed for failing to arrive at recommendations, nor (when they are) for failing to implement them (Beske, 1982; Mattheis, 1988; OECD, 1992; Graig, 1993; Sachverständigenrat für die Konzertierte Aktion im Gesundheitswesen, 1994). This kind of consultative structure derives its effectiveness from the threat of government intervention in the case of no consensus being reached (Made et al., 1992). It is, however, far from easy for a researcher to discover exactly what has been decided upon and to what extent it is put into effect.

Law enforcement problems
Another phenomenon that can cause deviations from the formal date of implementation of a reform evolves from low public support of a policy measure and weak incentives to enforce the law. These factors may result in disregard of the measure to be implemented. An example of this is hospital planning policy in Belgium. The first law concerning hospital bed planning dates from 1963. In 1973 and 1982, more restrictive measures were introduced. Hospital beds seemed, however, to evolve autonomously, independently of any policy measure (Van den Heuvel and Sacrez, 1982; Beeckmans, 1986; Cannoodt, 1987). Hospitals found creative solutions to the limitations, such as having more than 100% occupancy rate of legal beds to cover the 'black' beds (beds

indicated as superfluous). This was possible because of the per patient settlement of hospital days. So, on paper, hospital planning in Belgium has been regulated since 1963, but in practice the measures had no effect at all until 1982 (Beeckmans, 1986).

In short, there appear to be three major problems that can be encountered in investigating what has happened in the case of healthcare reforms. The first problem is inherent in the use of secondary or tertiary sources. These sources often only describe main characteristics and give detailed information only where this is relevant for the writer's subject matter. The effect is that information sources which are incomplete can seem to contradict each other.

The second problem addresses the appropriateness of the national level. The national level is not always meaningful when studying healthcare systems. It appears to be more and more the case that responsibilities are delegated from the national level to regional levels.

The third problem, vaguely defined national policies, derives from the nature of many reforms. Reforms are often introduced gradually, so that no clear starting point can be distinguished. Another problem is that the formal date of implementation does not always indicate the commencement of the reform. Sometimes preliminary public debate leads to anticipatory behaviour by the actors concerned; sometimes incentives are not strong enough to persuade the actors to observe the reform.

3.3 How to deal with the fuzziness

Above, some explanations for the fuzziness of health policy reform information have been given. The question which then arises is which approaches should be applied to attain an optimum reliable insight into what has actually happened, and to what extent do these approaches lead to satisfying results. The problem remains of adapting this information for statistical analysis. Essentially, the central point is how to deal with problems of inconsistencies and gradual implementation. In this section, methods of accommodating the problems are presented. The examples given for each method illustrate the extra value added in comparison with the other methods.

Gathering reliable information

The use of secondary sources

Secondary sources are often global in nature; they provide a global insight into what has changed in a country with respect to healthcare reforms. This kind of information is readily available and is often linguistically accessible. Secondary sources provide very suitable starting points for studying healthcare reforms. Not only do they contribute global insights; they also facilitate determination of a point where further investigation is necessary, because inconsistencies have been discovered, or because information is incomplete, or is insufficiently specific. It is important to evaluate these sources critically, because personal interpretations are inevitable when authors have to summarize or select information. Choices may lead to biased information and different interpretations can lead to apparent contradictions.

The use of primary sources

Discovering the initial intention of a reform may require the consultation of primary sources. Legal texts reveal the official regulation and exact figures concerning budget ceilings, norms (for example, the number of beds per population), and so forth. The use of primary sources, however, requires knowledge of the language of the country. This can be a problem; while English, German and French are accessible, languages such as Hungarian or Swedish are not (at least, not to the authors of this paper). Using primary sources alone brings with it the drawback indicated above that regulations are not always completely enforced, or may display unintended side effects. Such supplementary information may be missed if only primary sources are relied upon.

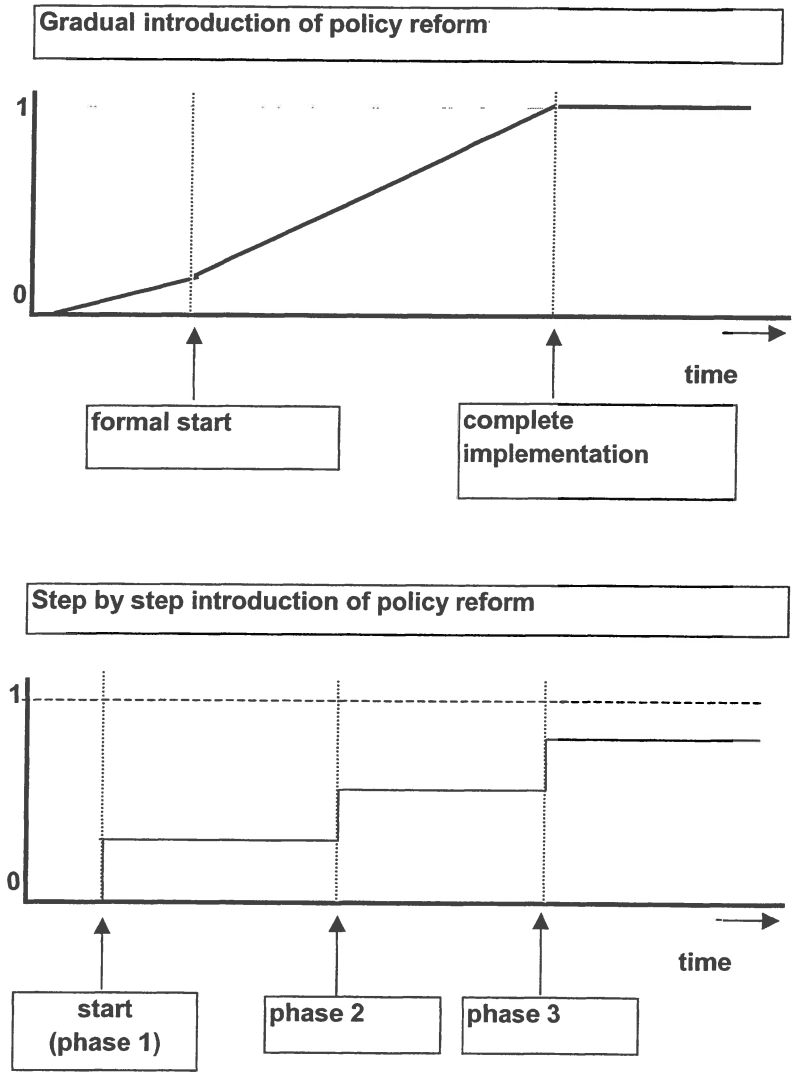
Consultation of experts

The second procedure concerns the inconsistencies and omissions in secondary and tertiary literature. A comprehensive literature search can form the basis of an overview of the reform. The overview, together with questions referring to any omissions or inconsistencies identified, can be put to experts within the countries concerned. Confinement to a single source, or to spokesmen from just one sector, is risky. Consulting representatives of the different sectors (the legislative body, the supply of care, health care insurance) is far more productive. Someone with practical experience (a hospital manager, for example) should also be included. The information thereby accumulated should enable the construction of a most probable reproduction of the reform process. It is, however, necessary to bear in mind that this reconstruction may still contain errors.

To adapt the information to suit statistical analysis
Even when the content and implementation procedures of the policy measure are clear, this reconstruction is still not straightforwardly appropriate for the (statistical) analysis of the effect of the measure. The following procedure is proposed to remedy this problem.

Development of a 'reform implementation index'
This index provides knowledge of the extent to which a reform has been implemented for the years preceding and following the implementation The index is expressed as a value between zero and one. In Figure 3.2, two examples of such an index are given. The upper diagram illustrates a reform that elicited reactions from the field, even before the formal introduction. The reform was spread gradually all over the country before it finally came into effect. The second picture illustrates phase by phase implementation; in this example full implementation was never reached. In this way, for each point in time (in our example, each year), the extent to which the reform has been effected can be expressed (on a scale from zero to one).

Figure 3.2 Two examples of a shape that a 'reform implementation index' can take through time



3.4 Practical experiences with the proposed methods

In the following examples the added value and drawbacks of the proposed methods are outlined and illustrated by means of examples. The extra value from a comprehensive study of primary sources compared with the information obtained from secondary sources is illustrated by the development of the hospital law in Belgium. The effect of additional expert consultation is illustrated by a reconstruction of the implementation of the new hospital budgeting system in Hungary. The usefulness of the reform implementation index was tested on the implementation of the global budgeting system in France.

Secondary sources versus primary sources

What is the extra value obtained from a comprehensive study of primary sources compared with the information obtained from other sources? To answer this question, a case study of the hospital planning reforms in Belgium was carried out. Belgium was chosen because, while from the authors' perspective the Belgian system is foreign, the primary sources are readily accessible, since they are in Dutch.

What is the advantage of using primary sources? For Belgium, all the ministerial and royal decrees were listed, with their content and official implementation date. Also, information giving exact figures of norms for hospital bed planning and computation rules for the hospital budget were described in detail. In the secondary sources, this kind of information was lacking. Also, in the secondary literature, the exact dates and content of ministerial decrees was not always clear, while this information was readily available in the primary sources. But, as we have noted, a major drawback of primary sources is that the actual implementation can differ markedly from the formal situation.

The result of expert consultation in Hungary

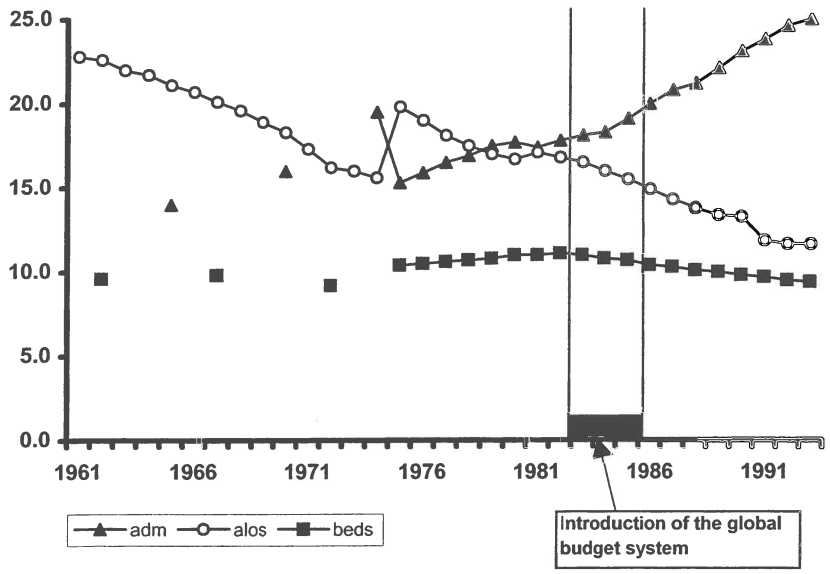
In Hungary, the hospital financing system changed from a system based on historical budgets (based largely on the number of beds and negotiation skills of the hospital manager) to an output based system, by means of DRGs. In the written sources, there was some imprecision about the implementation date. Further, a gradual adaptation from the historical budget to the new system was reported. To discover the exact date of implementation and the actual course of the adaptations, three different experts were consulted; a hospital manager, the head of the administrative department that carried out the financial

administration of the DRGs, and an executive of the health insurance fund. They were also asked to comment on the actual operation of the new financing system. These interviews afforded an excellent insight into the working of the system. It appeared that the proposed gradual adaptation in practice was yet to start; budgets were still based on historical budgets. There also appeared to be a major control problem; there was no check between the patient's actual illness and declared illness. Hospitals were therefore motivated to represent the patient's illness as seriously as possible.

The application of the 'reform implementation index' in France

The example we take is the effect of introducing a global budget system into hospital utilization in France. Hospital utilization is operationalized as average length of stay and hospital turnover rate. The average length of stay and turnover rate show respectively autonomous decreasing and increasing trends over time, as can be seen in Figure 3.3. The hypothesis tested is that the implementation of the reform caused a deviation in these trends: both the decrease in the average length of stay and the increase in the turnover rate became more marked. A regression equation was therefore fitted in which 'year' was included to facilitate estimation of the autonomous trend.

Figure 3.3 Hospital production and supply in France (1961-1993)



The question which arises is how to include the reform into the analysis. Here, three models are tested. For the first model it is assumed that the reform has been in effect since its formal introduction in 1983. An index is developed with the value 0 (zero) before 1983 and the value 1 (one) after 1983. For the second model, it is assumed that the reform has been in effect since 1986, because that was the year in which all hospitals applied the new system. In the third model, the information about the implementation process is incorporated into a reform implementation index.

The reform implementation index for the introduction of the global budget system in France was established as follows: for the years before 1983, the value is zero. In 1983, parliament passed the reform, which may have caused some anticipatory effects in the field. For 1983 an index of 0.1 is therefore assumed. In 1984, all regional hospitals applied the new rules. For this situation, an index of 0.3 is assumed (bed capacity in regional hospitals was about 30% of the total public hospital bed capacity in 1982; derived from (Bonamour, 1987, p. 101). In 1985 the reform was spread over more hospitals, resulting in an index of 0.7 (a rough estimate of the bed capacity relating to the new budgeting system). In 1986, all hospitals applied the new rules, resulting in an index of 1.

Time series analysis has to be considered with caution since many other developments are capable of interference. In France, for instance, a bed reduction program was set up that came into effect at about the same time. It is possible that this development also influenced the average length of stay and the turnover rate in the same direction, in the same period of time. A variable for bed reduction is therefore also included to control for this effect. This variable consists of a 0 (zero) in the case of equal bed supply or bed expansion; in the case of bed reductions, this variable expresses the difference between the current year's supply and the supply in the previous year.

The data for average length of stay and turnover rate was obtained from the OECD health data files 1995: average length of stay per admission since 1961, and turnover rate since 1974. The last available year was 1993. The turnover rate refers to the number of different patients that occupied a bed in one year.

The results of the analyses are displayed in Table 3.1.

Table 3.1 The influence of the introduction of the global budget system on hospital utilization, controlling for bed reductions and time effects (by means of regression analysis; B-statistics and significance of t-statistics are presented)[1]

Variable	model 1[2]	model 2[2]	model 3[2]
Dependent variable: average length of stay, n=33			
YEARS	-0.32	-0.30	-0.30
	(0.00)	(0.00)	(0.00)
BEDREDUC	-0.71	-1.63	-1.10
	(0.78)	(0.54)	(0.66)
REFORM	0.03	-0.70	-0.74
	(0.98)	(0.47)	(0.59)
Constant	652.63	613.46	603.22
Rho[3]	0.70	0.68	0.69
Adjusted R^2:	0.87	0.88	0.88
Dependent variable: turnover rate, n=22			
YEARS	0.38	0.31	0.25
	(0.01)	(0.01)	(0.15)
BEDREDUC	0.30	2.69	1.36
	(0.93)	(0.48)	(0.69)
REFORM	0.00	1.88	2.36
	(0.99)	(0.18)	(0.16)
Constant	-727.70	-586.45	-469.89
Rho[3]	0.70	0.53	0.62
Adjusted R^2:	0.82	0.86	0.85

1 The analyses were carried out with the LIMDEP program version 6.0

2 Model 1: the reform has been in effect since its formal introduction in 1983 (REFORM switches from zero to one in 1983)
Model 2: the reform has been in effect since all (public) hospitals first applied the new budgeting system in 1986 (REFORM switches from zero to one in 1986)
Model 3: The reform has been introduced gradually, the process is encapsulated in a reform implementation index, which gradually changes from zero to one between 1983 and 1986.

3 Rho indicates the correction for auto-correlation of the residuals according to the Prais-Winston method

These analyses indicate that the hospital utilization indicators have not been affected for any of the models by the implementation of the new budgeting system. The introduction of the new budgeting system had no additional effect on the existing trends. There was no effect from the implementation of the reform on average length of stay, even when the process information was incorporated into the regression equation by means of the reform implementation index. Also, there was no significant effect on the turnover rate.

The temptation now arises to draw the conclusion that the budgeting policy has no effect on hospital utilization. This may however be premature. At least two other conclusions have to be considered. First, the chosen output parameters, average length of stay and turnover rate, may not be the correct parameters for measuring the effect of the policy. Since a major goal of this policy was to contain public expenditures on hospital care, the choice of a variable containing public expenditure level would seem logical. However, in the OECD health data files for 1995, data about public expenditures on inpatient care are insufficiently complete to permit time-series analysis to be carried out. Data are particularly deficient for the period of the policy reform; in the period from 1970 to 1985 public expenditure is presented only for every five years. The same analysis carried out on total inpatient expenditure, corrected for inflation, also failed to reveal any significant effects for each of the three models. The second alternative conclusion which could be drawn from the lack of effect of the policy is related to the first and concerns the type of data in the OECD health files. The OECD data contains aggregate variables at country level. Sometimes the aggregation is not suitable for the evaluation of the policy measure. In the French example, for instance, the budgeting reform is only applicable to the public hospital sector. However, the OECD health files only contain aggregate data including both public and private sector. The inclusion of the private sector still paid on a per diem basis (30% of all hospital beds are in private hospitals) may disturb the effect of the policy measure.

Although the reform implementation index did not provide a better insight into the effect of the health policy reform than the other indexes, since none of them provided significant effects, the use of the reform implementation index gives a theoretical advantage. In the case of a gradual introduction, information about the period of time between initiation and full implementation is encapsulated in the index and better reflects reality than does the choice for a switch at the start or end of the implementation phase.

Summarizing, the advantages and drawbacks of each method of information gathering and analysis are listed in Table 3.2.

Table 3.2 Advantages and drawbacks of research methods into health policy changes

method	advantages	drawbacks
secondary sources	* overview of reform * inconsistencies and lack of clarity are revealed, facilitating targeted further investigations	* sometimes too global to give real insight * the global nature of the information may lead to apparent contradictions * the interpretation of the author may lead to biased information
primary sources	* initial intention of reform is revealed * exact contents of norms and rules can be found	* possible high translations costs * uncertainty about real implementation
expert consultation	* unintended effects may be * the actual course of implementation and implementation problems are discovered	* experts may give biased information, depending on their position * no exact information about implementation dates (because investigations are retrospective)
reform implementation index	* information about the implementation course can be included in the statistical analysis	* qualitative information has to be transformed into numerical values, possibly leading to information loss

The first three methods provide insight into what has happened and can be used for descriptive purposes. The fourth method, the reform implementation index, facilitates statistical analysis. The best way to investigate health policy reforms is to use a combination of all these methods. The extent to which each method is used depends on the aim of the study, the detail of the information required and the budget available for the study; extensive use of primary sources and expert consultation may lead to high translation and travel costs. It

is, however, important to realize that none of the methods alone leads to a complete insight into the effect of reforms. The use of a reform implementation index is required when statistical analysis is used in studies into the effect of healthcare reforms, and in comparative research. The index cannot of course be formulated without first gathering information, using the first three methods.

3.5 Conclusions and discussion

Conclusions

- Fuzziness about the content of health policy reforms is not only a methodological problem, stemming from the need to summarize and select information in order to describe a healthcare system or reform in a succinct manner. The nature of many policy reforms also contributes to the fuzziness. Neither the commencement nor the exact phase of implementation are always clear; commencement may differ from the formal date of implementation. During the long time span from formal introduction to complete implementation, all kinds of other developments may interfere with the process (such as a change of government, setting out new policy lines).

- Using primary sources and consulting experts, especially those familiar with the practicalities of the way rules are actually applied, helps to identify the type of 'fuzziness' relating to the policy process under study. When comparing healthcare reforms in different countries, or describing healthcare systems, it must be borne in mind that secondary sources are often very global in nature and this may lead to apparently contradictory information. A combination of different resources provides the best strategy for producing a reliable reconstruction of the reform process. Different sources provide different kinds of information. Secondary sources provide a global overview, primary sources provide insight into the original content of the reform and exact figures concerning norms, and so forth. Expert consultation is very useful for revealing exceptions and gradual implementation processes. Even the apparently harshest measures usually contain some exceptions, or other transition rules. These regulations are not always mentioned in the primary sources and secondary sources are often too global for this kind of information. To unearth any exceptions or transition rules, the best sources are health practitioners, such as hospital managers, or those responsible for paying the bills, such as insurance fund managers.

- When evaluating reforms in a quantitative way, the reform implementation index is very useful, since it is constructed on the basis of knowledge of the implementation process. The usefulness of data at the national level (like the OECD health data files) for analysis of the effect of the introduction and implementation of specific health reforms is hampered by the (increasing) fuzziness of the policy process; the RII can facilitate the connection of health data with the introduction and implementation of reforms. If a national level is not the appropriate analysis level, the reform implementation index should be constructed at a regional level.

- The aggregate nature of the OECD data may be troublesome in evaluating policy measures affecting only part of a sector. The appropriateness of data from the OECD health files should be considered critically. The emphasis on international comparability does not always make data suitable for studying intra national differences over time. The aggregations do not always fit the requirements of specific policy analysis.

Discussion

- The extent and level (national or regional) for which different sources should be consulted depends on the aim and the subject of the study. In one and the same country, some regulations may be implemented at a national level and other responsibilities may be delegated to the region. In Sweden, the waiting time guarantee operates at national level while the hospital financing systems operates regionally. The detail to which the information has to be gathered also depends on the aim of the study. A quantitative analysis of a reform requires a detailed insight in the implementation process. This provides information to reconstruct the Reform Implementation Index and ensures a correct connection of data to implementation phases.

- Most of the examples in this paper stem from pluralistic social security based healthcare systems, where responsibility is spread over different actors and neither they nor the Ministry of Health is all powerful. Do the same principles apply to centrally organized National Health Services? To a certain extent they do, indeed. According to Klein (Klein, 1995) the 1991 NHS reforms in the UK provides an example; one of the innovations was the introduction of 'fundholding' general practitioners; this innovation is still open to applicants and has now reached between 40 and 50% of British GPs.

The government had the power(and used it) to introduce these reforms more or less overnight, but it nevertheless took time for the actual implementation.

- Is the Reform Implementation Index really an improvement over an ordinary 'time-lag' function in the model? It is a sort of time lag parameter, although not a mechanical one constructed to make the equation fit better. The RII should be constructed and applied on the basis of information about the actual progress of the policy process.

- Is it, given the intrinsic 'fuzziness' of policy making, permissible to connect policy reforms to data in the OECD-files in comparative studies? The answer to this question must remain ambiguous. It is true that the quality of OECD data is steadily improving and that it provides an extremely cost effective way of comparing the performance of healthcare systems that could not otherwise be obtained. So, if a naive and discrete concept of health policy could be replaced by a more gradual and 'fuzzy' idea, both domains are capable of being matched.

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4 INTRODUCING DRG-BASED FINANCING IN HUNGARY

A study into the relationship between supply of hospital beds and use of these beds under changing institutional circumstances

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Forthcoming in Health Policy (2001)

Summary

Most hospital reforms carried out in Europe over the past few decades concern the supply of hospital beds and hospital financing systems. In Hungary, financing was not tied to hospital input or output until a Diagnosis-Related-Group system was introduced. This change provided an opportunity to study the effect of the new system, taking the supply of hospital beds into account. We studied the effect of the financing system and bed supply on four output parameters: average length of stay, admission rate, occupancy, and case-mix. The incentives of the financing system influenced the length of stay (shorter) and the admission rate (more admissions). Although the case-mix did increase, occupancy was not affected. The supply of more beds resulted in higher admission rates and a slightly lower efficiency (a lower occupancy rate). No interaction effects of (variations in) the bed supply and the financing system were found.

Keywords: Healthcare systems; Hospital financing; Hospital-bed use; Hospital-bed reduction; Comparative research

4.1 Introduction

In many European countries, governments have tried to restrain growth in the hospital sector over the past few decades (Westert, 1995; Wiley et al., 1995). The hospital sector accounts for a large share of the healthcare budget in most countries. The measures were mainly based on assumptions about hospital dynamics that had either to do with hospital capacity or with hospital financing. Concerning hospital supply, Roemer's Law has long been a prevailing view. In 1958, Roemer (1961) studied the effect of hospital bed expansion in one region and found that this led to more hospital use, despite the absence of major changes in the morbidity of the population. This effect has become known in health services research as Roemer's Law: 'A bed built is a bed filled' (Harris, 1975; Väänänen et al., 1967). Based on this principle, governments reasoned that costs could be restrained by shrinking bed supply, assuming that overcapacity existed. However, later studies revealed that Roemer's Law does not appear to be valid in all cases. Van Noordt et al. (1992) point to differences in the relationship between supply and use when different health systems or time periods are compared. Van Doorslaer and Van Vliet (1989) came up with similar findings and suggested that changing institutional circumstances might influence Roemer's Law. Wiley et al. (1999) came up with similar suggestions in a recent study on differences in length of stay. A second major thrust of reform concerned how to pay the hospital bill. Changing funding systems or restricting financial means to a certain maximum have been popular measures. The effects on hospital bed use, however, were seldom studied systematically. This study seeks to clarify the way hospital financing systems influence the use of hospital care, giving special attention to the effect of these systems in diverse bed-supply situations.

The introduction of a Diagnosis-Related-Group financing system (DRG system) in Hungarian hospitals provides an opportunity to study how change in the hospital payment system affects the production of hospital bed days (in short: hospital production). In a DRG system, hospitals are reimbursed according to the diagnosis of the patient. The system provides categories for grouping patients with similar characteristics. Each group of patients is expected to receive similar treatment and thus to require similar resources (Kimberly and De Pouvourville, 1993; Sanderson et al., 1998). For each group, resource use is estimated and translated to a fixed amount of reimbursement for the hospital. Neither actual length of stay nor actual treatment will influence the amount reimbursed. All over Europe, the DRG system is at the centre of attention (Kimberly and De Pouvourville, 1993). Some countries are experimenting with

this system, like Portugal, France, and Sweden. Hungary, however, is the first European country that has actually used the DRG system for reimbursing hospitals nation-wide. Data on hospital use in Hungary have been collected by the National Health Information Centre of the Ministry of Health (Gyógyinfók). These data have been used to study the effect of the new financing system. By studying the effect on the county level, the effect of bed supply on bed use could also be included. There is a considerable spread in hospital bed supply per 1000 inhabitants among Hungarian counties (ranging from 3.3 to 10.8 beds per 1000 inhabitants).

The research question of this paper relates to the effect of conditions provided by the hospital payment system and the supply of hospital beds on the utilization of hospital beds:

> *'What is the effect of changing the hospital payment system and of hospital bed supply on hospital bed use in Hungary?'*

4.2 Backgrounds

The introduction of the DRG system in Hungary

One objective of the healthcare reform was to stop the deterioration of health among the Hungarian population (Bordás, 1994). Control could be shifted from the government to the users (Westert, 1995) by introducing competition, thereby ensuring better care (Nagy et al., 1994). New financing systems were introduced to achieve this objective. For acute hospital care, a DRG-based system was chosen. The system was introduced gradually. In 1986, an experiment was set up in Tolna County for seven hospitals. In 1987, this experiment was expanded to 28 hospitals. These experiments had a dual purpose. First, they were used to adapt the DRG system that had been designed for the United States to make it suitable for the Hungarian situation. Second, they were used to calculate the costs for each DRG. The hospitals in the experiments were not actually reimbursed according to the DRG system. In July 1993, the system was introduced nation-wide (covering approximately 170 hospitals). To avoid large deviations from the former budget, hospitals were reimbursed on the basis of historical costs in the first year after the introduction. This was done as follows. A 'standard DRG' was defined and given weight 1. Then the average resource consumption of the patients in each diagnostic category was compared to this standard, and their DRG was assigned a relative weight. A weight of 1 was given a certain price (reflecting the costs

of such a 'standard DRG'). That price varied between hospitals, reflecting historical costs. Gradual adjustments were supposed to level out the differences between hospitals. Due to a strong lobby by some of the large and higher-paid hospitals, there was little political support for making adjustments. As a result, the differences between the hospital budgets still exist. During the first year under the new system, the budget for each hospital was fixed at the national level. In this way, the overall hospital costs were kept under control. Used in this way, the DRG system forms a method of allocating the total budget rather than a means of reimbursement for actual costs.

Hungary has a tradition of negotiation. Before the introduction of the DRG system, government representatives and hospital management used to settle the hospital budget via negotiations. The number of hospital beds was taken as an indicator for the amount of the budget, but there was no check on the real amount of facilities. After the introduction of the new financing system, negotiations were not supposed to be possible anymore. However, it seems hard to root out that tradition. This results in a strong lobby in favour of maintaining hospital-specific DRG prices to prevent hospitals for deviations from the former budget.

Long-term care is not part of the DRG system. Within one hospital, both long-term and acute care wards can exist. The reimbursement of long-term care wards is based on the number of patient days.

The effects of the introduction of the DRG system in Hungary after one year of nation-wide application are reported by Nagy et al. (1994). They find the following effects:

- There are more diagnoses per case than in the year before the introduction.
- The classification of the main diagnosis tends to be the diagnosis with the highest DRG weight, even if this diagnosis is not the main justification for hospitalization.
- The case-mix index has increased (the case-mix index indicates the average severity of the cases and is calculated by taking the average of DRG weights).
- The actual average length of stay is lower than the normative length of stay for most groups.
- The average length of stay has declined by 10% from 10.9 days in 1992 to 9.8 days in 1993.

If hospital reimbursement had not been set by the national budget, hospital care would have cost at least 7% more.

Similar effects on length of stay and case-mix were found after the introduction of the DRG system in the United States (Gay and Kronenfeld, 1990; Davis and Rogers, 1988; Kahn et al., 1990; Kosecoff et al., 1990; Rogers et al., 1990).

Comparison with the DRG system in the United States

The United States was the first country to introduce a DRG system. The Hungarian system is based upon the American version. There are, however, some notable differences between the Hungarian situation and conditions in the United States that may influence the impact of the DRG system. In the US, the system is only applicable to Medicare patients receiving acute care; care for other patients is financed by various payment methods. In Hungary, the DRG system is applicable to all patients receiving acute hospital care. In the US, the introduction of the DRG system coincided with the advent of managed care. Hence, the effects of the DRG system and the effect of managed care cannot be separated in the US setting. Peer Review Organizations were created to review the medical appropriateness of individual admissions. Those Organizations have final control over Medicare payments to hospitals (Davis and Rogers, 1988; Wilensky, 1997). In contrast, Hungary has no managed care system. The financial consequences of the introduction of the DRG system in Hungary are less stringent than in the US because of the adjustments to the historic budget. Due to these differences, the results of the American DRG system are only partly applicable to the Hungarian situation.

The Hungarian DRG system and its incentives

To study the effect of the introduction of the DRG system, it is necessary to analyse the incentives it offers to the hospital board and the physicians. Specifically, we want to know how those incentives influence the behaviour of both actors. As the US studies reveal, a DRG system provides incentives to keep patients for a shorter time, to assign cases to more severe groups, and to refuse to treat less profitable cases (Berki, 1995; Custer et al., 1990; Sloan and Valvona, 1986). With respect to effect of the DRG system in Hungary, the impact of the incentives on these actors is discussed below.

It is fair to assume that any hospital will strive to maintain a sound financial position and a good public image. The DRG system forms the context within which a hospital will try to survive as an organization. In any business a good

public image calls for satisfied customers. There are several ways for a hospital to satisfy its patients. First of all, quality of care is important. However, a discussion of that factor would go beyond the scope of this study. Besides quality of care, access to care is also important. Patients needing care should not be sent away. Once admitted, the stay should be long enough to ensure a relatively low-risk discharge. Therefore, we may assume that hospitals will not turn down patients who need care, even if the care required is not profitable to the hospital. The Hungarian DRG system offers a financial incentive to limit resource use as much as possible (Barnum et al., 1995). The combination of both incentives (financial and quality) will result in short stays that will not drop below a certain medically acceptable minimum (see also Westert, 1992). Contrary to the situation in the US (Hurley et al., 1990), there is only one financing system in Hungary. Thus, there is no possibility for patients to be treated under another (for hospitals more profitable) financing scheme. It is more likely that hospitals will try to negotiate a new DRG for such resource-consuming cases than to simply turn them down. According to Vogler and Habl (1999), patients with serious injuries from accidents or emergencies may have difficulty getting access to a hospital in Hungary. Hospitals generally claim that they have no beds available or are not equipped to treat these patients. In reality, it is more likely that these hospitals are not willing to burden their budget with these expensive patients.

Before the DRG system was introduced in Hungary hospital budgets were based on the number of beds in a hospital and the negotiation skills of its managers. This practice explains the anomaly that there are now two ways of counting beds: one registry gives the administrative number of beds (used in the former budget negotiations) and the other gives the actual number of beds. The discrepancy between the two figures can be rather large. For instance, the 1994 records of the Városi KH-RI hospital in Orosháza put the administrative number of beds at 559, of which only 467 were actually in use (NM Gyógyinfók, 1995)[1]. It seems safe to assume that there was no direct relationship between hospital production and hospital financing before the introduction of the DRG system. So, from a financial point of view, there was no incentive to increase the

[1] Hungary is not the only country with a discrepancy between administrative number of beds and actual available beds. The Netherlands also has fewer beds available than the official number. The opposite is found in Belgium where more beds were in use in the 1980s than the officially registered number.

efficiency of hospital (in the sense of shorter stays). Under those circumstances, low occupancy rates were likely.

The DRG system is not used as a fixed payment scheme, which would set equal prices for a specific DRG in every hospital. Rather, the system is used to allocate the total amount of money available according to certain criteria. This total amount is determined at the national level. This is comparable to the German point system for the reimbursement of ambulatory specialists. For the individual hospital, a higher output may lead to a larger share of the total amount available. At the national level, this will result in greater output for a lower price. Since an individual hospital cannot influence the way all the others work the only option is to follow the pack and produce more (see also Vogler and Habl, 1999).

In principle, each DRG case is reimbursed at a fixed amount, regardless of the length of stay. In Hungary, when the stay is below a certain minimum number of days, the hospital gets a lower reimbursement. For stays over a certain maximum, a small daily allowance is reimbursed for the extra days. The range between minimum and maximum stay is based on a normative length of hospitalization for this DRG case. The normative length of stay is derived from the average length of stay that was customary in Hungary for that DRG case before the introduction of the DRG system. This provides a financial incentive to reduce the length of stay to the minimum, as the hospital would thereby maximize its profit. To maintain a good public image, more serious cases should not be discharged too early. Therefore, the length of stay may be expected to stabilize between the average length of stay and the minimum length of stay. Indeed, Nagy et al. (1994) found this effect. Another financial incentive provided by the DRG system is to admit more cases to the hospital. Shorter stays make it possible to raise the admission rate (number of admissions per 100 inhabitants) and thus increase revenues.

The decision to hospitalize a patient is made by a physician. It should be noted that medical specialists in Hungary are in salaried employment. Compared to their Western counterparts, their pay is low. For instance, the average monthly salary at the National Institute of Surgery in Budapest in 1994 was 32,000 HUF (before taxes); the net income would be approximately 22,000 HUF. Housing costs at that time were at least 10,000 HUF for a 55 m^2 apartment. So a moderate-sized apartment would take up almost half of their monthly income. Working for a salary implies that any increase in productivity would not bring in

more income. From a financial point of view, the introduction of the DRG system is not likely to change the physicians' behaviour, since their remuneration does not change. However, they do have a way to increase their income, namely by accepting 'gratitude money'. All the people who were interviewed in this study (see methods section) confirmed that this system exists. It was described as a system with a rather 'social' character. Patients with a relatively high income pay more for their 'gratitude' than lower-income patients. The extent to which this system contributes to the income of physicians is not exactly known. There is no reliable information on the incidence of these practices. All we know is that the system exists and may contribute considerably to the physicians' income. Some estimates put the increase at 30 to 40 % (Marrée and Groenewegen, 1997). If 'pocket money' does contribute substantially to a physician's income, it may be more appropriate to speak of a mixed system, consisting of a salary and a fee for service. When interpreting the results, we have to bear this in mind. A fee-for-service system provides the incentive to admit as many patients as possible. When the care provided exceeds the amount that would have occurred when patients were fully informed this phenomenon is described as supplier-induced demand (Donaldson and Gerard, 1994; Westert and Groenewegen, 1999). There has been little or no change in the physician remuneration system since the introduction of the DRG system. If hospitals want to change their strategies, they have to persuade the physicians to comply with this policy. There are two different ways they can approach this. First, the employer-employee relationship creates opportunities. Physicians are salaried and are thus dependent on the hospital. This relationship gives hospitals a certain degree of power to influence the behaviour of their subordinates. Second, the incentive structure can be used. The pocket-money system already furnishes the right incentive - a convenient side effect of the informal arrangement. So although the introduction of the DRG system does not change the financial incentive structure of the physicians, hospitals will be able to convince them to comply with the changing hospital policy.

The effects of the Hungarian DRG system were mentioned in previous research (Nagy et al., 1994). In this study, we investigate whether these effects on the utilization of hospital beds vary according to differences in the supply of beds. We assume that hospitals in areas where the supply of beds was low already had relatively short stays because of the relative shortage of beds compared to areas of high supply. Besides this, a lower admission rate is likely; obviously fewer people can be admitted due to the relative shortage of beds. Therefore, the decrease in length of stay due to the introduction of the DRG system will be

lower in counties with a low bed supply than in counties where the supply is high. Also, the increase in admissions will be lower in the low-supply counties than in the high-supply counties. The above considerations led to the following hypothesis.

Hypothesis 1:

a. Counties with a high bed supply will have a longer average stay and more admissions than counties with a low bed supply.
b. The DRG system will lead to shorter stays and more admissions.
c. The effect of the DRG system will be stronger in high-supply counties compared to low-supply counties.

We can describe these expected outcomes as 'external' effects: what the users ('consumers/patients') of the hospital notice about the new financing system. However, there will also be 'internal' or organizational effects, changes that affect the hospital as an institution. Due to the DRG system, there may be changes in the administrative system and reorganizations of inpatient care (for the sake of increasing efficiency).

Hospitals may use their facilities more intensively by decreasing the number of days a bed is left empty (for instance, because of cleaning, maintenance, inefficient planning or emergencies) and thereby increasing the occupancy rate. In low-supply counties, hospitals may not have this option simply because they have fewer beds. Roemer's Law indicates that hospital bed capacity will be used maximally. However, this does not necessarily imply that the maximum level of efficiency will be reached. When it is financially attractive to increase occupancy rates by increasing efficiency, this may be an interesting option. Another way in which hospitals may try to increase their output is by reporting that patients are sicker than they really are (i.e., giving them a more serious diagnosis). The underlying assumption is that hospitals may yield to the temptation to engage in creative administration practices because this is an area that is hard to check. An increase in the case-mix index is even possible within the bounds of 'good medical practice'. That is because of the degree of uncertainty inherent to the medical profession (Andersen and Mooney, 1990; Evans, 1990). The advantage is that hospitals do not have to increase turnover (in the sense of more admissions) to increase their revenues. Low-supply hospitals have fewer opportunities to increase their turnover rates. 'Increasing' the case-mix will therefore be the preferred strategy among low-supply hospitals. In light of the above, the next hypothesis is stated as follows.

Hypothesis 2:

a. After the introduction of the DRG system, the case-mix index will increase.
b. In counties with a low bed supply, the case-mix index will rise more strongly than in counties with a high bed supply.
c. After the introduction of the DRG system, the occupancy rate will increase.
d. The occupancy rate in high-supply counties will increase more than in low-supply counties.

4.3 Data and methods

Information on the Hungarian healthcare system was gathered from the published literature and conference reports. Additional information was gathered during a two-week visit to Gyógyinfók (National Health Information Centre of the Ministry of Health). Several people who were involved in the introduction and implementation of the DRG system were interviewed. Besides personnel from Gyógyinfók, interviews were held with a physician (head of a surgical institute) and an executive of the Hungarian national health insurance fund. The introduction of the DRG system was organized by Gyógyinfók. Gyógyinfók was also responsible for the implementation of the system. All hospitals collected their data individually and sent this monthly to Gyógyinfók. There, the data were processed and an invoice was prepared for the sick fund. The hospitals were informed about their financial status and hospital production. The data used in this study are derived from this database.

Data used to analyse the DRG system go back to 1992, which is taken as the baseline year (the year before the DRG system was introduced). The data collected for that year refer only to the DRG system. The financial consequences of the system did not come into play until July 1993. The most recent data available on the utilization of hospital beds are from 1995. The most recent data on hospital bed supply are from 1994 (December 31). Prior to 1992, data were collected by a completely different procedure, so the results could not be made comparable to the new data. Before the DRG era, the data of every tenth patient was collected; furthermore, the protocol used a totally different classification of diseases.

To compare the two periods, data of 1992 (pre-DRG) and 1995 (DRG era) will be used. The years 1993 and 1994 are considered a period of adjustment, during which the hospitals had to become used to the new system. So 1992 and 1995 will be used in the analyses.

The data were subjected to a regression analysis on the county level. This was the only level for which information was available on number of beds, population size and travel (i.e., border crossings) of patients. Unfortunately, the data do not include occupancy rates. However, hospital bed days per 100 inhabitants and turnover rate (average number of patients per bed per year) were available. We use these variables as a proxy for occupancy rate[1]. Increasing occupancy rates will presumably correlate with increasing turnover rates and increasing bed days. The observations were pooled, but correction for autocorrelation was not necessary, due to the introduction of the dummy variable for financing system.

The hypotheses posed that hospital production parameters are a function of hospital bed supply, hospital payment system, and the interaction between payment system and bed supply. In equation:

hospital production = f (bed supply, payment system, bed supply * payment system)

To test the first hypothesis, a regression equation was estimated, consisting of bed supply and financing system as independent variables and average length of stay and admission rate as dependent variables:

Hypothesis 1: $alos = \alpha_1 + \beta_{11}\, beds + \beta_{12} DRGsys + \beta_{13} beds*DRGsys$
$adm = \alpha_2 + \beta_{21}\, beds + \beta_{22} DRGsys + \beta_{23} beds*DRGsys$

where alos: average length of stay in days;
adm: number of admissions per 100 inhabitants;
beds: number of beds per 1000 inhabitants;
DRGsys: financing system (1992 = 0, 1995 = 1).

More beds lead to longer stays (according to Roemer), so β_{11} is expected to be positive. The DRG system gives incentives for shorter stays, and thus β_{12} will be negative. In high bed supply counties, this effect will be stronger than in low-supply counties; β_{13} is thus expected to show a negative sign. More beds

[1] It would have been possible to calculate the occupancy rate from the available data. However, we chose not to do so because the available data were already computed and rounded off, thus creating too much risk for systematic error.

lead to higher admission rates, so β_{21} will show a positive sign. The DRG system gives incentives to increase admissions, so β_{22} will be positive. In high-supply counties, this effect will be stronger than in low-supply counties; thus β_{23} will show a positive sign.

Hypothesis 2:

$$case\text{-}mix = \alpha 3 + \beta_{31}\, beds + \beta_{32} DRGsys + \beta_{33} beds*DRGsys$$
$$turnover = \alpha 4 + \beta_{41}\, beds + \beta_{42} DRGsys + \beta_{43} beds*DRGsys$$
$$beddays = \alpha 5 + \beta_{51}\, beds + \beta_{52} DRGsys + \beta_{53} beds*DRGsys$$

where
- case-mix : average DRG weight produced by a county;
- turnover: average number of patients per bed per year;
- beddays: number of bed days (patient days) per 100 inhabitants.

In the event of a bed shortage, it is likely that only the more severe or urgent cases can be admitted. Fewer beds would then lead to a higher case-mix index, giving a negative sign to β_{31}. The case-mix index is expected to increase after the introduction of the DRG system, leading to a positive β_{32}. The increase will be larger when the supply of hospital beds is small, leading to a negative sign of β_{33}. For lower supplied counties we might expect a higher turnover rate (higher efficiency) to overcome the relative scarcity of beds compared to higher-supplied counties, leading to a negative sign of β_{41}. Because of the same scarcity of beds, a lower production of bed days is expected, giving a positive β_{51}. We expected that occupancy rates would increase after the introduction of the DRG system, resulting in a positive sign for β_{42} and β_{52}. For occupancy rates, we expected counties with a larger bed supply to have more possibilities to improve efficiency. Therefore, β_{43} and β_{53} will be positive.

4.4 Results

Characteristics of the Hungarian counties

Hungary consists of 20 counties. The largest county in terms of population size is the city of Budapest, with approximately two million inhabitants. The other counties have considerably fewer inhabitants (average 440,000 inhabitants) but cover much larger surfaces. In 1994, Hungary had 150 hospitals that provide acute care; 38 of these institutions were in Budapest. The rest of the counties had on average six hospitals each, with a minimum of three (in Nógrád, this is also the smallest county in terms of surface area, apart from Budapest) and a maximum of nine (in Baranya). The size of the hospitals - in terms of beds - varies considerably. The county hospitals are mainly large institutions with

around 1000 beds for acute care. The smallest hospitals, those with 50 beds or less, are mostly specialized - for instance, maternity hospitals. In 1992, Hungary had 6.5 beds per 1000 inhabitants. The county with the largest supply is Budapest, with 10.8 beds per 1000 inhabitants. The neighbouring county, Pest, has the lowest supply, with 3.3 beds per 1000 inhabitants. The other counties range from five to eight beds per 1000 inhabitants. Hospital bed supply was not stable from 1992 until December 1994. On average, the number of beds per 1000 inhabitants increased by 0.3. The largest increase was found in Baranya, where the supply rose by 0.9 beds per 1000 inhabitants (in 1992, Baranya had 7.2 beds per 1000 inhabitants). The largest decrease was found in Nógrád, where 1.2 beds per 1000 were removed (initial bed supply: 6.7 per 1000).

Sometimes patients living in one county are hospitalized in another county. These border crossings may influence the bed capacity in each county. Therefore, the impact of border crossings on hospital production was taken into consideration. On average, 87% of the patients treated lived in the same county as where they were hospitalized. There are, however, three counties that can be considered as outliers, since the share of patients from outside these counties was over 30%. The first outlier county is the city of Budapest, with only 62% of the patients coming from its own county. This is not surprising, since the main medical institutions are situated in the capital. The county of Pest surrounds the capital. Most patients who come from outside Budapest to be treated in the capital originate from this county (17%). This is not a very surprising finding since the supply of beds in Budapest is very large (10.8 beds per 1000 inhabitants), whereas Pest has an extremely low bed supply (3.3 beds per 1000 inhabitants). We considered taking both counties out of the analysis because of the disruptive effect of these outliers. However since we have a limited number of observations, we decided not to purge those two counties but to combine their data and treat them as one county. The other two outlier counties were Baranya (61% local patients) and Gyor-Sopron-Moson (64% local patients). However, in both instances 28% of the patients originating outside the county did not come from any of the other counties in Hungary. Baranya is situated at the border of the former Yugoslavia. Refugees from the former Yugoslavian Republic have been using the medical facilities in this county, which may explain this phenomenon. For Gyor-Sopron-Moson, a county at the Austrian and Czech border, no satisfactory explanation was found. The volume of border crossing from within Hungary is negligible for both of these counties. However, the bed capacity available to the local population can be on

balance be seen as lower because of these foreign patients. The analyses were carried out with a dummy variable to control for any effects specific to those two counties. This did not produce outcomes that were different from those found in analyses without this variable.

Developments in hospital bed use

Before turning to the results of the analyses, it is helpful to get a general overview of the development in hospital production in Hungary from 1992 until 1995 (see Table 4.1).

Table 4.1 Development in hospital beds and hospital output in Hungarian counties from 1992 to 1995

	Average		Change from 1992 to 1995		
	1992	1995	Average	min	max
Admission rate	17.18	20.70	3.53	0.37	9.71
Length of stay	11.78	8.99	-2.78	-1.38	-5.29
Case-mix	0.93	1.07	0.13	0.08	0.21
Turnover rate	26.57	31.85	5.28	0.59	12.47
Bed days per 100 inhabitants	202.33	186.34	-15.99	-74.32	59.12
Beds per 1000 (official)	69.2	71.48	0.23	n.a.	n.a.
Beds per 1000 (actually in use)	64.6	67.46	0.23	-12.2	8.75

Source: Gyógyinfók, Hungary

The increase in admissions and case-mix (case-mix is an indicator for the average severity of the cases) and the decrease in length of stay are as expected and as reported in earlier work by Nagy et al. (1994).Turnover rates have also increased. More interesting for the scope of this study is the variation between the counties. In some counties, the changes were considerable, in others almost negligible. Over the years, there has been a tendency for the length of stay to become more equal among the counties. The variation between counties within a given year is diminishing. For 1992, the standard deviation of length of stay is 1.10; for 1995, this figure is only 0.48. The number of admissions showed the opposite pattern; the variation in admission increased over the years. For 1992, the standard deviation is 1.77; for 1995 it is up to 2.87. The case-mix increased steadily without change in variation (standard deviation 0.03 for each year). On the average, the number

of bed days per 100 inhabitants has decreased. However, a large variation in change is observed between the countries.

The effect of bed supply and financing system

This section discusses how hospital utilization is influenced by the bed supply and the new financing system. Table 4.2 displays the results of the analyses of the main effects of the bed supply and the financing system.

Table 4.2 Effect of hospital bed supply and financing system on hospital utilization for Hungarian counties (n=38)[1]

Dependent	Independent	Expected sign of β	β[2]	T	Sig. T	Adj. R^2 for regression equation
Average length of stay						0.72
	Beds per 1000[3]	0	-0.03	-0.17	0.86	
	DRG system[4]	--	-2.79	-9.97	**0.00**	
	Constant		11.97			
Admission rate						0.60
	Beds per 1000[3]	0	1.86	4.91	0.00	
	DRG system[4]	0	3.64	6.03	**0.00**	
	Constant		5.05			
Case-mix						0.88
	Beds per 1000[3]	--	0.02	3.94	**0.00**	
	DRG system[4]	0	0.13	15.93	**0.00**	
	Constant		0.79			
Turnover rate						0.54
	Beds per 1000[3]	--	-1.50	-2.61	**0.01**	
	DRG system[4]	0	5.60	6.11	**0.00**	
	Constant		36.36			
Bed days per 100 inhabitants						0.28
	Beds per 1000[3]	0	17.38	3.48	**0.00**	
	Financing system[4]	0	-14.95	-1.88	0.07	
	Constant		89.26			

[1] There are 19 counties (Pest and Budapest being combined) and two measuring points in time, giving 38 observations.

[2] β is the non-standardized B-coefficient

[3] These are the beds that are actually in use

[4] The DRG system was coded 1, the former system 0

Regarding the average length of stay, there is a tendency towards shorter stays in a DRG environment. Apparently the strategy of decreasing length of stay is profitable within this system. Hospital bed supply has no effect on stays. The introduction of the DRG system leads to increasing admission rates. Even the higher-supplied counties have higher admission rates. Both results comply with the expectations. The assumption that the introduction of the DRG system leads to a higher case-mix index appears to be valid. Surprisingly, the effect of bed supply on case-mix is the opposite of what we expected to find. More beds lead to a higher case-mix. The turnover rate is also influenced by both bed supply and financing system. A larger supply leads to lower turnover rates. One extra bed per 1000 inhabitants lowers the turnover rate by 1.5 person per bed per year. The DRG system leads to increasing turnover rates. The production of hospital bed days per 100 inhabitants is higher in higher supplied- counties. There is no significant effect of the introduction of the DRG system on hospital bed days. Thus, there is no evidence that the DRG system has caused hospital beds to be used more efficiently in the sense of having higher occupancy rates.

Interaction between financing system and bed supply (beds*DRGsys) could not be demonstrated. The analyses with the interaction term did not show any significance for this term. Moreover, the explained variance (adjusted R2) did not differ from the model without interaction. Therefore, the model with the interaction term was rejected. Thus, hypotheses 1c, 2b and 2d cannot be confirmed. There is no evidence for different effects of the introduction of the DRG system under different supply circumstances.

4.5 Conclusion and discussion

First we will discuss the 'external' effects of hospital bed supply and the DRG financing system. External effects were described above as effects that the users (consumers/patients) of the hospital notice. Larger bed supply leads to more admissions and more bed days, which can be interpreted as a confirmation of Roemer's Law. These effects might result from larger supply. However, financial incentives for physicians may also play an important role in explaining this relationship. Officially, physicians receive salaries, which gives them no incentive to increase their productivity. However, the practice of 'gratitude money' provides an incentive for admitting more patients, giving credence to the 'supplier-induced demand' hypothesis. Since the remuneration system of physicians did not change with the introduction of the DRG system, the effect of its incentives could not be isolated in this study.

When studying the effect of bed supply in more detail, we see that larger bed supplies lead to more admissions and more bed days. Simultaneously, length of stay does not change and turnover rates drop. Apparently, beds are used less intensively, and are kept idle longer. Each extra bed will be used, but less efficiently, or less completely than in the previous situation. So, a bed built is a bed filled, though less efficiently.

The introduction of the DRG system affects the use of hospital bed. Before the introduction of the DRG system, there were no clear financial incentives to shorten or lengthen hospital stays. After the introduction, we see a clear tendency to shorten stays. We also see evidence that the financing system affects admission rates when compared to the former system, which was not related to hospital production parameters. The DRG system provides incentives to admit more patients, and this is exactly what happens. The suspicion of Van Doorslaer and Van Vliet (1989) - that institutional circumstances contribute to hospital bed use and therefore influence Roemer's Law - can be confirmed by these findings. We also conclude that hospitals have succeeded in persuading physicians to change their admission policy. Whether this is the result of the power of the hospital management as the employer or because of the financial incentives provided by 'gratitude money' remains to be seen . This question cannot be answered by this study. It does seem that the latter effect is less plausible. If the effect of the financial incentives of the physicians had been so predominant, it would have already been observed before the DRG system was implemented.

Next we will discuss the internal or organizational effects. There is no evidence that the DRG system increased efficiency in the sense of leading to more effective bed use. Hospital bed days did not increase after the introduction of the new system. The turnover rate increased, but this can be ascribed to shorter stays, leaving occupancy rates unchanged (the production of hospital bed days was not affected by the change in financing system). The effect of the DRG system does not vary by bed supply. Apparently none of the counties was so under-supplied that lengths of stay already represented the minimum length of stay. Another explanation could be that the lower-supplied counties, although perhaps under-supplied, did not offer the (financial) incentives to treat as many patients as possible, resulting in (longer) waiting lists. However, this is not a very plausible explanation, since Hungary has virtually no waiting lists; they only exist for a few very expensive treatments.

Creative administration, resulting in an increasing case-mix index, may be a strategy to manage the financial changes invoked by the DRG system. Previous research in the US revealed that although part of the increase of the case-mix was real, another part was due to 'upcoding', in favour of the hospital income (Carter et al., 1990; Hsia et al., 1990). Part of the increase may be due to changes between 1992 and 1995 that were not included in this study, like ageing of the population, an increasing use of day surgery, the introduction of new technologies. However, the phenomenon that in some hospitals the number of uncomplicated child deliveries diminished sharply and complicated births increased strongly, supports the suspect of at least some creative administration. An explanation for the effect of bed supply on the case-mix index might be that counties with a larger supply are typically those counties that have university hospitals, which may serve more serious cases. A higher case-mix index could be used to justify the higher supply, since sicker patients need longer stays. Of course the opposite could just as easily be true: a higher case-mix index could lead to higher bed supply. However, this is not very plausible. The former budget system was not dependent on the case-mix index but on the negotiation skills of managers. In that setting, a higher case-mix index is a valuable negotiation issue. It may be justified to conclude that hospitals try to gain maximal revenues with a minimal change in workload. However, increasing admission rates undoubtedly generate more work for physicians. Since physicians are officially in salaried positions, this would not be in their interest. The 'gratitude money', however, makes it financially profitable to increase admission rates, so we may assume they will cooperate with the hospital management. On the other hand, it might be the dependent position of physicians as employees of hospitals which makes them comply with hospital policy. It would be interesting to investigate whether the compliance of physicians with hospital policy would reflect different formal relationships with hospitals.

We see that differences in bed supply do not influence strategies to handle the new financing system. Higher-supplied counties do not have different reactions than lower-supplied counties. Regardless of bed supply, all counties show the same reaction to the new financing system. This can be taken as support for the proposition that hospitals (and physicians) try to gain maximal revenues with a minimal increase in workload.

After discussing the effects of the Hungarian bed supply and the DRG system, one question remains. Are these findings valid for countries other than

Hungary? An important issue is the absence over control of hospital production that existed in this country. The appropriateness of the decision to admit patients was evaluated by the sickness funds not prior to admission but after the fact. This left the door open to an increase in arbitrary medical inventions. On the other hand, the increase in case-mix and in admission rates may not fully reflect reality; it may be ascribed to creative administration. However, administrative creativity might be possible in other countries too. An increase in case-mix was also found in the US. The relative lack of diagnostic certainty inherent to the medical arts makes these increases difficult to unravel. However, policy-makers should take this ambiguity into account. The actual savings to be derived from a DRG system might be lower than expected. So, although creative administration in Hungary may be more deeply entrenched than elsewhere, the direction of the creativeness in other countries will point in the same direction. Besides this, we may conclude that financial incentives give stronger impetus to admission policy than bed supply. When financial incentives dictate shorter stays, stays will become shorter even if the supply of beds is greater. So, a change in financing systems can be used as a tool to influence hospital utilization. However, it is imperative to safeguard the quality of care. Barnum et al. (1995) have already drawn attention to this problem. Also, to prevent unwanted side effects, the incentive structure of all relevant actors and their power relationships should be taken into account.

Finally we would like to comment on the design of the Hungarian DRG system. It is combination of hospital reimbursement based on hospital activity and a capped system with respect to the total hospital budget. A DRG system as such is not capable of preventing unnecessary admissions. In our opinion, the simultaneous introduction of a fund-holding system might be useful against unnecessary admissions. On the other hand, the combination of the DRG system and the fact that hospital spending was limited at the national level resulted in an increase in hospital activity without having to pay more for it at the national level. From a financial point of view, the combination of the DRG system and capping the national budget did lead to a more efficient use of hospital beds.

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5 DIFFERENTIAL EFFECTS OF BED REDUCTIONS IN PRIVATE AND PUBLIC HOSPITALS: THE CASE OF FRANCE

By: M. Kroneman, P.J. Lancry

Summary

In this study, we investigated the effects of different hospital and physician financing systems on acute care hospital bed use, with the emphasis on differences in the management of hospital bed reductions. In the French healthcare system, two hospital financing system coexist. In public hospitals there is a global budget system and physicians receive salaries. In the private sector, hospitals are paid *per diem* and physicians are remunerated on a fee-for-service basis. We hypothesized that the financial incentives in the public sector for both hospital and physicians point in the same direction. Both try to reduce admission rates. In the private sector there is a divergence of interest and the preferences of the actor with the most power prevail. Hospitals try to keep patients hospitalized as long as possible, whereas physicians try to treat as many patients as they can. The data consisted of hospital bed use and supply for 22 French administrative regions from 1988 until 1997. The data were analysed by multilevel regression analysis. No effects of financial incentives on managing hospital bed reductions could be demonstrated. However, differences between the two sectors in hospital bed use could be explained from the incentives provided by the different financing systems. We conclude that there is support for our theoretical consideration that the power structure between physicians and hospital management is important in the case of divergence of interests.

5.1 Introduction

The relationship between hospital bed supply and hospital bed use was first studied by Roemer (Roemer, 1961). In 1959, he studied the effects of hospital bed expansion in one region and found that this expansion led to more hospital use, despite the absence of major changes in the morbidity of the population. This effects has become known in health services research as Roemer's Law. Variations in average length of stay per admission among countries appear in particular to depend not only on variations in the health status of the population, but also on such factors as hospital bed supply and healthcare system organization (Väänänen et al., 1967; Wennberg and Gittelsohn, 1973; Sloan and Valvona, 1986; Van Doorslaer and Van Vliet, 1989; Westert, 1992; Van Noordt et al., 1992; Wiley et al., 1999). For healthcare policy makers, Roemer's Law formed a justification for introducing bed reductions in order to contain the continuously expanding costs. As a result, in the last few decades hospital bed supply in Europe has diminished rather than expanded. The question arises, what would happen to hospital utilization in the case of hospital bed reductions and what would be the influence of the various institutional conditions. Previous research has revealed that countries employ different strategies to cope with bed reductions. The explanation for this phenomenon was that different hospital financing systems provide different incentives for hospital management and physicians and thus lead to different choices in those cases where medical decision making permits a choice between alternatives (Kroneman and Siegers, forthcoming of 2001). However, when comparing the healthcare systems of various countries, not only are the financing systems found to differ, but also all kinds of other factors, such as the health insurance of the population and the organization of primary care.

France provides a unique opportunity for the study of the effects of different financing systems while all other conditions remain on average the same. In France, two hospital sectors exist side by side: private and public. A kind of natural experiment evolved after a healthcare reform that changed the hospital financing system for the public hospital sector only. Until the mid 1980s, all hospitals were paid on *per diem* system. Since the mid 1980s the financing system for the public sector has changed to a global budget system (a detailed description is given below). Parliament passed the reform in 1983. The global budget was introduced gradually, starting with the large regional hospitals (*hôpitaux régionaux*) until in 1986 all public and semi public hospitals were incorporated in the new system (Aiach and Delanoe, 1989; Bagust et al., 1999). For the private sector the *per diem* system continued to apply.

In addition to the change in the financing system, bed reductions have taken place since 1979; these reductions are still ongoing. The combination of these factors provides an opportunity to study the influence of the different hospital financing systems on hospital bed utilization in the case of bed reductions. We have sought to replicate the results of Kroneman and Siegers (Kroneman and Siegers, forthcoming of 2001) with a view to come to a better understanding of the effects of different financial incentives. This was undertaken in two steps. First, the organization of the hospital sector in France was clarified. We were particularly interested in the incentives the actors concerned experienced and how these incentives directed their behaviour. Second, on the basis of this knowledge, hypotheses were formulated concerning the effects of diminishing hospital bed supply.

The questions addressed in this paper are:

1. *How is the French hospital sector organized and what incentives are provided to hospitals and physicians concerning the hospitalization of patients?*
2. *What are the effects of the reduction in hospital beds on the use of the remaining beds? Are the effects dissimilar for the different hospital financing systems in France?*

We addressed the first (descriptive) research question first in order to be able to derive hypotheses to be used to address the second research question.

5.2 Characteristics of the French hospital sector

Organization and financing

In France, private and public hospitals coexist. However, French patients have a free choice of hospital (Fuhrer, 1982; Schneider et al., 1992), with no distinction in financial consequences. Stays in both private and public hospitals are covered by national health insurance.

The responsibilities of public hospitals are defined in the Hospital Law of 1970 (*Loi Hospitalière*). Hospitals are autonomous legal bodies. The manager of a hospital is appointed by the Minister of Health. Public hospitals are obliged to provide care to all patients who enter the hospital, including emergency cases. Hospitals are subjected to various forms of public supervision and financial control. For example, authorization by a state authority is required for the

recruitment of personnel, or capital investments (Duriez and Sandier, 1994; Sourty-Le Guellec, 1995; Bagust, Place, and Posnett, 1999). A reform in 1991 gave hospitals more autonomy, in personnel matters for instance (Sourty-Le Guellec, 1995). Physicians working in public hospitals are in salaried service. In January 1983, Parliament enacted a reform introducing a new financing system for hospitals. The reform was implemented in 1984 for regional level hospitals (*hôpitaux régionaux*) and other hospitals followed in 1985. The system changed from *per diem* reimbursement to a global budget system negotiated between the hospital and the appropriate public authority. The global budget covers the operating costs, including costs relating to inpatient, outpatient (in part), psychiatric, emergency, and long term care. The budget is based on the budget of the previous year corrected for inflation and general economic trends, and depends only slightly on the level of activity in the hospital. The sickness funds pay the main part of the global budget. The government contribution (called the global allocation) together with the estimated income from other sources (patient co-payments, service fees) result in the global budget. In 1988 the global allocation accounted for 81% of operating revenues (Sourty-Le Guellec, 1995). The global allocation is divided into twelve monthly instalments. It is financed by the health insurance funds. The costs are divided among the funds. The annual increase in the global allocation (in real value) is slowly falling. In the period 1987-1989 the annual growth was 7.3%, while in the period 1989-1992 it was 6.4% and from 1992 until 1994 it was 5.5%. At the end of the year, the growth is invariably found to be larger than was foreseen at the beginning of the year during the budgeting stage, mainly as a result of increasing salary costs. (Fenina, 1995). Growth in expenditure has been close to general inflation, so from a cost-effectiveness point of view, the global budget can be said to have been successful. The effects on the provision of hospital care are, however, unknown. Since 1997 the global budget is no longer based on the historical budget, but on hospital output data. The severity of the cases treated in each hospital is determined based on a Diagnoses Related Groups (DRG) system. To each case a certain amount of points is assigned based on its DRG. The total expenditure of the hospital is divided by the number of DRG-points, thus specifying the hospital specific price per DRG-point. This price is compared to peer hospitals and the budget is adjusted according to the average DRG-point-price.

The PHPH hospitals (*Participant au Service Public Hospitalier*) are a special type. They are private hospitals, but they have signed an agreement with the government that incorporates them into the public hospital service. These

PSPH hospitals have comparable obligations and comply with the same rules as the public hospitals. The PSPH hospitals are also financed by means of the global budget system. These institutions do not have for-profit goals. Since in this paper the financing system is a distinctive feature, this group of hospitals has been considered part of the public sector. (In the French national statistics these hospitals are placed in the private sector; they account for 20% of the private sector)

The private hospitals are mainly for-profit institutions. Private hospitals, owning 76,482 acute care beds in 1997, make their own management and investment decisions, although they have to conform to certain regulations (such as the hospital planning rules defined in the '*carte sanitaire*', the health map for each region). The hospitals are reimbursed by a *per diem* system. Fees are negotiated at national level between private hospitals and health insurance funds (*Caisses d'Assurance Maladie*). There are fixed fees which depend on the level of performance. There are five performance levels; the classification depends on the available technologies, equipment and staff. The higher the ranking, the higher the fee that can be charged. This system provides an incentive for hospitals to invest in equipment and staff in order to gain a higher ranking. There is no overall *per diem* rate covering all hospital costs. There are fees for all kinds of different services rendered (hotel costs, nursing fees, physician's fees, fees for the use of the operating theatre, and so forth). The daily fees are fixed and there is no maximum per stay. Controlling the hospital production (and thereby expenditures) of private hospitals has therefore been problematic (Sourty-Le Guellec, 1995).

The services the sectors offer differ slightly. The public sector provides more emergency care, high technology care, and admits more elderly people. The high technology care derives from the fact that public hospitals have a monopoly in education and research. Public hospitals are obliged to provide emergency care, although private hospitals also provide it. The private (for-profit) sector undertakes relatively more surgical procedures (Choquet, 1991). According to Choquet (1991), the preference of private hospitals for surgical procedures may be explained from better returns on investments in surgical equipment than in medical equipment. The effects on hospital production of these differences in patient population are not clear. However, since our interest lies in changes in both sectors and not in a comparison of the absolute levels of both sectors, we chose to ignore these differences.

The medical specialists in the public sector (including the PSPH hospitals) are in salaried service. The majority work part-time (58% in 1993, source: SESI, tables H 80 and EHP 80). The medical specialists working in the private sector receive fee-for-service payment. Fees are fixed at the national level and depend on the type of care provided. The number of physicians working part-time in this sector is very high: 72% in 1993 (source: SESI, table EHP 80). It is not unusual for physicians to work in private and public hospitals at the same time. Unfortunately, no data are available on the number of physicians working in both sectors and the time they work for each.

The hospital service in France is divided into three categories: *court-séjour*, *moyen-séjour* and *long-séjour*. The *court-séjour* comprises acute care, mostly short stay hospitalization. The *moyen-séjour* includes rehabilitation care. This care is provided after the acute phase and assists re-entry into society. *Long-séjour* is long-term care. Most hospitals provide all three types of care. The beds assigned to each care type are clearly defined (*ex ante*). In practice, however, a patients may occupy a 'wrong' type of bed (there may frequently be patients in acute care waiting for transfer to rehabilitation care). The focus of this study is on acute care (*court-séjour*), so that we can compare results with those from the study by Kroneman and Siegers (forthcoming). The *court-séjour* comprises of approximately 50% of the total inpatient beds.

Supply

Approximately 70% of all French acute care hospital beds can be found in public hospitals. A substantial share of acute care beds is left for the private sector; almost 30% of all beds are private. The private sector is larger in the sense of the number of hospitals delivering acute care compared with the public sector. In 1997, there were 944 private acute care institutions and 828 public hospitals. On average, private acute care institutions are much smaller than their public counterparts (79 beds on average in a private hospitals versus 216 beds in a public hospital).

In France the total number of acute care hospital beds has fallen by approximately one fifth in 10 years (from 1988 to 1997). The reductions took place gradually and were evenly distributed over the two sectors.

5.3 Managing bed reductions

Strategies

In the case of hospital bed reductions, three strategies for managing diminishing supply can be distinguished. The first is to increase occupancy rates. This option has the fewest consequences for the number of hospital bed days produced. An increase in occupancy rates might be achieved by decreasing the share of beds kept empty for emergency cases, maintenance, or cleaning, or by more efficient planning. Assuming that hospitals want to maintain their service level (either because they do not wish to turn patients away, or with respect to reputation and competition) (Gaynor and Anderson, 1995), this option would be the most attractive. It is however limited to a certain maximum, whatever that rate may be (see Evans, 1984; and Bagust et al., 1999). When hospitals are functioning at their maximum occupancy rate, bed reductions must affect the daily routine of admitting and discharging patients. The second strategy is to maintain the average length of stay and treat fewer patients, resulting in a lengthening of waiting lists or substitution by other forms of care (substitution of short stay, ambulatory or day care for middle or long stay care). A third strategy is to reduce the average length of stay, either by using new technologies or by discharging patients at an earlier stage of recovery. The above discussion yields the following hypothesis:

Hypothesis 1:
In the case of bed reductions in a region, hospitals react with:
1. an increase in occupancy rates;
2. a decrease in admissions;
3. a decline in average length of stay.

All three strategies may occur simultaneously, although we expect the different circumstances in which hospitals and physicians have to act (such as initial bed supply, financial incentives, and opportunities for substitution) to lead to preferences for different strategies.

The effects of bed supply

Roemer's Law can be interpreted as follows: all available capacity is always used. This assertion implies maximum occupancy, no matter what the number of hospital beds may be, although it does not imply that beds are always used in the most efficient way. There may be opportunities to improve occupancy when circumstances permit. We assume that improved occupancy would be more feasible for hospitals in regions with a high bed supply than for hospitals in less

well supplied regions. Roemer's law can also be interpreted in the sense that more hospital beds lead to more production, so length of stay might be longer and the number of admissions higher in well supplied regions. So in the case of hospital bed reductions, in well supplied regions the preferred strategy would be a reduction in the length of stay. In that case no patients would have to be turned away. For less well supplied regions this strategy may be less feasible. Here the third strategy, decreasing the number of admissions, would be the most suitable. Summarizing, the following hypothesis can be formulated:

Hypothesis 2:
In the case of bed reductions in a region:

1. In well supplied regions occupancy rates rise more than in less well supplied regions.
2. In well supplied regions, the number of admissions falls less than in less well supplied regions.
3. In well supplied regions, length of stay falls more than in less well supplied regions.

The effects of financial incentives

The physician is the actor who practices medicine within the hospital. The physician makes the final decision for the hospitalization of a patient. The hospital provides the facilities for hospitalization (beds, operation theatres, nursing personnel, etc.). The hospital management (a management team, a board of directors, etc.) is in charge of this facilitating firm. Both hospital and physician experience incentives that either limit or encourage the production of hospital bed days. The relationship between hospital and physician is integrated into the institutional structure. Two determinants decide whose incentives prevail. The first determinant concerns power: which of the actors has the power to ensure that that actor's incentives prevail. This question is only relevant if there is a divergence of interests, of course. In the case of convergence, the incentives of both actors will fortify each other. In the case of divergence, the incentives of the strongest actor will prevail, although restrained by the other actor. Thus, the second determinant is whether there is convergence or divergence of incentives (see Figure 5.1).

Figure 5.1 Effects of power and incentive conflict on possibilities to realize behaviour according to incentives

		Actor with the greatest power	
		hospital	physician
Incentive direction of both actors	convergence	H: ++ P: ++	H: ++ P: ++
	divergence	H: + P: --	H: -- P: +

H: hospital, P: physician
++: An actor can behave according to the actor's own incentives
+: An actor can behave according to the actor's own incentives, but experiences some opposition from the other actor
--: An actor has to accommodate to the opponent, who has opposite incentives

Before discussing the financial incentives for hospitals and physicians, it is first stressed that financial incentives do not provide the only motive, nor necessarily the most important motive for these actors having to choose between alternatives. The main obligation of both hospital and physician is to improve patients' health. However, where there is uncertainty about the most appropriate type or course of treatment for a patient, there is room for considerations other than medical (Wennberg et al., 1982; Ham, 1988; McPherson, 1990; Andersen and Mooney, 1990; Mooney, 1994). Although the result at individual patient level may be relatively trivial, such as one day shorter or longer stay in the hospital, at national level this uncertainty could have considerable financial consequences. The study of the effects of institutional circumstances is therefore relevant, because policy measures or healthcare reforms may influence these circumstances.

Since the global budget for hospitals in the **public sector** is based on historical costs, no incentives are provided to increase hospital productivity. Admitting relatively few patients and keeping them as long as possible would be financially profitable (the last days of a stay are less care intensive and therefore less expensive). Salaried physicians in public hospitals have no financial incentive to limit or increase the number of admissions or the length of stay, since this decision would not influence their income. In case of doubt about the appropriateness of an admission, the scales may tip in the direction

of not admitting a patient, because that would not yield more money but would increase workload. Once a patient is admitted, there is no financial incentive for early discharge. So, the financing systems of both hospitals and physicians are independent of the number of patients admitted, or the number of bed days produced. Diminishing bed capacity would therefore result in treating fewer patients. The introduction of the DRG-type budget-parameters changed the incentives slightly. It becomes interesting to promote cost-effectiveness. However, since we have only one year of data with this new system, we will not elaborate on the effects of this system. This discussion leads to the third hypothesis:

Hypothesis 3:
In the public sector the preferred strategy to manage bed reductions is to lower the admission rate, leaving occupancy rates and length of stays unchanged.

The *per diem* payment system in the **private sector** makes fewer admissions with longer stays more profitable for the hospital than more admissions with shorter stays, because the longer the stay for a certain procedure, the less care acute the last days become. The physicians in these hospitals are paid on a fee-for-service basis, and so have the financial incentive to treat as many patients as possible. In contrast with the salaried physicians, these fee-for-service physicians would have a tendency to admit a patient in case of doubt. We see here a divergence of interests between private hospitals and their physicians. Private hospitals would try to maintain the number of bed days they produced and keep patients in as long as possible, thereby enhancing their revenue. Physicians on the other hand would want to maintain the number of patients treated in order to maintain their income level, and so may try to shorten stays. Private sector physicians do not receive a salary from the hospital, so hospitals have no direct influence on the level of their income. Since private hospitals depend for their income on the patients admitted via the physicians, we assume that the physician's incentives prevail. So, in the case of bed reductions, stays become shorter. Summarizing, this leads to the effect described in the following hypothesis:

Hypothesis 4:
In the private sector the preferred strategy to manage bed reductions is to reduce length of stay, leaving occupancy rates and admission rates unchanged.

Possibilities for substitution

When hospital bed supply is reduced, alternatives to hospitalization may be sought, including day surgery or placing patients on waiting lists. Unfortunately, no data was available for either day surgery or waiting lists, although the strategy of admitting fewer patients may lead to an increase in both alternatives. Another possibility for substitution is between public and private hospitals. If there are greater bed reductions in one sector than in the other, patients may switch sectors. We have controlled for this effects in our analyses.

5.4 Data and methods

For the description of the organization of the French hospital sector, a literature study was carried out (keywords: France, hospital, healthcare system). Additional information was gathered during a one month visit at CREDES in Paris (*Centre de Recherche, d'Etude et Documentation en Economie de la Santé*) from additional documents and conversations with informants. CREDES gathers data and conducts research on the French healthcare system. Data on hospital supply and utilization were available from Eco-santé France and Eco-santé Régional, databases composed by CREDES, and from the *Bureau des Statistiques des Etablissements d'Hôpitalization* (Hospital Statistics Office), department of the *Service des statistiques, des Etudes et des Systèmes d'Information* (SESI, until 1994) and its successor *Direction de la Recherche, des Etudes, de l'Evaluation et des Statistiques* (DREES, as from 1994) (National Statistics Office). The data were available at regional level, that is for the 22 regions forming the French administrative health regions. A region is the unit of analysis.

$$\text{bed use}_{ij} = \beta_{0ij}\, \text{cons}_{ij} + \beta_1\, \text{dbed}_{ij} + \beta_2\, \text{avbeds}_j + \beta_3\, \text{avbed}_j{}^*\, \text{dbed}_{ij} + \beta_4 \text{avpriv}_j + \beta_5 \text{dpriv}_{ij} + \beta_6\, \text{ageing}_j + \beta_7\, \text{techno}_{ij} + \beta_{8j}\, \text{time}_{ij}$$

$$\beta_{0ij} = \beta_0 + U_{0j} + e_{ij}$$

$$\beta_{8j} = \beta_8 + U_{8j}$$

where
- bed use_{ij} : hospital bed use per year per region. Bed use may be either occupancy rate (%), admission rate (%), or average length of stay
- cons_{ij} : constant
- dbed_{ij} : change in bed supply per 1000 inhabitants compared with the previous year

$avbeds_j$	:	average number of beds per 1000 in the region over the years 1988 to 1997
$avpriv_j$	:	average share of the private sector in the region over the years 1988 to 1997
$dpriv_{ij}$	:	change in share of private sector compared with the previous year (%)
$ageing_j$	:	average share (%) of the population older than 60 in the region between 1988 and 1997
$techno_{ij}$	:	technology index
$time_{ij}$	:	time variable, coded from 0 for 1988 to 9 for 1997
U_{0j}	:	random variation at regional level
e_{ij}	:	random variation at year level
U_{8j}	:	random variation in the effects of time at regional level
i	:	year (level 1, individual level)
j	:	region (level 2, group level)

Hospital bed use consists of three parameters: occupancy rate, admission rate, and average length of stay. Six regression models were therefore set up, one for each parameter in each sector (combining both sectors in one model was not possible, because of the high correlation between bed supply and the dummy variable for the sector). The change in hospital bed supply ($dbed_{ij}$) reflects the short term (one year) change in bed volume. According to hypothesis 3, hospital bed reduction in the public sector reduces admission rates (β_1 is positive, because bed reduction is a negative figure). Occupancy rates and length of stay are not affected (β_1 not significant). In the private sector, according to hypothesis 4, the effects of bed reduction are a decrease in average length of stay (with β_1 positive, because bed reduction is a negative figure) and occupancy rates and admission rates are not affected (β_1 not significant). The average bed supply ($avbeds_j$) indicates whether a region is on average well or less well supplied. According to Roemer's Law, well supplied regions have longer stays (β_2 positive) and more admissions (again, β_2 positive) compared with less well supplied regions. Occupancy rates are not affected by bed supply, so β_2 is non significant. The interaction term between change in hospital bed supply and average bed supply was expected to show the different reaction of well and less well supplied regions on change in bed supply. According to hypothesis 2, well supplied regions prefer to increase occupancy rates (β_3 negative, again due to the negative figure of bed reductions) more than less well supplied regions. Furthermore, the admission rate remains higher (β_3 is negative) and the average length of stay remains longer (β_3 is positive) compared with the less well supplied regions.

Table 5.1 Expected signs of coefficients according to the hypotheses

Independent variables	Occupancy rate	Admission rate	Average length of stay
Public sector:			
Bed reduction (β1)	0	+* (decrease)	0
Average bed supply (β2)	0	+	+
Initial bed supply* change in bed supply (β3)	+	-	+
Initial private share (β4)	c	c	c
Change in private share (β5)	c	c	c
Ageing (β6)	c	c	c
Technology (β7)	c	c	c
Time (β8)	c	c	c
Private sector:			
Bed reduction (β1)	0	0	+* (decrease)
Average bed supply (β2)	0	+	+
Initial bed supply* change in bed supply (β3)	+	-	+
Initial private share (β4)	c	c	c
Change in private share (β5)	c	c	c
Ageing (β6)	c	c	c
Technology (β7)	c	c	c
Time (β8)	c	c	c

Legend: 0 not significant; + increase, - decrease; c control variable

* The interpretation of these signs is different because bed reduction is a negative number. A positive b will thus result in a decrease of admission rates or average length of stay

To test the relevance of the regression models, the increase in variance accounted for compared with the *empty* model was computed. An empty model is a model without explanatory variables. For both models the deviance (equal to -2 loglikelihood) was computed. The difference between the deviances has a Chi square distribution where the number of explanatory variables is the number of degrees of freedom.

5.5 Results

Before discussing the results of the multi level analysis, an overview is given of hospital bed supply and use in both sectors. The hospital bed supply in the

public sector is roughly 2.5 times higher than the private bed supply (see Table 5.2). The scale of the bed reductions is comparable for the two sectors. The share of private beds in total bed supply has not changed over the years (about 70%). Occupancy rates in the private sector are considerably higher than in the public sector; the difference is about 20%. There has been hardly any change in occupancy rates over the years in either sector. In the public sector, admission rates have increased slightly; a minimal decrease can be observed in the private sector. Admission rates in the public sector are nearly twice as high as those in the private sector. Compared with bed supply (public sector 2.5 times private sector), this means that admission rates are relatively low in the public sector. The average length of stay in the public sector was higher than in the private sector in 1988, but slightly lower in 1997. The decrease in average length of stay in the public sector was much greater than in the private sector (see Table 5.2).

Table 5.2 Average hospital bed supply and utilization in the French regions

Acute care	Public sector			Private sector		
	1988	1997	Change (%)	1988	1997	change (%)
Beds/1000 inhabitants	3.91	3.14	-20	1.43	1.23	-16
Occupancy rate	72.20	71.60	-1	94.30	92.50	-2
Admissions/100 inhabitants	13.20	14.10	7	7.00	6.85	-2
Average length of stay	7.86	5.81	17	7.00	5.97	-15

There is considerable variation between the regions in bed reductions and bed use. In the public sector, all regions experience bed reductions, although of a different magnitude. Not all regions have experienced reductions in the private sector (see Table 5.3). In both sectors, occupancy rates and number of admissions vary between decreasing and increasing. Length of stay is diminishing in all regions, but variation is considerable with the largest decrease about three times higher than the smallest in the public sector and an even larger difference in the private sector (see Table 5.3).

Table 5.3 Absolute changes in acute care hospital utilization and supply within the public and private sectors at regional level from 1988 to 1997 (over 10 years, minimum, maximum and average)

	global budget (public sector)			*per diem* payment (private sector)		
	min*	max*	average*	min*	max*	average*
Supply parameter						
Change in number of beds/1000 inhabitants	-1.81	-0.39	-0.77	-0.58	+0.02	-0.20
Utilization parameters						
Change in occupancy rate	-4.31	+6.75	-0.61	-9.06	+8.03	-1.76
Change in number of admissions/1000 inhabitants	-0.58	+2.30	+0.99	-0.96	+1.24	-0.11
Change in average length of stay (days)	-3.84	-1.29	-2.06	-1.67	-0.27	-0.99

* min: the figure of the region with the smallest change; max: the figure of the region with the largest change; average: average change over all 22 regions

Having concluded that there is considerable variation in hospital bed use, we can now explain this variation by applying the analysis model as defined in the methods section.

For the occupancy rates, based on the incentive structures, we expected no effects from bed reductions. However, in the public sector a significant effect was found (see Table 5.4). Larger reductions lead to higher occupancy rates. The expected differentiated effects of well and less well supplied beds could be demonstrated. In large supply regions the increase in occupancy rates resulting from bed reductions was lower than in less well supplied areas. From the constant we learn that there is a basic difference between the sectors in occupancy rates. In the private sector, much higher occupancy rates are realized (see Table 5.5). The random part of the regression models show that the variation among regions is larger than the variation over time. The negative covariance indicates that the variation is decreasing with time. In the private sector the variation between regions is much higher. Apparently, the private sector is more heterogeneous than the public sector.

Table 5.4 Multilevel regression analysis for the effects of acute care bed supply on occupancy rates[1]

	model 1[2]	exp. sign[3]	model 2[2]
PUBLIC SECTOR			
Fixed effects:			
Change in hospital beds		0	-23.0 (9.11)*
Average beds		0	-1.50 (1.13)
Interaction between beds and change in beds		+	5.78 (2.48)*
Average private share		c	-0.14 (0.08)
Change in private share		c	0.29 (0.09)*
Proportion older than 60 years		c	0.28 (0.16)*
Technology		c	0.26 (0.97)
Time	-0.16 (0.07)*	c	0.18 (0.08)*
Constant	72.42 (0.62)*		74.58 (5.76)*
Random effects:			
level 2			
Constant	7.93 (2.53)		4.436 (1.36)
Time	0.08 (0.03)		0.08 (0.03)
Covariance constant*time	-0.50 (0.22)		-0.19 (0.15)
level 1			
Constant	0.99 (0.10)		0.78 (0.08)
Deviance	754.529		707.776
PRIVATE SECTOR			
Fixed effects:			
Change in hospital beds		0	-24.07 (13.92)
Average beds		0	-5.76 (4.48)
Interaction beds and change in beds		+	10.41 (4.43)*
Average private share		c	-0.08 (0.26)
Change in private share		c	-0.60 (0.53)
Proportion older than 60 years		c	0.83 (0.23)*
Technology		c	-3.90 (2.14)
Time	-0.21 (0.11)	c	-0.02 (0.16)
Constant	93.44 (1.04)*		89.34 (5.06)*
Random effects			
level 2			
Constant	23.01 (7.14)		8.10 (2.57)
Time	0.21 (0.09)		0.21 (0.08)
Covariance constant*time	-0.10 (0.56)		-0.08 (0.32)
level 1			
Constant	6.60 (0.70)		4.59 (0.49)
Deviance	1146.423		1057.948

(for notes see under Table 5.6)

Table 5.5 Multilevel regression analysis for the effects of acute care bed supply on admission rates[1]

	model 1[2]	exp. sign[3]	model 2[2]
PUBLIC SECTOR			
Fixed effects:			
Change in hospital beds		+	2.57 (2.57)
Average beds		+	3.09 (0.35)*
Interaction beds and change in beds		-	-0.37 (0.88)
Average private share		c	-0.03 (0.02)
Change in private share		c	0.04 (0.02)
Proportion older 60 years		c	0.08 (0.05)
Technology		c	-0.99 (0.28)*
Time	0.08 (0.02)*	c	0.14 (0.02)*
Constant	13.35 (0.45)*		5.19 (1.80)*
Random effects:			
level 2			
Constant	4.40 (1.34)		0.44 (0.13)
Time	0.01 (0.00)		0.01 (0.003)
Covariance constant*time	-0.07 (0.04)		-0.02 (0.01)
level 1			
Constant	0.99 (0.11)		0.06 (0.01)
Deviance	228.597		156.337
PRIVATE SECTOR			
Fixed effects:			
Change in hospital beds		0	3.74 (2.74)
Average beds		+	3.72 (1.04)*
Interaction beds and change in beds		-	0.03-(0.88)
Average private share		c	0.03 (0.06)
Change in private share		c	-0.22 (0.10)*
Proportion older 60 years		c	0.08 (0.05)
Technology		c	-0.14 (0.35)
Time	-0.06 (0.01)	c	-0.05 (0.02)*
Constant	7.25 (0.48)		-0.06 (1.12)
Random effects:			
level 2			
Constant	5.06 (1.53)		0.45 (0.14)
Time	0.001 (0.01)		0.00 (0.00)
Covariance constant*time	-0.06 (0.03)		0.00 (0.01)
level 1			
Constant	0.20 (0.02)		0.19 (0.02)
Deviance	395.115		335.085

(for notes see under Table 5.6)

Bed reductions do not lead to fewer admissions. For the private sector, this was the outcome we expected, but for the public sector we expected admissions to decrease with bed reductions. This is however not the case. A larger average bed supply does lead to higher admission rates, as predicted. A differential effects between higher and lower bed supply could not be demonstrated in either sector. Increasing technological development leads to lower admission rates in the public sector. The random parts of the models show that variation among regions is higher than variation over time. We also see here a slight decrease in variation over time. There is hardly any difference in variation between the sectors.

The only significant explanatory parameter in the models for length of stay is technological development. Apparently, length of stay is mainly influenced by technological development: longer stays coincide with advanced technological situations. This is not according to our expectations. The hypothesis concerning the effects of bed reductions and bed supply could not be demonstrated. Again, the random part shows that variation is mainly found among regions and hardly at all over time. Also, a decrease in variation over time was found. The fit of the model for average length of stay was not very good. The difference between the empty and complete models was not significant. In the public sector the system to set the hospital budget changed in 1997. To control for the effects of the introduction of this new system to set the global budget the analyses for the public sector were carried out omitting the year 1997. For occupancy rates we found a slightly smaller effect of bed reductions (β_1 = -17.5, s.e. = 8.38), for the other two hospital bed use components no differences were found.

Table 5.6 Multilevel regression analysis for the effects of acute care bed supply on average length of stay[1]

	model 1[2]	exp. sign[3]	model 2[2]
PUBLIC SECTOR			
Fixed effects:			
Change in hospital beds		0	-2.26 (1.35)
Average beds		+	0.12 (0.17)
Interaction beds and change in beds		+	0.62(0.36)
Average private share		c	-0.01 (0.01)
Change in private share		c	0.00 (0.01)
Proportion older 60 years		c	0.04 (0.02)
Technology		c	0.32 (0.14)*
Time	-0.22 (0.01)*	c	0.24 (0.01)*
Constant	7.94 (0.14)*		5.51 (0.91)*
Random effects			
level 2 (region)			
Constant	0.44 (0.13)		0.18 (0.05)
Time	0.00 (0.01)		0.00 (0.01)
Covariance constant*time	-0.03 (0.01)		-0.02 (0.01)
level 1 (time)			
Constant	0.02 (0.00)		0.02 (0.00)
Deviance	-116.295		-126.811
PRIVATE SECTOR			
Fixed effects:			
Change in hospital beds		+	1.39 (1.68)
Average beds		+	0.23 (0.65)
Interaction beds and change in beds		+	0.15(0.54)
Average private share		c	0.03 (0.04)
Change in private share		c	0.08 (0.06)
Proportion older 60 years		c	0.02 (0.03)
Technology		c	0.65 (0.25)*
Time	-0.22 (0.01)*	c	-0.12 (0.02)*
Constant	6.28 (0.12)*		4.74 (0.73)*
Random effects			
level 2 (region)			
Constant	0.29 (0.09)		0.24 (0.08)
Time	0.00 (0.00)		0.00 (0.00)
Covariance constant*time	-0.01 (0.01)		-0.01 (0.01)
level 1 (time)			
Constant	0.07 (0.01)		0.07 (0.01)
Deviance	149.140		137.258

[1] For the fixed effects, the b-coefficients are displayed with the standard error between brackets. For the random effects, the (co)variance is displayed with standard error between brackets.

[2] Model 1 is the empty model with only the intercept and control for serial correlation by the variable time (time varies from 0 for 1988 to 10 for 1997).

[3] Expected sign according to hypotheses. Legend: 0 non significant; + in crease; - decrease; c control variable.

* Significant at p = 0.05.

5.6 Conclusions and discussion

Evaluating the results by means of the hypotheses, we observed the following. Hypothesis 1 stated that in the case of hospital bed reductions hospitals react with increasing occupancy rates, decreasing admission rates, and/or a decline in average length of stay. This hypothesis can only be confirmed for the public sector for occupancy rates. The average bed supply in the regions influences admission rates, in the sense that higher supply leads to higher admission rates. This result was found for both sectors. The second hypothesis concerned the differential effects of bed reductions for different supply situations. For occupancy rates, we found an opposite effect to that expected. Well supplied regions do not react to bed reductions with higher occupancy rates, but with lower occupancy rates than less well supplied regions. For admission rates and average length of stay, no interaction effect between average bed supply and bed reductions was found. According to hypothesis 3, the public sector would react to bed reductions by reducing admission rates, leaving the other bed use parameters unchanged. This effects could not be demonstrated. In fact, the occupancy rates increased. For the private sector (hypothesis 4) no effects from hospital bed reductions were found.

Increasing occupancy rates as a strategy for managing bed reductions has the advantage for both physicians and hospitals that they do not have to change their behaviour. This advantage may be the reason why we found increasing occupancy rates in the public sector. The relatively low occupancy rates compared with the private sector left room to increase the rates.

Although no effect from financial incentives on managing bed reductions could be demonstrated, there was a differential effect between the two sectors in hospital bed use that could be accounted for by the incentives financing systems provide. In the public sector, lower occupancy rates and relatively low admission rates were found, which is in line with the financial incentives for both actors in the public sector. The relatively high admission rates and high occupancy rates demonstrate the effects of the incentives on the physicians in the private sector (the fee-for-service payments make the treatment of as many patients as possible financially attractive). Also, the effects of higher admission rates in the case of more bed supply in a region indicates that in the private sector the physicians' preferences - to generate sufficient income by admitting more patients - prevail over the hospitals' preferences of keeping patients hospitalized longer. The incentives of the private hospitals - the *per diem* financing system makes it financially attractive to keep patients

hospitalized as long as possible - could not be demonstrated. The effects of higher admission rates in the case of greater public bed supply may be explained by the goal of the hospital to maintain the organization: using all available capacity may prevent the hospital from further, or greater bed reductions. We conclude that the theoretical model of convergence or divergence is of interest; where, in the case of divergence, the preferences of the actor with the most power prevail, the model appeared capable of predicting the behaviour of physicians and hospitals in this study.

In the case of hospital bed reductions, the question of what happens to the doctor/bed ratio arises. If the number of doctors also decreases and the availability of beds for each individual doctor is kept constant, the remaining doctors may not have to change their behaviour. We therefore investigated the development in medical staff. It appeared that hospital bed reductions did not coincide with reductions in medical staff. When evaluating developments in the number of physicians in public hospitals, a growth in medical staff can be observed. In 1987 there were 7.2 physicians per 100 beds (in full-time equivalents); in 1993, this figure increased to 10.1 per 100 beds. This rise is not only the result of a reduction in beds, since the absolute number of positions in full-time equivalents also increased from slightly more than 35 thousand in 1987 to 45 thousand in 1993. Unfortunately, for the private hospitals no data on full-time equivalents were available.

It is interesting to note that technological development decreases admission rates in the public sector and increases length of stay in both sectors. Both effects can be explained from the substitution for inpatient care that technological developments make feasible. Developments such as saver anaesthesia and minimally invasive treatments make it possible to shift less severe cases from inpatient care to day surgery, or treatment in outpatient departments. This substitution explains the decreasing admission rates in the public sector. The increase in length of stay can also be explained from this development, since the more severe cases continue to be treated in inpatient care. It is plausible that on average these cases need longer stays than those shifted to outpatient care would have needed had they been inpatients.

The study by Kroneman and Siegers showed similar results; hardly any effects from hospital bed reductions could be demonstrated. A differential effects of hospital financing systems was demonstrated, independent of hospital bed reductions. We consider that these findings support our theoretical model.

In our evaluation, we have to state that no effects from different financial incentives on managing hospital bed reductions could be demonstrated. Differences between the two sectors in hospital bed use could be explained from the incentives provided by the different financing systems. We conclude that there is support for our theoretical proposition that the power structure between physicians and hospital management is important in the case of divergent interests.

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6 INTERNATIONAL VARIATIONS IN AVAILABILITY AND DIFFUSION OF ALTERNATIVES TO IN-PATIENT CARE IN EUROPE: THE CASE OF DAY SURGERY

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Summary

Objectives: Technological and medical developments have contributed to the increased number of surgical procedures carried out in a day-case rather than an inpatient hospital setting. The diffusion of day surgery varies among European countries. This study aims to explain this variation from health care system characteristics.

Methods: Questionnaires were sent to experts in 12 countries in northwest Europe. The questionnaire contained questions about the organization and diffusion of day case surgery (at country level and individually for 18 selected procedures), and relevant health care system characteristics (financing systems, organization of after care, etc,).

Results: It is demonstrated that hospital bed supply relates to the diffusion of day surgery. In countries with fewer beds, a higher day surgery rate is found. The financing system of hospitals does not influence the choice of surgical setting. In countries with a fee-for-service financing system for hospital-based physicians, day surgery rates are not higher than in countries with salaried medical specialists. With respect to aftercare, the availability of sufficient home nurses favours day surgery.

Conclusions: The relative scarcity of hospital beds or large reductions in bed supply has led to the perception of day surgery as an alternative that could meet the growing demand for surgical treatment. It is worthy of note that, although the majority of experts state that financial incentives discourage day surgery, the supply is growing.

6.1 Introduction

Developments in medical technologies such as endoscopy, laser and ultra sound, shorter and safer anaesthesia have led medical and surgical treatments to become less invasive. Some procedures are now so minimally invasive, hospital admission is no longer necessary. At the end of the day, after treatment, patients return home. However, day treatment does not always prevail over more traditional inpatient treatments, since it is not yet everywhere common practice. In The Netherlands only about 1/3 of all elective surgery is performed in day surgery, whereas in the US day surgery is more common: 2/3 of all elective surgery is day surgery (Ankoné, 1999). Obstacles can be found at different levels. First, at the micro level: patients or physicians may not want, or may not be able to use day surgery. For some patients day surgery could be unsuitable because of their health condition (e.g., co-morbidities), social conditions (e.g., no carers at home), or personal preferences (Stocking, 1992; Morgan and Beech, 1990; Banta et al., 1993). On the physician's side there may be problems through lack of experience with new techniques, or doubts concerning the safety of a procedure. For physicians, personal preferences such as a tendency to adopt innovations may also play a part, as may local customs (Wasowicz et al., 1998; Banta et al., 1993; Haworth and Balarajan, 1987; Henderson et al., 1989). Second, hospital characteristics, such as the organization of hospital care, the number of hospital beds, the size of the hospital, may play a part. Finally, at the macro level, healthcare system characteristics such as financing and insurance influence the diffusion of day surgery. It could be argued that obstacles at the micro level were evenly spread over all healthcare systems. Although important as such, they cannot therefore be considered capable of explaining the differences between countries. The explanation of differences between countries needs to be sought in factors at intermediate and macro levels.

The acute hospital care sector has been subject to change in the last few decades. Two organizational characteristics are highlighted here, namely the decline in hospital bed supply and the changes in hospital financing systems. Day surgery could serve as an alternative to inpatient care in the case of declining bed supply. Most studies concerning the effect of hospital bed supply on hospital bed use fail to include alternatives for inpatient procedures, such as day surgery, or waiting lists (Van Doorslaer and Van Vliet, 1989; Van Noordt et al., 1992; Westert, 1992; Wiley et al., 1999). The aim of this study is therefore to gain insight into the organizational conditions that favour day surgery as an alternative to inpatient care.

Our research questions were formulated as follows:

1. *Do European countries differ in the diffusion of day surgery?*
2. *Can differences in the diffusion and availability of day surgery be accounted for by health care system characteristics?*

In this study we have used the following definition of day surgery: 'Day case surgery can be defined as elective, minor or intermediate procedures performed under local or general anaesthesia on patients who are admitted and discharged during a single working day' (Mascarenhas and Newton, 1994).

6.2 Conditions that influence the use of day surgery

We can divide the conditions that favour day surgery as an alternative to inpatient care into two main categories: organizational characteristics; financial incentives. First, we discuss the possible influence of the characteristics of health care organization.

The level of and change in the supply of hospital inpatient beds must be considered. First, it can be expected that hospitals in countries with low bed supply would be more willing than countries with high supply to introduce day surgery to relieve pressure on inpatient capacity. For low-supply countries day surgery might afford the opportunity to reduce waiting lists. In high-supply countries, hospital managers could be expected to prefer sufficient use of the inpatient capacity (Väänänen et al., 1967). Managers may fear bed reductions when working below full capacity. They may also want to see returns on investments made to create the bed capacity (compare Roemer's Law: *a bed built is a bed filled*). Second, hospital-bed reductions in the last decade may have contributed to the diffusion of day surgery. In countries undergoing a substantial reduction of hospital beds, the need to introduce day surgery (in order to compensate for the loss of in-patient capacity) may have been felt more strongly.

In addition to triggers from hospital bed supply, day surgery also needs a good organization of and communication with home care (community nurses, general practitioners). In countries where the primary care sector has developed strongly, the introduction of day surgery could be expected to be easier than in countries traditionally more oriented towards secondary care. It is also plausible that, in countries where hospitals have attached outpatient departments, the

switch to day surgery would lead to a less fundamental organizational change than in countries where hospital care is mainly devoted to inpatient care. Where no outpatient wards exist, not only would the organization of the hospital have to change; constructional changes would also be needed. So, in countries with hospitals without outpatient departments, the conditions for introducing day surgery as an alternative for in-patient care would be less favourable (Van der Zee, 2000; Sorgatz, 1994).

We now turn to the financial conditions. When day surgery is provided within the hospital environment, the financing of inpatient care is important. Where hospitals are paid *per diem*, it would be financially attractive to keep patients hospitalized for as long as possible. This would not provide a very favourable financial climate in which to switch to day surgery. In a global-budget situation, where the hospital receives a fixed amount, day surgery would be more attractive, since it is cheaper than inpatient care. However, there is the danger of what is known as the *efficiency trap*. Day surgery may be cheaper per case but, through greater patient throughput, it may be more expensive than inpatient care in a given budget period (Morgan and Beech, 1990).

Previous research has revealed that day surgery is not always a substitute for inpatient care; it may be supplementary (Henderson, Goldacre, Griffith, and Simmons, 1989; Haworth and Balarajan, 1987). According to Haworth and Balarajan (1987), day surgery may only be a substitute for inpatient care where the population is adequately provided, or even over-provided, with inpatient care. In all other cases, day surgery may be used to reduce waiting lists, or compensate for the loss of inpatient bed supply, in which case no reduction of admission rates would be realized.

Hospitals that have invested in special day surgery wards, or the managers of free standing day surgery wards, would be more eager to promote day surgery in order to have returns on their investments than hospitals where day surgery is performed within the inpatient setting. In addition, the remuneration of the physicians performing the surgery is important. Since nowadays both day surgery and inpatient treatment are often acceptable, physicians have the opportunity to choose between the two options. In addition to medical arguments, financial incentives may play a part. As Westert and Groenewegen (1999) have argued, insofar as medical considerations allow, physicians choose an optimum between income and leisure time. Physicians in salaried service may not be willing to increase productivity, since this would increase workload

without further financial gain. On the other hand, the decision of physicians paid on a fee-for-service basis may depend on the level of remuneration. With inpatient surgery better paid than day surgery, there would be no financial incentive to adopt new procedures. On the other hand, if more patients could be treated in day surgery, an increase in income within the same working hours may be achievable.

In summary, we can expect countries with a lower bed supply, a positive financial climate towards day surgery, and pre-existing well developed outpatient and/or primary care to have a higher day surgery rate than countries where these are not in place. In this study, the units of analysis are countries. Although the underlying explanatory mechanisms may operate at intermediate (managerial decision making) or micro levels (clinical decision making), we expect their implications to cluster within countries. The discussion above leads to the following hypotheses:

Hospital bed supply:

1. In countries with a high acute care bed supply, day surgery rates are lower than in countries with a low bed supply.
2. In countries which have experienced a strong reduction of hospital beds, the tendency to look for alternative forms of care is stronger and there is a higher day-surgery rate.

Aftercare organization:

3. In countries that are strongly secondary care oriented, the day surgery rate is lower than in countries with a stronger primary care orientation.
4. In countries where hospitals do not have outpatient departments, the day surgery rate is lower than in countries that do have outpatient departments.

Financial:

5. In countries with a global-budget financing system, the day surgery rate is higher than in countries with a *per diem* system.
6. In countries where physicians are remunerated per case or fee-for-service, the day surgery rate is higher than in countries where physicians receive a (fixed) salary.
7. In countries where the costs of day surgery are covered by the returns, the day surgery rate is higher than in countries where this is not the case.

6.3 Data and method

Before the data and method are described, day surgery must first be operationalized. For this study we have used Mascarenhas and Newton's definition as cited above (1994). Unfortunately, this definition does not yield an unambiguous classification of the type of surgery. Confusion with surgical procedures in an outpatient setting is possible. There is not always a clear distinction between a procedure carried out in an outpatient setting, or in day surgery. This lack of precision can even influence national statistics. For instance, in the United Kingdom the Royal College of Surgeons sets targets for day surgery. To achieve these targets, some hospitals shifted some procedures in their registration from outpatient surgery to day surgery (Raftery and Stevens, 1998). Such lack of transparency is a common problem in health services research (Kroneman and Van der Zee, 1997). We solved the problem in this study by combining the procedure-specific data for day surgery and outpatient treatment. Moreover, day surgery is known by many different terms: *day case treatment* and *day-care* are used in this study as synonyms.

The data came from various sources. First, a questionnaire was sent to day surgery experts in several West European countries. The subset of countries was selected for their comparable level of economic wealth. This is important in order to minimize the disturbing effects of economic constraints on the level of health care supply (see also Westert, 1997). In this questionnaire we asked for the organization of day surgery in the country concerned. In addition to these data, we used the OECD health data files of 1999 for data concerning acute care hospital bed supply. Healthcare organization data were obtained via a literature survey carried out in another study dealing with hospital bed reductions (Kroneman and Siegers, forthcoming of 2001).

The questionnaire consisted of two parts. The first part contained questions about the diffusion of day surgery (which kind of hospitals, since what date, how many hospitals). For eighteen surgical procedures, we asked to what extent the procedure was performed in inpatient or outpatient/day care. This part of the questionnaire consisted of closed questions. The second part concerned the financing of day surgery; financial, organizational, or medico-technical impediments perceived in the use of day surgery, and the organization of after-care. The questions about after-care and perceived problems were open questions; the remainder of the questions were closed. For countries where more than one expert answered the questionnaire, we combined the answers to obtain one result for that country. When answers

differed, we followed the following decision scheme: answers that according to the expert were based on statistical data prevailed over answers based on estimations. When experts clearly contradicted each other, the answers were coded as 'experts contradict each other' and treated as missing values. Where these rules did not result in a solution, a decision was taken for which the underlying argumentation was documented (to be obtained from the authors on request).

In 1996-1997, the questionnaires were sent to 25 experts in 12 countries. The experts were people who were well informed about the development of day surgery within their own countries. The experts consisted of people who worked at national hospital institutes, innovative hospital physicians who had promoted day surgery at a national level, and researchers who had published on the subject. Before answering the questionnaire, respondents were asked to judge whether they considered themselves to be a suitable expert. In a few cases the recipient of the questionnaire proposed another person who was considered to have more expertise. The response was 72% (18 questionnaires), resulting in at least one completed questionnaire for each of these 12 countries. The experts from France and Italy were not able to provide national statistics on the place where procedures were carried out, leaving data from 10 countries available for analysis of the procedure settings: Austria, Belgium, Denmark, Finland, Germany, The Netherlands, Norway, Sweden, Switzerland, the United Kingdom. The data for Switzerland were based on one canton (Zurich). Questions about organization, financing, and perceived problems were answered by all 12 countries.

The degree of day surgery in a country was computed as follows. A subset of 18 procedures was selected and presented to the experts. In addition to frequency of performance, the basis on which the procedures were selected was to ensure that sufficient variation would be available in the conversion of the procedure to day surgery. The procedures range from easily convertible (such as cyst excision) towards procedures difficult to carry out in day surgery (such as prostate surgery). For each of the18 procedures the country experts were asked to indicate whether the procedure was carried out as an inpatient, day surgery, or outpatient procedure. The following categories could be chosen: always as a day case/outpatient (more than 90%); mostly as a day case/outpatient (50-90%); mostly as an inpatient (50-90%); always as an inpatient (more than 90%). The categories were coded 1 through 4 respectively. For all the procedures, all the scores were added and divided by the number of procedures.

This process resulted in a score between and including 1 and 4: 1 indicates a complete orientation towards inpatient care; 4 indicates a complete orientation towards day case/outpatient care. The validity of this scale was tested with the data collected by De Lathouwer and Poullier (1998) who investigated the diffusion of day surgery in 29 OECD countries. In their survey, they aimed to give the percentage carried out in day surgery for each procedure. They were successful for 13 countries, eight of which were European countries. Six countries participated in both studies. De Lathouwer and Poullier (1998) also failed to obtain statistical data from France or Italy. For the seven procedures common to both studies, we recoded these percentages into our categories and compared the rankings of the procedures (the average of all 6 common countries) and country scores in both studies. The procedure rankings were similar. For the ranking in countries, Denmark was an outlier. Apart from this country, the ranking again was similar. The substantial similarity between De Lathouwer and Poullier's findings and our own indicates that the statistical data and estimates were quite reliable within certain boundaries. The only outlier was Denmark. According to De Lathouwer and Poullier's data, Denmark is more inpatient oriented.

To test the hypotheses, we computed Spearman rank-correlations. We chose this method because most of the data were categorical and therefore required a non-parametric method.

6.4 Results

In half the West European countries in our study, day surgery had already been performed on a routine basis since before 1980 (Austria, Denmark, Italy, Norway, Switzerland, the United Kingdom). In Belgium and The Netherlands, day surgery was introduced on a large scale between 1980 and 1985. In Finland and Sweden, this type of surgery became common between 1985 and 1990; France and Germany were the last to introduce day surgery on a routine basis. If day surgery is performed in a country, this care is provided to the same extent by all types of hospitals (academic, public, private for profit, private non-profit). Although our experts in Italy and Austria indicated that day surgery had already been performed routinely in their country before 1980, this introduction is not yet countrywide, since this type of procedure is only performed in some hospitals. For Belgium, Finland, The Netherlands and Sweden day case procedures started after 1980, but as in most of the countries that started earlier, the experts reported that day surgery was performed in most or all

hospitals. So the period of starting day surgery appears to bear no relationship with its current diffusion.

An important problem concerning the diffusion of day surgery is the lack of financial incentives. In seven of the 12 countries the experts indicated that there was either no financial incentive, or even a negative incentive in the sense that real costs were barely covered, or inpatient procedures were more profitable. On the one hand two countries (The Netherlands and Denmark) report an insufficient inpatient bed supply as an incentive to switch to day surgery. On the other hand the expert for Austria indicated that the oversupply of inpatient beds had led to a preference for inpatient care.

The importance of the primary care sector can be illustrated by the fact that most respondents indicated that GPs were the most important people involved in aftercare (in eight countries, see Table 6.1). In Denmark, the aftercare for the first 24 hours is provided by the hospital; afterwards, GPs and home nurses take over. In UK, the large day centres provide their own aftercare; the smaller centres depend on community-based aftercare. The expert in Norway reported that the hospital-based doctors saw to the aftercare without mentioning the part played by other aftercare providers. In seven countries the home nurse was also involved. Only one country (Austria) indicated that relatives were involved in aftercare. In Austria the communication between hospitals and GPs was reported to be problematic, so that the quality of aftercare may be endangered.

Table 6.1 Disciplines involved in aftercare (n=12)

Discipline	Involved in number of countries
Hospital	4
GPs	8
Home/Community nurses	7

From Table 6.1 we can conclude that day surgery has both secondary and primary care elements.

For the 18 distinctive procedures, we asked to what extent each procedure was implemented in day surgery. In Table 6.2 we present the procedures according to the setting in which they are most commonly performed.

Table 6.2 Classification of procedures towards setting of surgery (n=10)[1]

Almost always in day surgery	Both in day surgery and inpatient surgery	Almost always in inpatient surgery
Excision of a sebaceous cyst	Cystoscopy	Laparoscopic cholecystectomy
Excision of a nevus or lipoma	Dilatation & curettage	Radicular disc replacement
Termination of pregnancy	Adenoidectomy	Prostate surgery
	Cervical cerclage and cone biopsy	Laparoscopic appendectomy
	Cataract surgery	
	Haemorrhoidectomy	
	Hysteroscopic surgery	
	Knee or meniscus operation	
	Inguinal hernia repair in children	
	Tonsillectomy	
	Inguinal hernia repair in adults	

[1] No data available for Italy and France, the data for Switzerland are based on one Canton (Zurich).

From Table 6.2 it appears that procedures that require penetration of the skin before performing the procedure and concern the abdominal space are preferably performed in an inpatient setting. Procedures that concern the skin surface, extremities, or abdominal organs that can be reached without skin penetration are more often performed in day surgery.

On the basis of the answers given concerning the setting of surgery for the selected procedures in each country, a rough classification was made of the degree in the various countries to which day surgery is performed (see Table 6.3).

Table 6.3 Classification of countries towards setting of surgery (n=10)[1]

Mainly day surgery	More day surgery than in-patient surgery	More inpatient surgery than day surgery	Mainly inpatient surgery
Norway	Denmark	The Netherlands	Belgium
	Sweden	United Kingdom	Austria
	Finland	Switzerland[2]	Germany

[1] For Italy and France, no data are available on place of surgery

[2] The ranking of Switzerland is based on the data of only one Canton (Zurich)

Table 6.3 reveals a geographic gradient in the diffusion of day surgery. Broadly, we can state that the more northern a country, the greater the extent of day surgery.

The influence of hospital bed supply on the use of day surgery is now discussed. Hospital bed supply was operationalized as acute care hospital beds per 1000 inhabitants. The data were obtained from the OECD health data files. Change in hospital bed supply was operationalized as the percentage change in beds between 1986 and 1996. The change in hospital beds in absolute terms (in beds per 1000 inhabitants) does not show much variation between countries. However, since the countries vary significantly in the number of beds per 1000 inhabitants, the percentage change also varies considerably (from 1.5% change in Austria to almost 40% in Sweden). Countries with a large supply of acute care beds were more oriented towards inpatient procedures, while countries with a low supply had a higher day case rate (Spearman's rho = 0.78, p = 0.01). Countries that experienced substantial reductions in hospital beds also have a higher day case rate (Spearman's rho = 0.83, p= 0.03). We conclude that hypotheses 1 and 2, stating that a relative shortage of beds and a substantial reduction of hospital beds are favourable factors for the application of day surgery, are both confirmed by these data.

The orientation towards primary care was operationalized in several ways. First, we used the number of GPs per 1000 inhabitants (more GPs represents a stronger orientation towards primary care); second, we used the percentage of GPs per specialist (a higher percentage indicates a stronger orientation towards primary care). Both data were derived from the OECD health data files. Figures for 1994 were used. A third indicator of orientation towards primary care was

the supply of home nurses. Here we used the ranking used in Westert (1997). Neither the number of GPs (Spearman's rho=0.40, p=0.25) nor the percentage of GPs per specialist (Spearman's rho = 0.18, p= 0.63) influence day case orientation. The supply of home nurses correlates positively with orientation towards day care (Spearman's rho= 0.72, p=0.02). Two countries in the sample do not have outpatient departments: Denmark and Germany. However, these two countries react quite differently towards day surgery. While in Denmark day surgery is already quite a common alternative to inpatient care, Germany is still mainly oriented towards inpatient care. Overall, we conclude that hypotheses 3 and 4, stating that well developed primary care and the existence of outpatient care favour day surgery, cannot be confirmed by the data. Only the supply of home nurses seems to be positively related to day surgery positively.

To test the influence of financing systems, the country averages of surgery setting were divided into 3 categories. In Table 6.4 an overview is presented of hospital and physician financing systems for each country and the place of surgery.

Table 6.4 The coherence between financing systems and place of surgery (n=10 countries)[1]

Setting of surgery	Hospital financing			Physician remuneration	
	global budget	per diem	other	salary	fee-for-service
Mainly day surgery	1	1	2	4	
Both day surgery and in-patient	1	2		2	1
Mainly in-patient	1	2		2	1

[1] The average scores on setting for surgery for the 18 procedures for each country rank between 1 (over 90% in day surgery) and 4 (over 90% in in-patient setting). The countries were divided into three categories. The first category (average score < 2.5), consisted of Norway, Denmark, Sweden, and Finland. The second category (2.5 < average score < 3) consisted of The Netherlands, United Kingdom, and Switzerland. The third category (all others) consisted of Belgium, Germany and Austria.

The hospital financing system seems to have no relationship with surgery setting. The countries within each financing system are evenly distributed over the categories of place of surgery (see Table 6.4). The effect of physician

remuneration system transpired to be as follows. Countries where physicians received a salary were more oriented towards day surgery. Neither of the fee-for-service countries scored in the category *mainly day surgery*. Whether the financial incentives encouraged or discouraged hospitals and physicians, as judged by the experts, seems to be of no importance for the diffusion of day surgery. Countries with negatively and positively evaluated incentives are spread evenly over the categories for the orientation towards day surgery. We conclude that hospitals' financial incentives are unrelated to the availability of surgery in a day setting (rejecting hypotheses 5 and 7). The effect predicted in hypothesis 6, stating that in countries with physicians paid on a fee-for-service basis procedures are more frequently performed in day-case surgery, is contradicted by the results. Only two countries have a fee-for-service system for hospital-based physicians (Netherlands and Belgium). In neither of them is day surgery the dominant setting for the selected surgical procedures.

6.5 Conclusions and discussion

There are differences in the diffusion of day surgery among the countries of northwest Europe. In the Scandinavian countries day surgery has become fairly common practice, whereas in the more southern countries inpatient care is still the most favoured type of care. So, the first research question - whether there are differences in the diffusion of day surgery in the European countries - can be answered affirmatively for the countries that participated in our study.

It appears that the supply and substantial changes in supply of hospital beds favour day care surgery. As a result of the relative scarcity of hospital beds in low-supply countries and the large changes in some other countries, day surgery is now perceived as an alternative that can be used to meet the growing demand for healthcare. The ageing of the northwest European population is one of the factors leading to an increasing demand for healthcare, resulting in a growth of admission rates. Since demand is increasing and inpatient capacity is decreasing, day surgery may serve as an alternative to prevent waiting lists from growing excessively. Of course, there is the question of causality. Does bed-supply decrease through the availability of alternatives such as day surgery, or new technologies that shorten length of stay, or is day surgery welcomed as a solution for decreasing inpatient capacity? We consider that day surgery acts as an alternative to decreasing supply, leading to causality running from bed supply to day-surgery, since countries have differed in bed supply for a long time, even before day surgery became more commonplace. So the fact

that low supply countries tend to be more enthusiastic in applying day surgery can be seen as an attempt to meet unmet demand. In addition, the hospital bed reductions in northwest Europe often result from cost containment measures, with Roemer's Law as background: a bed built is a bed filled. No methods are available as yet for the sound estimation of sufficient inpatient care capacity for a given population.

Our hypotheses, that a strong primary care organization and the existence of outpatient departments attached to hospitals would favour day surgery, were not confirmed. Only the supply of home nurses seems to affect day surgery. Since many of the countries indicated that home nurses also played a part in aftercare, we can state that countries with a poor organization of home care may face problems in implementing day surgery.

A striking result is that financial incentives for hospitals do not appear to influence the choice for day surgery. A possible explanation for this is that the physicians decide the type of treatment and it may be difficult for the hospital management to influence them. However, also for physicians, the remuneration system plays a different part than that expected. Countries with salaried hospital physicians more often apply day surgery. This may be related to the experience of negative financial incentives as, for instance, occurs in The Netherlands. There, a surgeon carrying out inguinal hernia repair receives three times as much for it in inpatient care as would be the case in day surgery (Ankoné, 1999). Despite this financial incentive for inpatient treatment, the percentage of inguinal hernia repairs in day surgery in The Netherlands is rising. One explanation may be that the surgeon can do more than three day-case treatments in the time that would be needed for one inpatient treatment. Another possible explanation is that physicians opt for day surgery because of a shortage of inpatient capacity. A third possible explanation is that applying the modern techniques of day surgery may add to the status of the surgeon and the hospital. These possible explanations cannot however be tested with the country level data used for this study. A fourth explanation may be that the global budget systems as applied in the countries of northwest Europe are assessed not only on the basis of objective capitation criteria, but also according to hospital production characteristics. For instance, in The Netherlands formula for hospital budgets, the same procedure in day case treatment would result in a lower budget than for inpatient treatment.

Hypothesis 4, concerned with the effect of the existence of outpatient departments, could not be confirmed in our study. However, when using De Lathouwer and Poullier's data, a different conclusion may be drawn. Since neither Denmark nor Germany have outpatient departments and since both countries, according to De Lathouwer and Poullier (1998), are inpatient oriented, the conclusion may be drawn that the absence of outpatient departments may indeed slow down the introduction of day surgery. Why the two studies differ in their ranking for Denmark is not clear. The low rate of day surgery in Germany may be explained by the legal constitution. Until recently, hospitals in Germany were not allowed to see patients in an outpatient setting. Since 1992, it has been possible for hospitals to treat patients in day surgery. However, hospitals need constructional and organizational changes to facilitate these changes (Sorgatz, 1994); this will take time.

This study was carried out at country level and this unavoidably brings with it some imperfections. We were not able to study within-country variations. The use of day surgery within countries varies considerably. This variation may result from specific hospital or physician characteristics that cannot be studied at country level. Since in many countries healthcare policy is still a national matter, and reforms often affect the whole country, it is necessarily useful to identify the effect of national healthcare organization characteristics and their effect on national level.

In summary we conclude that, of the healthcare system characteristics used in this study, physician remuneration and acute-care hospital bed supply have the strongest relationship with the diffusion of day surgery.

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7 SUMMARY, DISCUSSION AND CONCLUSIONS

7.1 Introduction

In the introduction to this study we put forward three research questions. In this Chapter, answers to these questions have been formulated on the basis of the results reported in the previous Chapters. The three research questions were as follows:

1. *How does the relationship between hospital bed supply and hospital bed use vary with time and place?*
2. *What are the effects of different healthcare system characteristics on hospital bed use?*
3. *Can variations in hospital bed use be accounted for by the effects of opportunities and constraints provided by healthcare system characteristics and hospital bed supply on the decision making process by medical specialists and hospital management?*

To answer these questions, a theoretical framework was set up (see Figure 1.5, Chapter 1). This framework is based on the model for social change developed by Boudon. The interaction between physicians and hospital management is the central feature of this model. Both actors play an important part in hospital bed use; physicians admit patients and hospitals provide the facilities. The healthcare system provides the opportunities and constraints that influence the decisions of both actors. Physicians make their decisions on the basis of medical considerations. There is often a grey zone where type or course of treatment is ambiguous, leaving room for considerations other than the purely medical. The actions of both physicians and hospitals are goal oriented and constraint driven. Physicians are assumed to strive for a balance between income, workload, and social approval. Hospitals are assumed to strive for a healthy financial situation and a good public image. Both actors are assumed to prefer to act according to the incentives the healthcare system provides. When interests converge, the incentives of both actors will fortify each other. If interests diverge, the incentives of the actor with the most power will predominate. So given the restrictions and opportunities provided by healthcare system characteristics and hospital bed supply (the environment in the Boudon model) and the formal relationship between the actors (the interaction system) the decision making process will result in either the

production of hospital bed days, or an alternative decision such as postponed hospitalization, alternatives to inpatient treatments, or no treatment at all. The aggregate result of these decisions (the outcome in the Boudon model) is hospital production. Hospital bed use depends on three mutually dependent components: occupancy rate (to what extent beds are really used), admission rate, and length of stay. When hospital bed supply changes, at least one of these three values has to change. Three strategies for managing hospital bed reductions are possible. First, increase occupancy rates. Second, admit fewer patients, resulting in longer waiting lists, alternative treatments, or no treatment at all. Third, discharge patients earlier, resulting in shorter stays. The preferred strategy depends on the direction of the incentives and the power structure experienced by the actors in the interaction system.

7.2 Summary of the empirical findings

In Chapter 2, the first two research questions were addressed. Ten countries in Northwest Europe were studied in a period dominated by hospital bed reductions. The effects of bed supply, bed reductions in the previous year, and the hospital financing system on hospital bed use were investigated. The first research question addresses the variation in the relationship between hospital bed supply and bed use. Variations among the countries were found in this relationship. The hospital financing systems contributed markedly to these variations. When controlling for the financing system, a stable relationship over time was found between hospital bed supply and hospital bed use. Fewer hospital beds lead to shorter stays and fewer admissions. In contrast, over a short term (one year) bed reductions lead to longer stays. This may be the result of the shift of less severe cases to waiting lists, giving way to more severe cases needing longer stays. The second research question addresses the influence of healthcare system characteristics on hospital bed use. The hospital financing systems had an effect on how hospital beds were used. In a per diem system, higher occupancy rates and longer stays were registered, whereas in global budget systems shorter stays were registered. The hospital financing system is thus a healthcare system characteristic that influences the use of hospital beds. Different incentives from different financing systems contribute to the variation in hospital bed use.

In Chapter 3, the problems encountered in international comparative research were evaluated. The focus was on the difference between policy intentions and practice. The insights provided by this Chapter were essential for answering

the second research question. Healthcare reforms appear to be continuous processes subjected to adaptations during the implementation process and beyond. These reforms may be initiated by health policy makers, but they may also evolve through the formalization of daily practice. Unexpected or unintended side-effects can override the original intentions of the reforms. The gradual process of reform complicates research into its effects. Several years may elapse between the before and after situations. Since all kinds of other processes intervene in healthcare provision (ageing of the population, technological development, and so forth) isolating the effect of a reform becomes extremely difficult. The continuous, changing character of reform is not exclusive to decentralized healthcare systems. Reforms also change in centrally organized systems during the implementation process, for example.

In Chapter 4, a case study of the effect of a changing financing system was described. In Hungary, the financing system changed from an open-ended financing system having no relationship with hospital production into a diagnosis related groups financing system (DRG system). When the financing system changed, the hospital incentives changed so as to promote shorter stays and more admissions. This effect was indeed found, regardless of any differences in hospital bed supply. However, more admissions and shorter stays result in a higher workload (more procedures to be carried out, and patients more sick, since the first days of hospitalization are normally more care intensive than the latter days). Creative administration was a strategy used to raise revenues, but to limit the increase in workload. Evidence for this was found in the increase of the case-mix index. This index indicates the severity of cases treated in a given hospital in a certain period of time. So, another answer to research question 2 is that the hospital financing system influences hospital bed use and this effect overrides Roemer's law (a bed built is a bed filled). In addition to the hospital financing systems, the effects of hospital bed supply were also studied. The different regions in Hungary differ in hospital bed supply, but the same healthcare system applies. We found support for Roemer's law: when more beds were available there were more admissions and more bed days, although each extra bed was filled less efficiently, or less completely. This is in line with the findings of Schieber and colleagues (Schieber et al., 1991).

In Chapter 5 we address the question of the distribution of power between hospital management and physicians in order to answer research question 3. When there is a divergence of interests (as a result of incentives from the

financing systems, for example) the incentives of the actor with the greatest power prevail. When there is a convergence of interests, both actors cooperate. In France there are two sectors providing acute hospital care; public and private. In the public sector, the hospital is paid by global budgets and the physicians are in the salaried service of the hospital. In the private sector, hospitals are paid per diem and physicians are remunerated on a fee-for-service basis. In the public sector there is a convergence of (financial) interests. The global budget favours short stays, low admission rates, and low occupancy rates - as does the salary-system; neither system is workload related. This explanation is supported by the lower occupancy rates and lower admission rates found in the public sector compared with the private sector. However, in the public sector greater bed supply in a region leads to higher admission rates. This situation may be explained from the hospitals' incentive to maintain the organization: using a sufficient part of the capacity may enable the hospital to resist further, or larger bed reductions. In the private sector there is a divergence of interests. The per diem system favours long stays, while the fee-for-service system for physicians favours high admission rates. The relatively high admission rates and the high occupancy rates compared with the public sector demonstrate the effect of the physicians' incentives. The effect of higher admission rates in the case of larger bed supply in a region also indicated that in the private sector the physicians' financial incentives prevail over the hospitals' incentives.

Chapter 6 discusses the alternatives to inpatient hospital care and relates to research question 2. If the strategy for managing bed reductions is to admit fewer patients, there has to be an alternative for them. Three possibilities were formulated. First, less severe cases may be postponed by putting them on a waiting list. Second, alternatives for inpatient care may be found. Third, physicians may refrain from treatment. Chapter 6 discussed day surgery as an alternative to inpatient care. We found that day surgery was used more in countries with a low bed supply or which had experienced substantial bed reductions. The expansion of day surgery occurred despite the conflicting financial interests for physicians and hospitals. These findings can be interpreted as an indication that applying day surgery can be seen as an attempt to meet unmet demand. Another explanation for the growing diffusion of day surgery may be that applying the modern techniques of day surgery enhances the prestige of both surgeon and hospital.

7.3 Evaluation of the theoretical framework

In each Chapter, we reported the hypotheses formulated on the basis of the theoretical framework. Table 7.1 lists all the hypotheses, ordered by the topics 'effects of bed supply', 'effects of financing systems', and, 'effects of other healthcare characteristics'. The conditions under which the hypotheses were tested and the results are shown.

Our evaluation reveals effects from both bed supply and financing systems on the choices hospitals and physicians make. First we discuss the implications of differences in bed supply on hospital bed use. In a well supplied bed situation the extra beds were indeed filled, but less efficiently than in a low bed supply situation. The effects generated by bed reductions become integrated into the effects of overall bed supply and financing systems, resulting mostly in non significant effects of bed reductions. However, some striking effects of bed reductions were found that did not fit into our framework. An increase in length of stay was demonstrated in the case of bed reductions. A plausible explanation for this may be that less severe cases are transferred to waiting lists or alternatives such as day surgery, leaving the more severe cases for inpatient treatment and thereby increased length of stay. In the absence of a financial incentive (in the case of non workload related financing systems) we expected the actors to reduce their workload when faced with bed reductions. In the case of France, however, we found that under these conditions actors tried to maintain the workload to which they were accustomed resulting in an increasing occupancy rate. Physicians are apparently reluctant to withhold treatment from patients, which is in line with our statement that physicians' main goal is to improve their patients' health.

Table 7.1 Summary of hypotheses and results

Hypotheses	Source	Kind of data	Result/remarks
The effect of hospital bed supply			
1 In the case of bed reductions in an area, hospitals react with: a an increase in occupancy rates; b a decrease in admissions; c a decline in average length of stay.	Chapter 2, Hypothesis 1	10 countries, time series, OECD health data files	1a: rejected 1b: rejected 1c: rejected length of stay increases; overall bed supply influences bed use
	Chapter 5, Hypothesis 1	France, 22 regions, time series, two different hospital financing systems	1a: confirmed for global budget 1b and 1c: rejected
2 Areas with a high bed supply has: a a longer average stay; and b ore admissions than areas with a low bed supply	Chapter 4, Hypothesis 1a and 1b	Hungary, 19 counties, 2 points of time, changing hospital financing system	2a: confirmed 2b: rejected an extra bed built is filled, but less efficiently
3 In the case of bed reductions in an area: a in well supplied areas the occupancy rates rise more than in less well supplied areas; b in well supplied areas, the number of admissions fall less than in less well supplied areas; c in well supplied areas, the length of stays will reduce stronger than in less well supplied areas.	Chapter 5, hypothesis 2	France, 22 regions, time series, two different hospital financing systems	3a: rejected 3b: rejected 3c: rejected
4 a In areas with a high acute care bed supply, day surgery rates are lower than in areas with a low bed supply; b In areas which have experienced a substantial reduction of hospital beds, the tendency to look for alternative forms of care is stronger and there is a higher day surgery rate.	Chapter 6, hypotheses 1 and 2	12 countries, 1 point of time, data collected by questionnaires	4a: confirmed 4b: confirmed

-Table 7.1-

Hypotheses	Source	Kind of data	Result/remarks
The effect of financing systems			
5 In the case of reductions in acute care hospital bed supply, the preferred strategy of a hospital is: a In the case of a per diem hospital financing system in an area, the occupancy rate increases, there is no effect on length of stay, and admissions decrease; b In the case of a global budget hospital financing system in an area, length of stay decreases, the number of admissions falls, and occupancy rates do not rise, but may even decline.	Chapter 1, Hypothesis 2	10 countries, time series, OECD health data files	5a: rejected 5b: rejected hospital financing systems influence hospital bed use.
6 In a global budget system with salaried physicians, the preferred strategy to manage bed reductions is to reduce the admission rate, leaving occupancy rates and length of stays unchanged	Chapter 5, hypothesis 3	France, 22 regions, time series, two different hospital financing systems	rejected; occupancy rates increased
7 In a per diem system with physicians paid fee-for-service, the preferred strategy to manage bed reductions is to reduce the length of stay, leaving occupancy rates and admission rates unchanged	Chapter 5, Hypothesis 4	France, 22 regions, time series, two different hospital financing systems	rejected
8 a The change from an open-ended financing system towards a DRG system leads to shorter stays and more admissions. b The effect of the DRG system is stronger in high supply areas than in low supply areas.	Chapter 4, Hypothesis 1c and 1d	Hungary, regional statistics, 2 points of time, changing hospital financing system	8a: confirmed 8b: rejected
9 a The change from an open-ended financing system towards a DRG system leads to a higher case-mix index.	Chapter 4, hypothesis 2	Hungary, 19 counties, two points of time, changing hospital financing system	9a: confirmed 9b: rejected 9c: confirmed

-Table 7.1-

Hypotheses	Source	Kind of data	Result/remarks
b In areas with a low bed supply, the case-mix index rises more than in areas with a high bed supply. c After the introduction of the DRG system, the occupancy rate increases. d The occupancy rate in high supply areas increases more than in low supply areas.			9d: rejected
10 In the case of hospital bed reductions, the preferred strategies in different physician remuneration systems are: a In the case of fee-for-service remuneration, the occupancy rates increase, the average lenght of stay decreases, and there is no no effect on number of admissions. b In the case of salaried physicians there is no effect on occupancy rates or length of stay. The number of admissions diminishes.	Chapter 2, hypothesis 3	10 countries, time series, OECD health data files	neither confirmed nor rejected
11 The diffusion of day surgery as an alternative to inpatient care: a In areas with a global budget financing system, the day surgery rate is higher than in areas with a per diem system; b In areas where physicians are remunerated per case or fee-for-service, the day surgery rate is higher than in areas where physicians receive a (fixed) salary; c In areas where the costs of day surgery are covered by the returns, the day surgery rate is higher than in areas where this is not the case.	Chapter 6, hypotheses 5, 6 and 7	12 countries, 1 point of time, questionnaires	11a-c: rejected

-Table 7.1-

Hypotheses	Source	Kind of data	Result/remarks
Other healthcare system characteristics:			
12 Aftercare organization	Chapter 6, hypotheses 3 and 4	12 countries, 1 point of time, questionnaires	12a: rejected, although the diffusion of home nurses appear to be important 12b: rejected
a In areas that are strongly secondary care oriented, the day surgery rate is lower than in areas with a stronger primary care orientation;			
b In areas where hospitals do not have outpatient departments, the day surgery rate is lower than in areas that do have outpatient departments.			

We discuss next the effects of the different financing systems. These effects seem to be limited. Under the low bed supply condition, day surgery as an alternative to inpatient care became popular despite the negative financial incentives. This finding may be accounted for by the restrictions imposed on the choices open to hospital or physician with a limited bed supply. When bed supply turns into a shortage of beds, alternatives will be sought. This search is the result of the physicians' main goal to improve patients' health. However, this argument does not explain why, despite the negative incentives, day surgery is also rising in high supply situations -although less rapidly than in low supply conditions. Two possible explanations can be put forward. First, day surgery may enhance a physician's or hospital's prestige (in line with the goal of both actors to gain social approval). Second, the patient, so far seen as a passive actor, may play an active role here. For patients, in contrast with the choices available among different inpatient treatments, day surgery is a visible alternative to inpatient care. Since most people dislike staying in hospital, day surgery may be a popular alternative, in which case patients will ask for it. Different courses of inpatient treatment will be less visible for patients and therefore more difficult to disentangle and influence. When physicians have to choose between one inpatient treatment and another, it is difficult for patients to express any preference since they are not usually aware of or exposed to these options. In the case of day surgery as opposed to inpatient care, the patient is well able to perceive the difference. We assume that most patients will favour day surgery and will ask for it if they have heard of the possibility, or have acquaintances who have experienced it. We therefore anticipated that the role of the patient might become more prominent in the model we constructed in this study, at least with respect to the choice between day surgery and inpatient treatment.

In our framework, we hypothesised that the power balance of the actors in the interaction system would affect the decision making process for hospitalization. We found some evidence for the importance of the power balance between the actors in explaining the effects of different incentives generated by the financing systems. When incentives from different financing systems of hospital management and physicians conflict with each other, the incentives of the most powerful actor prevail.

Although the effects of financing systems and hospital bed supply are not unknown, the advantage of our study is that our model can be used to predict the behaviour of physicians and hospitals in inpatient care. The theoretical

model is based on the interests of physicians and hospital management as goal oriented actors, so predictions can be formulated concerning the effect of new developments by analysing the incentive structure and power balance between the actors. How actors will react in the case of conflicting internal goals remains unclear. In a situation where a physician has the financial incentive to treat as few patients as possible, but is unable to refuse patients because of the physician's goal to improve the patient's health, this model does not provide sufficient insight to predict the outcome of the physician's decision making process.

Differences in the supply and use of hospital beds in various countries are substantial. An important question is how these differences affect the quality of healthcare. In this study, the quality of healthcare was not included. However, to evaluate differences among countries, an understanding of the effect on the quality of care and the health status of the population is necessary. It is also important to acquire an understanding of the balance between primary care, inpatient care and day surgery. To what extent these types of care are exchangeable and how shortages in one type of care can be compensated by other types are important issues.

7.4 Reflections on methodology

This study is based on historical data. The problem with this kind of data is that they were not collected specifically for the purpose of this study, so inevitably for our purposes the data had shortcomings. For instance, the definition of acute care hospitals differs per country. Sometimes psychiatric care or rehabilitation care is included, while elsewhere they are registered separately. Sometimes data considered relevant for this study (data on waiting lists) are not available. The choice of cross-country time series analysis, providing the opportunity to separate time and place effects, made it necessary to use existing data files, since it would have been difficult to obtain historical data otherwise. The data used came mainly from existing national and international data files. The international comparisons were based on the OECD health data files (except for the data on day surgery, which were collected via a questionnaire). The advantage of using these data is that efforts have already been made to make data comparable among countries.

For the Hungary study, the results have to be interpreted with care, because it is not clear whether the data registered reflect actual behaviour. This

discrepancy stems from a lack of control on hospital output in terms of both hospital production (treatments) and administrative products such as financial reports. For instance, the health insurance funds evaluate the appropriateness of a treatment retrospectively. We found marked effects of the change in financing system on hospital bed use. The interpretation of the results may be as follows. The effects found may be an enlargement of those that would be found in countries with a more effective control system, with the effects in the same direction. In the United States, the control of physicians and hospitals is much stronger. However, US studies into the effect of DRG financing systems found the same direction of effects as those demonstrated in Hungary, although they were less prominent.

The use of time series data was useful to enable a distinction to be drawn between effects related to time (technological development) and effects related to geographical location (healthcare system characteristics). Developments over time such as medical technologies have an important influence on hospital care, but they do not occur simultaneously in different places. Different healthcare systems exert different pressures on the actors involved. With time series analysis, these effects could be studied. Another advantage is that for a time series, relatively few countries or regions are required.

In this study, the data analysed were at macro level (aggregated data at country or regional level). The macro level of the data had the advantage that small scale problems, such as defining the service area of a hospitals, or border crossings in healthcare provision, had a relatively low impact. An important disadvantage of the macro level of the data is that the problem of the actors' conflicting internal goals could not be studied.

The problem of how to analyse the exact process of reforms and thereby to assess the complex incentive structure based on these reforms is a difficult one (see Chapter 3) and is a complicating factor in studies such as this. Researchers studying the effects of reforms should observe critical reflection on these reforms and their effects. One cannot rely on one source only, not even on primary sources such as law texts (hospital laws, or other official documents describing the content of the reform). When consulting different sources (experts, literature, primary sources), a comprehensive insight may be gained, but it has to be appreciated that unexpected behaviour may still occur.

What are the important issues for future studies into hospital care? One important point is that technological developments have rendered hospital care no longer coterminous with inpatient care. Patients' treatments have become differentiated and day surgery and outpatient treatment are important lines of business. The treatment capacity of a hospital can no longer be measured by means of hospital bed supply. It is important to develop an indicator describing hospital treatment capacity. There will be implications for the collection of (inter)national data on hospital capacity and use before this parameter can be used.

7.5 Policy implications

The findings of this study may have certain implications for healthcare policy makers. For them, the fact that financing systems influence hospital bed use is an important finding. Apparently, hospital bed use can be changed by changing financial incentives. There are however limits to the extent to which financial incentives direct behaviour. When treatment is considered necessary, physicians are reluctant to withhold treatment from a patient.

An important insight is the significance of the power balance between hospitals and physicians. Hospitals provide the facilities to admit and treat patients, but physicians make the ultimate decisions. An individual evaluation of the appropriate treatment is made for each patient. This individual nature of medical decisions makes it difficulty to influence the demand side: patients do not choose to have health problems which require hospitalization. The fact that medical decision making is not a public process can make it difficult for hospitals to influence it in the direction favouring their incentives. It is important to enhance our understanding of this power balance if we are to distribute scarce resources efficiently and motivate actors effectively. Policy makers have to ask themselves whether the effects of changes resulting from different financial incentives are desirable. For instance, quality of care may be a more important consideration than cost containment.

Financial incentives are clearly not the only motives for hospitals and physicians in their medical decision making. When treatment is considered necessary and conditions are restrictive, solutions will nevertheless be sought to provide treatment, even when financial incentives point in the direction of no treatment. The rise of day surgery, especially in low bed supply areas is an example of this phenomenon. This is an important point in the discussion of

the introduction of the market mechanism into medical decision making. Physicians find it difficult to refuse a patient and will try to find alternative solutions. Financial benefits concerning the choice for treating patients are certainly not the only considerations in the medical decision making process.

The hospital as an organization may also learn from this study. It is important for hospitals to appreciate that, when they want to achieve certain goals, either the physicians' perceptions must concur with these goals, or the power balance must be in the hospital's advantage.

The magnitude of waiting lists in hospital care is not yet clear. Before a full understanding of the effect of restrictions on hospital care can be attained, an understanding of the dynamics of waiting lists is needed. Insight is needed into the extent to which waiting lists act as a buffer for temporary shifts in demand. Insight is also needed into the extent to which waiting lists reflect structural shortages in hospital care provision. Currently, enhancing insight is difficult because the registration of waiting lists is not standardized within or across countries. A uniform registration of waiting lists is required, although experiments in the Netherlands show that this is difficult to achieve even within one country.

In summarizing, we can state that the theoretical framework described in this study can be used as a first step in modelling the process of healthcare provision. Important elements in such a model are the opportunities and restrictions provided by healthcare systems and hospital bed supply. In the decision making process, the power balance between hospital and physician appears to be important when interests diverge. Medical considerations also play an important part; physicians try to treat patients whenever they consider it necessary, despite possible opposing financial incentives.

References

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8 SAMENVATTING (SUMMARY IN DUTCH)

8.1. Inleiding

Roemer deed in 1959 onderzoek naar het effect van uitbreiding van klinische ziekenhuiscapaciteit op het gebruik van die capaciteit. Hij ontdekte dat zowel het aantal opnames als de ligduur toenamen, terwijl er geen aanwijsbare verandering in de gezondheidstoestand van de bevolking opgetreden was. Deze waarneming werd later bekend als Roemer's wet: 'a bed built is a bed filled' (vrij vertaald betekent dit: een nieuw bed wordt zeker gebruikt). Toen eind jaren '70 de grenzen aan de financiële groei van de gezondheidzorg bereikt werden, werd de wet van Roemer aangegrepen om het mes in de ziekenhuiscapaciteit te zetten. Samen met de ontwikkelingen op medisch technologisch gebied veroorzaakte dit een sterke daling van het aantal ziekenhuisbedden in Europa. Inmiddels was echter duidelijk geworden dat de beddencapaciteit niet de enige bepalende factor was voor het gebruik van deze bedden. Ook de wijze waarop de gezondheidszorg georganiseerd is leek van invloed te zijn. In deze studie hebben we geprobeerd beide determinanten van het gebruik van ziekenhuis-bedden samen te voegen en middels een theoretisch model hebben we verklaringen opgesteld waarom bepaalde effecten gevonden worden. In de volgende alinea's worden achtereenvolgens de onderzoeksvragen en het theoretisch model besproken. Vervolgens komen de resultaten uit de diverse hoofdstukken aan bod en we sluiten af met een evaluatie en discussie van deze resultaten.

In dit onderzoek worden drie vragen gesteld. De vragen luiden:

1. *Hoe varieert de relatie tussen aanbod van ziekenhuizen en het gebruik ervan door de tijd heen en tussen verschillende gebieden?*
2. *Wat is het effect van verschillende gezondheidszorgsystemen op het gebruik van ziekenhuisbedden?*
3. *Kunnen variaties in ziekenhuisbedden verklaard worden uit het effect van mogelijkheden en beperkingen van het gezondheidszorgsysteem en het aanbod van bedden op het besluitvormingsproces van medisch specialisten en ziekenhuismanagement?*

Om deze vragen te kunnen beantwoorden is een theoretisch raamwerk ontwikkeld (zie figuur 1.5). Dit raamwerk is gebaseerd op het model voor

sociale verandering, dat ontwikkeld werd door Boudon. Centraal in dit model staat de interactie tussen specialisten en ziekenhuismanagement. Beide actoren spelen een belangrijke rol in de totstandkoming van gevulde bedden in ziekenhuizen. De besluitvorming van de artsen resulteert in opnames van patiënten, terwijl ziekenhuizen de faciliteiten leveren om deze patiënten te kunnen opnemen. De medisch specialisten baseren hun besluit tot opname op medische gronden. Echter, vaak is er een zogenaamd 'grijze' zone, waarin het niet vast staat welke behandeling de meest geschikte is. Als dit het geval is, ontstaat er ruimte voor artsen om naast puur medische ook andere overwegingen in hun besluitvorming mee te laten wegen. Het model gaat uit van de aanname dat artsen en ziekenhuizen doelgericht werken, gegeven de beperkingen van hun omstandigheden. We nemen aan dat artsen streven naar een balans tussen inkomen, werkdruk en sociale goedkeuring. Van ziekenhuizen verwachten we dat ze streven naar een gezonde financiële situatie en een goed imago. Van beide actoren nemen we aan dat ze zich in hun keuzes laten leiden door de incentives vanuit het gezondheidszorgsysteem. Als de belangen van beide actoren met elkaar overeenkomen, dan worden de incentives van beide actoren versterkt. Als de belangen uiteenlopen, dan zullen de incentives van de actor met de beste machtspositie domineren. Dus gegeven de beperkingen en de mogelijkheden vanuit het gezondheidszorgsysteem en het aanbod van ziekenhuisbedden (de *omgeving* in het model van Boudon) en de formele relatie tussen de actoren (het *interactiesysteem*) zal het besluitvormingsproces resulteren in de totstandkoming van ziekenhuisbeddagen, of een alternatieve beslissing, zoals uitgestelde opname of alternatieven voor klinische opname of het besluit niet te behandelen. Het geaggregeerde resultaat van al deze beslissingen noemen we ziekenhuisproductie (de *uitkomst* volgens het model van Boudon). Het gebruik van ziekenhuisbedden bestaat uit drie verschillende, maar onderling afhankelijke componenten: de *bezettingsgraad* (de mate waarin de bedden daadwerkelijk gebruikt worden), de *opnamegraad* (het percentage van de bevolking dat wordt opgenomen) en de *ligduur*. Als het aanbod van ziekenhuisbedden verandert, dan moet tenminste een van deze drie componenten wijzigen. We formuleren drie strategieën om bedreducties op te vangen. Ten eerste kan de bezettingsgraad worden verhoogd. Ten tweede kunnen er minder patiënten opgenomen worden, hetgeen resulteert in langere wachtlijsten of alternatieve behandelingen of het besluit niet te behandelen. De derde optie is om patiënten eerder uit het ziekenhuis te ontslaan, waardoor de ligduur korter wordt. Welke strategie de voorkeur heeft, hangt af van de richting van de incentives en de machtsverhouding tussen de actoren in het interactiesysteem.

8.2. Samenvatting van de resultaten

In hoofstuk 2 komen de eerste twee onderzoeksvragen aan de orde. Tien landen in Noordwest Europa werden bestudeerd in een periode die gekenmerkt wordt door reductie van ziekenhuisbedden. Het effect van het aanbod van ziekenhuisbedden, de beddenreducties in het voorgaande jaar en de wijze waarop ziekenhuizen gefinancierd worden stonden centraal. De eerste onderzoeksvraag van dit hoofdstuk betrof de variatie in de relatie tussen het aanbod van ziekenhuisbedden en het gebruik ervan. We vonden variaties in deze relatie tussen de verschillende landen. Het financieringssysteem droeg significant bij aan deze variaties. Als er gecontroleerd werd voor het financieringssysteem, bleek er een stabiele relatie te bestaan door de tijd heen. Een lager aanbod leidde tot minder opnames en tot kortere ligduren. Echter, reducties op korte termijn (een jaar) bleken te leiden tot langere ligduren. Dit kan het gevolg zijn van de verschuiving van minder ernstige gevallen naar wachtlijsten, waardoor de overblijvende ernstigere gevallen resulteren in langere ligduren. De tweede onderzoeksvraag van hoofdstuk 2 richtte zich op de invloed van gezondheidszorgsysteem-kenmerken op het gebruik van bedden. Het financieringssysteem bleek van invloed op het gebruik. In een *per diem* systeem werden hogere bezettingsgraden en langere ligduren geregistreerd, terwijl in systemen met globale budgetten kortere ligduren geregistreerd werden. Het financieringssysteem is dus een kenmerk van het gezondheidszorgsysteem dat bijdraagt aan variatie in het gebruik van ziekenhuisbedden.

In hoofdstuk 3 werden de problemen besproken die naar voren komen bij het internationaal vergelijkend onderzoek. Het verschil tussen beleidsintentie en praktijk stond hierbij centraal. De inzichten die zo verkregen werden waren van essentieel belang voor het beantwoorden van de tweede onderzoeksvraag. Hervormingen in de gezondheidszorg blijken continue processen te zijn, die tijdens de implementatie en daarna aan aanpassingen onderhevig zijn. De hervormingen kunnen geïnitieerd worden door beleidsmakers, maar kunnen ook het gevolg zijn van een formalisering van reeds bestaand dagelijks gebruik. Onverwachte en onbedoelde neveneffecten kunnen de oorspronkelijke intenties van de hervorming te niet doen. Het geleidelijke proces van een hervorming bemoeilijkt het onderzoek naar de effecten van deze hervorming. Er kunnen verscheidene jaren voorbijgaan tussen de situatie voor en de situatie na invoering van de hervorming. In de tussentijd kunnen allerlei andere processen interveniëren met de gezondheidszorgvoorziening (zoals de vergrijzing van de bevolking, technologische ontwikkelingen, enzovoort). Hierdoor wordt het

isoleren van het effect van een hervorming sterk bemoeilijkt. Het continue en veranderende karakter van hervormingen is niet exclusief voor decentraal georganiseerde gezondheidszorgsystemen. Ook hervormingen in centraal georganiseerde systemen veranderen bijvoorbeeld gedurende het implementatieproces.

In hoofdstuk 4 is een case-studie uitgevoerd naar het effect van de invoering van een nieuw financieringssysteem. In Hongarije veranderde het financieringssysteem van een open-eind systeem zonder relatie tot de productie van de ziekenhuizen naar een diagnosegroepen gerelateerd systeem *(diagnoses related groups system, DRG-systeem)*. Als gevolg van de verandering van het financieringssysteem veranderden de incentives van het ziekenhuis. Kortere ligduren en een hogere opnamegraad werden aantrekkelijk. Uit de productiegegevens van de diverse provincies in Hongarije blijkt dat dit effect inderdaad optrad, ongeacht verschillen in het aanbod van ziekenhuisbedden tussen de provincies. Meer opnames en kortere verblijven leiden echter tot een hogere werkdruk (er worden meer behandelingen uitgevoerd en de patiënten zijn gemiddeld zieker omdat de eerste dagen van een verblijf meestal intensievere verzorging vergen dan de latere dagen). Als antwoord hierop werd men creatief met de registratie van de opnames. Door patiënten in een financieel gunstige DRG in te delen konden de inkomsten verhoogd worden zonder de overeenkomstige toename van de werkdruk. Dat deze strategie inderdaad plaatsvond is terug te vinden in de verhoging van de zogenaamde case-mix index. Deze index geeft aan wat de gemiddelde ernst van de gevallen is die in een gegeven ziekenhuis(-regio) behandeld worden over een gegeven tijdsperiode. Het onderzoek in Hongarije leidde tot een antwoord op de tweede onderzoeksvraag, namelijk het inzicht dat het financieringssysteem van ziekenhuizen het gebruik van ziekenhuisbedden beïnvloedt en dat dit effect sterker kan zijn dan Roemers Wet. (Roemers Wet luidt: a bed built is a bed filled (vrij vertaald, een nieuw bed wordt altijd gebruikt). Naast het financieringsysteem werd ook het effect van het aanbod van ziekenhuisbedden onderzocht. De verschillende provincies in Hongarije verschillen in het aanbod van bedden, terwijl ze wel onder hetzelfde gezondheidszorgsysteem vallen. We vonden een bevestiging van de Wet van Roemer: als er meer bedden beschikbaar zijn worden er meer beddagen geproduceerd, alhoewel elk extra bed minder efficient gevuld werd, ofwel minder compleet. Dit is overeenkomstig de resultaten van Schieber en anderen (Schieber, Poullier et al., 1991).

In hoofdstuk 5 wordt aandacht besteed aan de machtsverhouding tussen ziekenhuismanagement en artsen om onderzoeksvraag 3 te kunnen beantwoorden. Als de belangen uiteenlopen (als gevolg van verschillende incentives vanuit de financieringssystemen bijvoorbeeld) dan zullen de incentives van de actor met de meeste macht prevaleren. Als de belangen overeenkomen, dan zullen beide actoren samenwerken. In Frankrijk zijn twee sectoren die ziekenhuiszorg leveren, een publieke en een private sector. In de publieke sector worden de ziekenhuizen betaald volgens een globaal-budget systeem en zijn de artsen in dienst van het ziekenhuis en ontvangen een salaris. In de private sector worden de ziekenhuizen per diem betaald en de specialisten worden per verrichting betaald. In de publieke sector komen de (financiële) belangen van de beide actoren overeen. In een globaal budget-systeem is het aantrekkelijk om de ligduren kort te houden, de opnamegraad laag evenals de bezettingsgraad. Vanuit het salaris-systeem komen dezelfde prikkels. Geen van beide systemen is gerelateerd aan de hoeveelheid werk. In de publieke sector worden inderdaad een lagere opnamegraad en een lagere bezettingsgraad gevonden ten opzichte van de private sector. Echter, als er in de publieke sector in de ene regio meer bedden zijn dan in de andere, dan wordt daar een hogere opnamegraad gevonden. Dit kan verklaard worden aan de hand van de incentives voor ziekenhuizen tot instandhouding van de organisatie: als er een voldoende hoeveelheid van de beschikbare bedden gebruikt wordt, dan kan dat voor het ziekenhuis een argument vormen tegen eventuele verdere bedreducties. In de private sector lopen de belangen van ziekenhuis en specialisten uiteen. In het per diem systeem is het aantrekkelijk om patiënten lang in het ziekenhuis te laten, terwijl het systeem waarbij per verrichting betaald wordt het financieel aantrekkelijk maakt om zoveel mogelijk patiënten op te nemen. De relatief hoge opnamegraad en de hoge bezettingsgraad in vergelijking met de publieke sector duiden op het effect van de incentives van de specialisten. De hogere opnamegraad als er meer bedden in een regio zijn, duidt eveneens erop dat in de private sector de financiële belangen van de specialisten de overhand hebben boven de belangen van het ziekenhuis.

In hoofdstuk 6 wordt aandacht besteed aan de alternatieven voor klinische zorg. Dit hoofdstuk heeft betrekking op onderzoeksvraag 2. Als het opnemen van minder patiënten wordt gebruikt als strategie om bedreducties te hanteren, dan moeten er alternatieven zijn voor de patiënten die niet opgenomen kunnen worden. Er zijn drie mogelijkheden voor deze patiënten. Ten eerste kunnen minder ernstige gevallen op de wachtlijst geplaatst worden. Ten tweede kunnen er alternatieven voor klinische zorg aangewend worden.

Ten derde kunnen artsen afzien van behandeling. In hoofdstuk 6 wordt dagchirurgie als alternatief voor klinische zorg bestudeerd. Dagchirurgie blijkt vaker toegepast te worden in landen die een laag beddenaanbod hebben of in landen waar het beddenaanbod sterk afgenomen is. De toename van dagchirurgie vindt plaats ondanks dat dit niet financieel aantrekkelijk is voor ziekenhuizen en specialisten. Deze resultaten kunnen geïnterpreteerd worden als een indicatie dat dagchirurgie wordt toegepast om aan de vraag naar zorg te kunnen voldoen. Een andere verklaring voor de toenemende diffusie van dagchirurgie kan zijn dat de moderne technieken zoals gebruikt bij dagchirurgie bijdragen aan een toename van het prestige van zowel arts als ziekenhuis.

8.3 Evaluatie van het theoretisch kader

In tabel 7.1 (zie hoofdstuk 7) staat een overzicht van alle hypothesen die in de diverse hoofdstukken geformuleerd zijn, met daarbij een indicatie onder welke condities deze hypothesen getest zijn en of ze uitgekomen zijn. Uit de resultaten-hoofdstukken (hoofdstuk 2 tot en met 6) blijkt dat er effecten zijn van zowel het aanbod van bedden als het financieringssysteem op de keuzen die ziekenhuizen en specialisten maken. Als eerste wordt het effect van verschillen in bedaanbod op ziekenhuisbedden besproken. Als er een groot aanbod van bedden is, dan blijken de extra bedden inderdaad gevuld, maar niet zo efficiënt als in een situatie met weinig bedden. Het effect van beddenreducties bleek in dezelfde richting te werken als het effect van totale bedaanbod, waardoor meestal geen significante effecten voor bedreducties gevonden werden. Toch werden er enkele opvallende effecten van bedreducties gevonden die niet in ons theoretisch kader pasten. Zo vonden we een toename van de ligduur in geval van beddenreducties. Een aannemelijke verklaring hiervoor is dat de minder ernstige gevallen op een wachtlijst geplaatst werden of in dagchirurgie behandeld werden. Hierdoor blijven voor de klinische behandeling de ernstigere gevallen over, waardoor de ligduur toeneemt. Als er geen financiële belangen waren (in het geval van niet werk-gerelateerde betalingssystemen) verwachtten we dat de actoren hun werkbelasting zouden verminderen in geval van beddenreducties. In Frankrijk vonden we echter dat onder deze omstandigheden de actoren probeerden de werkbelasting waaraan ze gewend waren te handhaven. Blijkbaar zijn artsen terughoudend in het afwijzen van behandelingen voor patiënten. Dit is een bevestiging voor ons bewering dat het hoofddoel van artsen het verbeteren van de gezondheid van patiënten is.

Vervolgens gaan we in op de effecten van de verschillende financieringssystemen. Deze effecten lijken beperkt te zijn. Als er weinig bedden zijn, dan blijkt dagchirurgie een populaire oplossing voor het capaciteitstekort ondanks de negatieve financiële prikkels. Dit kan verklaard worden vanuit de beperkingen in de keuzes die open staan voor ziekenhuizen en artsen bij een laag beddenaanbod. Als het beddenaanbod een beddentekort wordt, dan worden alternatieven gezocht. Dit is het gevolg van het hoofddoel van artsen om de gezondheid van patiënten te verbeteren. Dit verklaart echter niet waarom, ondanks de negatieve financiële incentives, dagchirurgie ook toeneemt in situaties waar veel bedden zijn, alhoewel minder snel dan in de lage aanbodsituaties. Hiervoor zijn twee verklaringen mogelijk. Ten eerste kan het toepassen van dagchirurgie bijdragen aan het prestige van de arts of van het ziekenhuis (dit komt overeen met het doel van beide actoren om sociale goedkeuring te verwerven). Ten tweede kan de patiënt, die we tot nu toe als passieve actor beschouwd hebben, hier een rol spelen. Dagchirurgie is voor patiënten een zichtbaar alternatief voor klinische zorg. Daar de meeste mensen niet graag in het ziekenhuis verblijven, kan dagchirurgie een aantrekkelijk alternatief zijn. In dat geval zullen patiënten er om vragen. Verschillen tussen klinische behandelingen zullen minder zichtbaar zijn voor patiënten en daarom moeilijker te traceren en te beïnvloeden. Als artsen tussen twee verschillende klinische behandelingen kiezen, dan is het moeilijk voor patiënten om hun voorkeur uit te spreken, omdat ze zich meestal niet bewust zijn dat er verschillende keuzemogelijkheden zijn en ze ook niet bij het keuzeproces betrokken worden. In het geval van dagchirurgie als alternatief voor klinische opname is het verschil wel duidelijk voor de patiënt. We nemen aan dat de meeste patiënten een voorkeur hebben voor dagchirurgie en er om zullen vragen als ze gehoord hebben van de mogelijkheid, of mensen kennen die er ervaring mee hebben. We verwachten daarom dat de patiënt een meer prominente rol zal krijgen in het door ons opgestelde theoretisch kader. In ieder geval voor zover het de keuze tussen dagchirurgie en klinische opname betreft.

In ons theoretisch kader voorspelden we dat de machtsverhouding van de actoren in het interactiesysteem het besluitvormingsproces zou beïnvloeden. We vonden enige evidentie voor het belang van de machtsverhouding tussen de actoren in de verklaring van het effect van verschillende incentives vanuit de financieringssystemen. Als de financiële belangen van ziekenhuismanagement en specialisten tegenstrijdig zijn, dan prevaleren de belangen van de actor met de meeste macht.

Alhoewel de effecten van financieringssystemen en het aanbod van ziekenhuisbedden niet onbekend zijn, is het voordeel van ons onderzoek dat het theoretisch kader gebruikt kan worden om gedrag van artsen en ziekenhuizen in geval van klinische zorg te voorspellen. Het theoretisch model is gebaseerd op de belangen van specialisten en ziekenhuismanagement als doelgerichte actoren, waardoor voorspellingen geformuleerd kunnen worden omtrent het effect van nieuwe ontwikkelingen door het analyseren van de incentive structuur en de machtsverhouding tussen de actoren. Hoe de actoren zullen reageren in het geval van conflicterende interne belangen blijft echter onduidelijk. In een situatie waar de arts een financieel belang heeft bij het behandelen van weinig patiënten, maar patiënten niet kan weigeren gezien zijn doel om de gezondheid van de patiënt te verbeteren, dan geeft het model onvoldoende inzichten om de uitkomsten van het besluitvormingsproces te voorspellen.

De verschillen in het aanbod en het gebruik van ziekenhuisbedden tussen de verschillende landen zijn groot. Een belangrijke vraag is of deze verschillen de kwaliteit van gezondheidszorg beïnvloeden. In dit onderzoek was de kwaliteit van de zorg niet opgenomen. Echter, om verschillen tussen landen te evalueren, is inzicht in het effect op kwaliteit van zorg en de gezondheidstoestand van de bevolking noodzakelijk. Het is ook van belang om inzicht te krijgen in de balans tussen zorg in de eerste lijn, klinische zorg en dagchirurgie. De mate waarin deze vormen van zorg uitwisselbaar zijn en hoe tekorten binnen het ene type van zorg gecompenseerd worden door het andere zijn belangrijke punten van aandacht.

8.4 Beschouwing omtrent de methode

Dit onderzoek is gebaseerd op historische gegevens. Een nadeel van dit type data is dat de gegevens niet specifiek voor dit onderzoek verzameld zijn. Het onvermijdelijke gevolg hiervan is dat de data niet altijd perfect geschikt zijn voor ons doel. Zo zijn er bijvoorbeeld problemen met betrekking tot de definitie van acute klinische zorg tussen de verschillende landen in onze studie. In sommige landen worden de psychiatrische en revalidatieafdelingen van algemene ziekenhuizen meegeteld in het acute beddenoverzicht, terwijl deze bedden in andere landen onder andere noemers verzameld worden. Een ander probleem is dat soms de voor dit onderzoek relevante gegevens (zoals gegevens omtrent wachtlijsten) eenvoudigweg niet beschikbaar zijn. De keuze voor een combinatie van cross-sectionele en tijdreeksanalyse, wat de mogelijkheid oplevert om plaats en tijdeffecten te onderscheiden, maakt het nood-

zakelijk om bestaande historische gegevens te gebruiken. De gebruikte gegevens zijn voornamelijk afkomstig uit nationale en internationale statistieken. De internationale vergelijkingen zijn gebaseerd op de OECD-health data files (behalve de gegevens over dagchirurgie, die verzameld zijn door middel van een vragenlijst). Het voordeel van de OECD-gegevens is dat er reeds pogingen ondernomen zijn om de data onderling vergelijkbaar te maken.

De Hongaarse resultaten moeten voorzichtig geïnterpreteerd worden, omdat het niet duidelijk is in welke mate de geregistreerde gegevens het daadwerkelijke gedrag weergeven. De discrepantie ontstaat door het gebrek aan controle over de ziekenhuis-output in termen van zowel behandelingen als van administratieve producten zoals financiële verslagen. De ziekenfondsen controleren bijvoorbeeld de noodzaak van een behandeling retrospectief. De resultaten van de invoering van het financieringssysteem kunnen als volgt geïnterpreteerd worden. De gevonden effecten zijn waarschijnlijk een versterkt effect van de effecten die gevonden worden in landen met een meer effectief controle-systeem. De effecten wijzen echter wel in dezelfde richting. In de Verenigde Staten is de controle van artsen en ziekenhuizen veel strenger. Toch werden ook in de Verenigde Staten dezelfde effecten gevonden van de invoering van het DRG-financieringssysteem als in Hongarije, echter in een afgezwakte vorm.

Het gebruik van tijdreeksgegevens maakte het mogelijk om een onderscheid te maken tussen de effecten die gerelateerd zijn aan de tijd (technologische ontwikkeling) en effecten gerelateerd aan geografische locatie (gezondheidszorgsysteem-kenmerken). De ontwikkelingen door de tijd heen zoals medisch technologische ontwikkelingen hebben een belangrijk invloed op ziekenhuiszorg. Ze treden echter niet gelijktijdig op in de verschillende geografische locaties. Verschillen tussen gezondheidszorgsystemen resulteren in verschillende mogelijkheden en beperkingen voor de artsen en ziekenhuizen. Met cross-sectionele tijdreeksanalyse is het mogelijk om deze effecten te bestuderen. Een ander voordeel van tijdreeksen is dat een klein aantal landen of regio's geen bezwaar is. Voor het internationaal vergelijkend onderzoek, waar de 'n' zelden boven de 20 uit zal komen, geeft dat mogelijkheden om toch hypothesen statistisch te toetsen.

De data in dit onderzoek zijn op macro-niveau (geaggregeerde data op land- of regioniveau). Het macro-karakter van de gegevens heeft als voordeel dat problemen die zich op kleinere schaal voordoen, zoals het vaststellen van het

adherentiegebied van ziekenhuizen of grensoverschrijdingen bij het leveren van gezondheidszorg een relatief kleine invloed hebben. Een belangrijk nadeel is dat het probleem van conflicterende interne doelen bij actoren niet bestudeerd kon worden.

De analyse van het exacte proces van gezondheidszorghervormingen en daarmee het vaststellen van de complexe incentive-structuur gebaseerd op deze hervormingen blijkt een moeizame exercitie (zie hoofdstuk 3). Dit bemoeilijkt een onderzoek als het onderhavige. Onderzoekers die het effect van hervormingen onderzoeken moeten deze hervormingen en hun effectèn kritisch beschouwen. Bij het vaststellen van de inhoud dienen meerdere bronnen geraadpleegd te worden. Ook primaire bronnen, zoals wetteksten (ziekenhuiswetten of andere officiële documenten die de inhoud van een hervorming beschrijven) geven onvoldoende inzicht in het daadwerkelijke hervormingsproces. Bij het raadplegen van verschillende bronnen (experts, literatuur en primaire bronnen) kan een redelijk inzicht verkregen worden, maar het moet worden benadrukt dat onverwachte effecten nog steeds kan optreden.

Wat zijn belangrijke onderwerpen voor toekomstig onderzoek naar ziekenhuiszorg? Een belangrijk punt is dat als gevolg van technologische ontwikkelingen ziekenhuiszorg niet langer samenvalt met klinische zorg. De behandeling van patiënten is zeer gedifferentieerd geworden en dagchirurgie en poliklinische behandeling zijn belangrijke onderdelen hiervan geworden. De behandelingscapaciteit van ziekenhuizen kan niet langer meer afgemeten worden aan de klinische beddencapaciteit. Het is belangrijk dat er een indicator ontwikkeld wordt waarmee de behandelcapaciteit van ziekenhuizen beschreven kan worden. Dit zal gevolgen hebben voor de verzameling van (inter)nationale data met betrekking tot ziekenhuiscapaciteit en ziekenhuisgebruik voordat zo'n indicator gebruikt kan worden in onderzoek.

8.5 Beleidsimplicaties

Voor beleidsmakers is de constatering dat financieringssystemen het gebruik van ziekenhuisbedden beïnvloeden een belangrijke constatering. Blijkbaar kan het gebruik van ziekenhuisbedden veranderd worden door het veranderen van financiële incentives. Er zijn echter wel grenzen aan de mate waarin financiële incentives het gedrag beïnvloeden. Als een behandeling noodzakelijk geacht

wordt, dan zullen artsen proberen om hun patiënt deze behandeling te laten ondergaan.

Een belangrijk inzicht is de relevantie van de machtsverhoudingen tussen ziekenhuizen en artsen. Ziekenhuizen leveren de faciliteiten om patiënten op te nemen en te behandelen, de arts echter neemt de uiteindelijke beslissing. Een individuele afweging van de geschikte behandeling wordt voor iedere patiënt gemaakt. Het individuele karakter van medische besluitvorming maakt het moeilijk om de vraagzijde te beïnvloeden: patiënten kiezen er niet voor om gezondheidsproblemen te hebben waarvoor ze in het ziekenhuis opgenomen moeten worden. Het feit dat medische besluitvorming geen publiek proces is maakt het moeilijk voor ziekenhuizen om dit proces te beïnvloeden in de richting van hun belangen. Het is van belang om het inzicht in de machtsverhoudingen uit te breiden als we schaarse resources zo efficiënt mogelijk willen inzetten en de actoren zo effectief mogelijk willen motiveren. Beleidsmakers moeten zich afvragen of de effecten van veranderingen als gevolg van andere financiële incentives wenselijk zijn. Zo kan bijvoorbeeld de kwaliteit van zorg een belangrijker argument vormen dan kostenbesparing.

Ziekenhuizen en artsen laten zich niet alleen leiden door financiële motieven. Als een behandeling noodzakelijk geacht wordt en de mogelijkheden beperkt, dan zullen oplossingen gezocht worden om de behandeling toch uit te voeren, ook al is dit niet interessant vanuit financieel oogpunt. De opkomst van dagchirurgie, met name in gebieden met beperkte bedcapaciteit is een voorbeeld van dit fenomeen. Dit is dan ook een belangrijk punt in de discussie over het introduceren van marktmechanismen in de medische besluitvorming. Artsen vinden het moeilijk om een patiënt te weigeren en zullen alternatieve oplossingen proberen te vinden. In het medisch besluitvormingsproces wordt de keuze voor behandeling van een patiënt niet alleen op grond van financiële motieven gemaakt.

Het ziekenhuis als organisatie kan ook profiteren van de inzichten die dit onderzoek opgeleverd heeft. Het is belangrijk voor ziekenhuizen om zich te realiseren dat wanneer ze bepaalde doelen willen bereiken, dat ofwel de belangen van de artsen overeenkomen met deze doelen, ofwel dat de machtsverhouding in het voordeel van het ziekenhuis moet zijn.

De omvang van de wachtlijstproblematiek in ziekenhuizen is nog niet inzichtelijk. Voordat een compleet beeld van de effecten van beperkingen op

ziekenhuiszorg verkregen kan worden, is het noodzakelijk om inzicht te hebben in de dynamiek van wachtlijsten. Er moet inzicht komen in de mate waarin wachtlijsten kunnen dienen als buffer in tijdelijke veranderingen in de vraag. Ook is het nodig inzicht te krijgen in de mate waarin wachtlijsten de structurele tekorten van ziekenhuizen weergeven. Op dit moment is het verkrijgen van dit inzicht zeer moeizaam omdat er geen uniforme registratie van wachtlijsten bestaat, zowel tussen als binnen landen. Een uniforme registratie is noodzakelijk, alhoewel experimenten in Nederland aantonen dat het al moeilijk is om een uniforme registratie binnen één land te realiseren.

Samenvattend kunnen we concluderen dat het theoretisch kader dat in dit onderzoek opgesteld werd gebruikt kan worden als een eerste stap in het modelleren van het proces van het leveren van gezondheidszorg. Belangrijke elementen in zo'n model zijn de mogelijkheden en beperkingen die voortkomen uit het gezondheidszorgsysteem en het aanbod van ziekenhuisbedden. In het besluitvormingsproces blijkt de machtsverhouding tussen ziekenhuis en arts van belang in het geval de belangen niet overeenkomen. Medische overwegingen spelen ook een belangrijke rol. Artsen zullen proberen een patiënt te behandelen als ze dit noodzakelijk achten, ook al heeft dit mogelijk negatieve financiële gevolgen.

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CURRICULUM VITAE

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