



Nederlandse
Zorgautoriteit

Welfare Standards in Hospital Mergers

Katalin Katona | Marcel Canoy

Also available as TILEC DP 2011-038 | <http://ssrn.com/abstract=1914494>

2011

07

Welfare Standards in Hospital Mergers

Katalin Katona Marcel Canoy *

July 31, 2011

Abstract

There is a broad literature on the consequences of applying different welfare standards in merger control. Specific aspects of health care mergers, however, have not yet been considered. Two features of the health care sector are especially relevant. First, health care providers are possibly not profit oriented. Second, consumers can be covered by a mandatory health insurance and pay uniform premiums. The fact and level of payment is not connected to the consumption of health care services, which makes the concept consumer in merger control ambiguous.

Previous literature on welfare standards in merger control has often built on the general result that consumer welfare is a more restrictive standard than total welfare. We model mergers on hospital markets and allow for non-profit maximizing behavior of providers and mandatory health insurance. We show that applying a restricted interpretation of consumer in health care merger control can reverse the relation between the two standards. Consumer welfare standard can be weaker than total welfare. Consequently, applying the wrong standard can lead to both clearing socially undesirable and to blocking socially desirable mergers. The possible negative consequences of applying a simple consumer welfare standard in merger control can be even stronger when hospitals maximize quality and put less weight on financial considerations. We also relate these results to the current practice of merger control.

JEL Classification Numbers: I11, I18, L44

Keywords: merger control, hospital merger, welfare standard, consumer welfare

*Corresponding author: Katona: Dutch Healthcare Authority, P.O. Box 3017, 3502 GA Utrecht, the Netherlands, T: +31 30 296 8939, F: +31 30 296 8296, E: kkatona@nza.nl, and TILEC, Tilburg University, PO BOX 90153, 5000LE Tilburg, the Netherlands; Canoy: professor in health economics TILEC, Tilburg University, PO BOX 90153, 5000LE Tilburg, the Netherlands; and Chief economist Ecorys, Watermanweg 44, 3067GG Rotterdam, The Netherlands, E: m.canoy@uvt.nl

1 Introduction

Competition authorities that need to decide on mergers have some leeway as to the criteria for their assessment of welfare. Most authorities have decided to go for consumer welfare. However, there are some countries such as Canada and Australia where merger control seems to follow the principles of total welfare (Renckens, 2007). There is a long standing discussion in the economic literature on whether one or the other standard is preferable. The question is addressed both from practical and theoretical perspectives. We contribute to this discussion by pointing out that specific features of the health care sector reverse some key results.

Merger control of hospitals is a relatively new branch for competition authorities, and is less analyzed in the literature on optimal welfare standards. Hospital markets are liberalized in a number of countries (e.g., Switzerland, Netherlands, US) making it a sector that falls under competition law scrutiny.¹

Hospital markets have certain specific features that require attention. First, hospitals are not necessarily striving for maximum profits. When providers attach much weight on quality arguments in their merger decisions², it is more probable that mergers of socially undesirable (i.e. excessive) quality improvements are initiated. Second, the market is characterized by the fact that patients are insured. The concept 'consumer' becomes ambiguous when health insurance is mandatory, premiums are uniform regardless of heterogeneity among consumers, and there are no significant co-payments (such as is the case in Germany, France and The Netherlands). Patients receive treatment from the providers but do not directly pay for the services. Insurers reimburse providers and collect premiums from their clients. The level of premium is, however, independent from the individual consumption, making the financial and consumption side of the market for hospital services detached. Theoretically, there could be many different definitions of a 'consumer': one that actually visits the given hospital, one that might visit it, or one that through insurance premiums pays for the services offered by the given hospital. Since insurance spreads the health care expenditure across all its clients, only the most extended definition allows one to consider the whole financial effect of a merger. If we use a narrower definition, we have to take external effects of the insurance into account. Our contribution to the literature is that we explicitly model these specific hospital market features.

Depending on the definition of 'consumer', the exact meaning of consumer welfare standard also changes. Applying a narrow definition, the consumer welfare (CW) standard can result in a more lenient criterion than the total welfare (TW) standard, which is in contrast to the general view in the literature. Considering markets where consumers bear the whole benefits and costs of their consumption, the CW standard has been equal to or tougher than the TW standard. Many theoretical models (e.g., Besanko and Spulber, 1993; Lyons, 2003) have built on this feature when showing the superiority of CW standard in certain circumstances. We show that the externality effects on health care markets stemming from insurance can reverse the relationship between CW and

¹The standpoint that competition law applies to health care just like to any other sector in the US stems from the case *Goldfarb v. Virginia State Bar* in 1975 (Sage et al., 2003).

²There is no consensus in the literature about what (not-for-profit) hospitals maximize. See section 2.3 for a overview of proposed alternatives.

TW standard, which questions the generality of the claims in the literature.

From a policy perspective, a narrow definition of 'consumer' in the CW standard can lead to both approving socially undesirable mergers as well as blocking socially desirable mergers. A CW standard, which applies the most extended definition of 'consumer', repairs this problem; however, it requires to consider effects that are potentially external to the relevant hospital market of the merger. In the process of merger control, this dilemma appears in the evaluation of the potential positive (quality) effects of a merger against the negative (price) effects. The externality caused by insurance is reflected in the diverging valuation of quality improvements by different groups of consumers. The method to value potential quality improvements and aggregate it across all consumers influences the effectiveness of the merger standard.

The next subsection reviews the economic literature that investigates the reason for different welfare standards in merger control. Section 2 describes the model. Section 3 summarizes the results of our model and discusses the consequences of applying different merger standards from a theoretical perspective. Policy implications and relevance to the current practices are described in Section 4. In Section 5, we conclude.

1.1 Related literature

There are two branches of economic literature analyzing the optimal welfare standard. One compares practical and direct effects of applying TW or CW while the other branch applies the agency framework to analyze the decision problem of competition authorities. We summarize the arguments of both approaches.

Articles of the practical approach (e.g. Heyer, 2006; Salop, 2005; Pittman, 2007), focus broadly on two aspects: efficiency of production and (re)distribution among different groups of society such as providers and consumers. Regarding efficiency is analyzed whether a merger offers opportunity to produce more or better given the scarce resources. While the TW standard values every efficiency improvement, the CW standard merely acknowledges gains that are passed on to consumers. Fixed cost savings for example may weigh out the anticompetitive effects of a merger according to the TW standards but do not contribute to the CW standard. The CW standard ignores some efficiency gains and give priority to distributional aspects. In this way it can lead to a situation where consumers are the final beneficiaries of the merger, but it forgoes some efficiencies that would solely benefit providers.

About the costs and workability of one or the other welfare standard opinions diverge. The TW standard requires more information on costs of the merging firms, which is usually hardly available for competition authorities. Furthermore, it takes account (theoretically) of effects on rival firms as well. The CW standard, in contrast, focuses only on a segment of effects, namely that on consumers. The price forecast of post-merger market equilibrium is, however, burdensome irrespective the applied welfare standard.

Articles in the other branch of the literature look at the merger control process as a whole and apply principal-agent theory (e.g., Neven and Röller, 2005; Fridolfsson, 2007; Besanko and Spulber, 1993; Lyons, 2003). They assume that the ultimate goal is to maximize TW. In these models competition authority is an agent that controls mergers according a given welfare standard. The focus

of these analyses is the consequence of choosing total or consumer welfare standard as objective function of the competition authority. However the final goal is always to maximize total welfare, it sometimes can be achieved by defining CW as objective function for the agent authority. Besanko and Spulber (1993) and Lyons (2003) both build on the general result that CW standard is more restrictive than TW standard and show under which conditions the CW standard achieves higher TW than the TW standard.

Besanko and Spulber (1993) apply a model of asymmetric information to show that a tougher merger standard than the TW standard increases the societal gain from the merger. Since authorities cannot perfectly estimate the welfare consequences of a merger, their decision is a random variable from the firms perspective. Furthermore, rejection of a merger has a higher probability when CW standard (a tougher criterion) is applied than in case of TW standard. Because preparing and submitting a merger proposal is costly, firms initiate mergers that they expect to be accepted. In instance of a tougher merger standard, it results in a self selection toward socially preferable merger alternatives. The key elements in this model leading to the preference of CW standard are the costly procedure and asymmetric information.

Lyons (2003) derives the relative advantage of one or the other welfare standard from the difference in the treatment of changes in fixed costs. CW standard incorporates cost reductions only if they are passed on to consumers. Therefore, fixed cost reductions are excluded from the analysis. Welfare gain from mergers are described as the ratio of anticompetitive effects and fixed cost reductions. CW standard is a tougher standard because potential anticompetitive effects cannot be compensated by cost reductions in the analyses. Since firms prefer mergers with anticompetitive effects (higher prices), CW standard is more likely to reject the first proposal of firms than TW standard. The desirability of rejection in the long term depends on alternative mergers. If the subsequent proposal of firms yields a higher TW, then rejection was a desirable decision. If the alternative is a socially less beneficial merger, then approval by TW standard is a better strategy. Lyons (2003) models a given industry structure and analyses sequential mergers to find the equilibrium structure conditional on the merger standard.

These articles all have considered general sectors, which set-up does not fully fit health care markets. Calem et al. (1999) focus on distinguishing different welfare measures specific to health care markets. They emphasize two distinguishing characteristics of hospital (and in general health care) markets. First, health care insurance causes moral hazard in the consumption of hospital services to the extent of the co-payment rate. Second, hospitals may be non-profit; namely, they may maximize output instead of profit. Considering these characteristics of hospital markets, they compare the effects of a merger on consumer surplus (gain from hospital services minus co-payments paid by consumers), net social surplus (gain from hospital services minus price paid by the insurer) and gross social surplus (gains from hospital services minus costs born by hospitals). They model quality competition among hospitals, which may yield over-production of quality because of moral hazard problems or the non-profit nature of hospitals. Consequently, merger may be gross social welfare enhancing since it reduces quality competition and restricts excess quality. Considering only consumer surplus, which reduces with decreasing quality, can be misleading when evaluating hospital mergers. These results are health care

specific but are not explicitly linked to the literature on merger control. Our article makes this last step too. Similar to Calem et al. (1999), we compare various welfare concepts applied to health care markets; and additionally, we look explicitly at the consequences of using these measures in merger control.

Finally, we mention the strand of literature that investigates if not-for-profit (NFP) organizations should be treated differently in antitrust law than for-profits (FP). Several articles show that the behavior of NFP firms can be interpreted as a profit-maximizing behavior with lower perceived costs. Beside monetary profit, NFP firms gain additional utility from production, which makes them accept higher costs for the same level of production. This attribute of NFP appears in our model as well. Both theoretical (e.g., Philipson and Posner, 2006; Richman, 2007) and empirical (e.g., Vita and Sacher, 2001; Gaynor and Vogt, 2003) articles conclude that not-for-profit hospitals exploit their market power in a similar way than their for-profit counterparts.

Prüfer (2011) however shows that this result depend on the assumptions made on the maximand of the NFP firms. In his article, NFP firms with an owner preferring high quality produce excessive quality (from societal perspective). The merger (to monopoly) eliminates competition, which indirectly makes the firm produce lower quality increasing in this way the total welfare. Prüfer (2011) draws the attention to the importance to examine the objective of the owners of the merging NFP firms when assessing the net effects on the society.

However, it is important to notice that the not-for-profit status of hospitals is different from the possible not-profit-maximizing behavior. The first is a definition used in the context of taxation and refers roughly to two rules. NFP hospitals enjoy exemption from taxation, and they are not allowed to pay rents to their owners (non-distribution constraint). The not-profit-maximizing behavior refers to the objective function of the hospital that is revealed in its decisions. In this article, we consider this second possibility but do not discuss the case of not-for-profit status.

2 Model

Our static model includes three players; hospitals deciding whether to initiate a merger, consumers paying the insurance premium and choosing a hospital when they fall ill, and a competition authority blocking or approving the merger. The standard that the competition authority applies in merger control is either the TW standard or a version of the CW standard. In both cases, the authority approves the merger if the standard indicates net gains and blocks the merger if the standard indicates net losses. We do not model the insurance market explicitly. This assumption is not restrictive for the purpose of our research.

2.1 Hospital market and consumer preferences

We characterize the market for hospital services and consumer preferences by applying the circular city model. Distance to hospital is an important choice factor of consumers (see, e.g., McGuirk and Porell, 1984) which makes substitutability of providers asymmetric, i.e., dependent on distance from the consumer's location. Location models fit this characteristic of the market. Furthermore, we

focus on effects of a merger and consider hospitals in any other aspect symmetric. The circular model, in contrast to linear models, allows for this.

Let the n hospitals offering treatment to patients be located on a circle of unit circumference at equal distance from each other. Besides this horizontal differentiation, hospitals may also vary in quality of services offered. Patients³ are uniformly distributed on the circumference of the circle. We assume that every patient prefers hospital services of higher quality to that of lower quality and that they dislike traveling. They trade-off quality and distance from the hospital uniformly in ratio t . Patients do not pay directly for the treatment; therefore, price does not play a role in their hospital choice. Thus, the utility derived from receiving hospital treatment includes two terms; the quality of the services in the visited hospital (q_i) and the distance to the hospital (x).

$$U = q_i - tx \quad (1)$$

The demand for hospital i 's services (equation 2) consists of the sum of two 'half demands': the demand in the market segments where hospital i competes with hospital $i + 1$ and $i - 1$ respectively. In each segment, the demand is derived by determining the position of the indifferent patient based on the utility function (equation 1).

$$D_i(q_i, q_{i-1}, q_{i+1}, t) = \frac{1}{n} + \frac{q_i - q_{i-1}}{2t} + \frac{q_i - q_{i+1}}{2t} \quad (2)$$

Equation (3) describes the utility that patients of hospital i derive from their visit. We refer to this value as patient welfare produced by a given hospital (PW_i). Equation (4) defines the (total) patient welfare (PW) which is the sum of the welfare produced by each hospital.

$$PW_i = \int_0^{\frac{1}{2n} + \frac{q_i - q_{i-1}}{2t}} (q_i - tx) dx + \int_0^{\frac{1}{2n} + \frac{q_i - q_{i+1}}{2t}} (q_i - tx) dx \quad (3)$$

$$PW = \sum_{i=1}^n PW_i \quad (4)$$

We do not model the insurance market and the hospital - insurer relationship explicitly but make some simplifying assumptions. In the insurance market, we assume Bertrand competition among symmetric firms, which results in premiums at the level of the uniform marginal cost. The single role of insurance market in this model is to pool patients health care expenditure and set a uniform premium for all consumers. On the prices between insurers and hospitals we assume that they are results of negotiations. Instead of modeling the negotiations, we make two assumptions on the outcomes and incorporate these simplified solutions in the further steps of the model. These assumptions are common in the literature and are not restrictive for this model.

First, insurers reimburse the costs of the hospitals. Above that they pay a share of the added value produced by the hospital minus the difference in expenditure caused by including the given hospital in the insurers network, similarly to the idea of option demand markets in Capps et al. (2003). The added value of a given hospital is defined as the total patient welfare assuming patients may

³We use the term patient to refer to a consumer who needs hospital treatment.

attend to all hospitals in the market minus the total patient welfare assuming that patients may attend any but the given hospital in the market. This value represents the added utility that patients derive from the existence of that given hospital. Note that this formula yields higher added value for a hospital of a high quality or in an isolated location than for a hospital of average quality in a densely populated location. The underlying intuition is that dropping high-quality low-density hospital from the market leads to consumers substituting it for a hospital of considerably lower quality or for one lying relatively far away.

Second, in order to keep the model simple, we assume that insurer and hospital share the added value in a given proportion, namely 50-50%. We apply thus the following formula to determine the price of hospital i 's services (w_i)

$$w_i = c_i + \left(\frac{PW - PW_{-i}}{D_i} - \frac{TE - TE_{-i}}{D_i} \right) \frac{1}{2}$$

where c_i denotes the constant average cost of hospital i , TE denotes the total expenditures of insurers, which is defined as $TE = \sum_{i=1}^n D_i w_i$. PW_{-i} denotes the total PW when hospital i is not in the market and similarly TE_{-i} is the total expenditure of insurers when hospital i is not in the market.⁴ Note that we assume hospitals to agree on the same price with all the insurers, i.e., a hospital has a single price. Since insurers are symmetric in the model, this is a logical assumption.

Following a merger, the merged hospitals negotiate with the insurers together. If they fail to agree, both of their locations become unavailable for patients. PW_{-i} is thus calculated by dropping both hospitals from the market. Therefore, patients have to travel further for a substitute than before merger, and the added value of the hospital increases. A merger leads to higher prices, *ceteris paribus*, reflecting the increased market power of the merged hospitals.

Note that the price depends only on the value that hospitals add to patient welfare. Hospitals of higher than average quality produce more added value; therefore, have higher prices. This is, however, independent of the hospital's objective function. Similarly, the price of the merged hospital increases regardless its maximand. This result is in line with the literature on NFP hospitals, which finds that NFP hospitals exploit their market power similarly than their FP counterparts. Our results coincide with this, although we model a bargaining outcome in contrast to the usually assumed price setting behavior.

2.2 Welfare measures

Based on the exact definition of 'consumer' used in the merger analysis, we identify two different consumer welfare standards. We define 'simple CW' as the difference of the PW and the share patients pay from health care expenditures. Simple CW measures the direct effect of a merger, and does not consider external effects introduced by health insurance. The concept 'consumer' is defined here as patients visiting the hospital, which is a narrow exposition because it excludes a large group of healthy consumers or consumers in other hospital markets.

An extended definition of 'consumer' that we use involves everyone affected by the merger. This is all people covered by the same insurance because through

⁴Note that $PW_{-i} \neq PW - PW_i$ (and $TE_{-i} \neq TE - TE_i$). The left hand side describes the patient welfare (total expenditure) calculated for $n - 1$ hospitals in the market, while the right hand side represents the patient welfare (total expenditure) in a part of the market.

the uniform premium they pay they are affected by changes in the hospital prices. Furthermore, we assume that consumers from other hospital markets can also be pooled by the same insurance and so can be affected by the merger. Expenditures can be shared among consumers in a larger region than the hospital market each patient considers. We will call the welfare measure calculated as PW derived from hospital services minus health care expenditure as 'extended CW'.

The difference between simple and extended CW is in the cost component. Patients visiting the hospital enjoy all benefits of a potential quality increase (reflected in increasing PW), but pay only a proportion of potential extra costs. When considering all consumers affected by the merger, PW is still completely considered, and costs are also fully taken into account. Calculating the extended CW, we internalize the external effects of insurance on consumers paying premium but not visiting the given hospital.

To formalize the concept of simple CW and extended CW, let us define the ratio

$$S = \frac{\text{Number of patients directly affected}}{\text{Number of all affected consumers}}$$

Equation (5) defines simple CW, while Equation (6) defines extended CW. Note, that S can also be interpreted as the ratio of consumers that are included in the merger analysis. In this way, S is a continuous variable that determines the level of externality and the distortion introduced by partial analysis that excludes a group of consumers paying premiums. Equation (6) shows that the extended CW can be written as the sum of simple CW and the externality effect caused by health insurance.

$$CW_{simple} = PW - S \sum_{i=1}^n D_i w_i \quad (5)$$

$$CW_{ext} = PW - \sum_{i=1}^n D_i w_i = PW - S \sum_{i=1}^n D_i w_i - (1 - S) \sum_{i=1}^n D_i w_i \quad (6)$$

TW is defined as the difference of PW and the cost of its production, which equals the sum of the welfare of all groups in society.⁵ Similar to the theoretical strand of the literature, we use TW as the benchmark.

$$TW = PW - \sum_{i=1}^n D_i c_i$$

⁵First, considering the extended definition of consumer, TW is the sum of CW and suppliers surplus, i.e. $TW = (PW - \sum_{i=1}^n D_i w_i) + (\sum_{i=1}^n D_i w_i - \sum_{i=1}^n D_i c_i)$. Second, considering the restricted definition of consumer and so calculating with the simple CW, we can write TW as $TW = (PW - S \sum_{i=1}^n D_i w_i) + (\sum_{i=1}^n D_i w_i - \sum_{i=1}^n D_i c_i) - ((1 - S) \sum_{i=1}^n D_i w_i)$. The first term equals the simple CW, the second term is the suppliers surplus, while the third term is the externality effect, i.e. effect on other consumer groups in the society. In the calculations of TW, externalities have to be taken into account since they form costs (or benefits) for the society although not for the group defined as 'consumers' or 'suppliers' in the analysis. It can be compared to the textbook example of production or consumption externalities. The individual and social costs of consumption diverge, which results in externalities that are not considered by the consumers but that are costs for the society. See, e.g., in Begg (2008, p.304).

2.3 Objective function of hospitals

The term NFP hospitals suggest that the objective function of these organizations deviates from purely monetary profit maximization. This hypothesis is tested by several empirical articles such as Chang and Jacobson (2008); Deneffe and Masson (2002); Horwitz and Nichols (2009). They confirm that the maximand of NFP hospitals is not the monetary profit. Deneffe and Masson (2002) and Horwitz and Nichols (2009) find that NFP hospitals are most likely to maximize output or a mix of monetary profit and output, while Chang and Jacobson (2008) conclude that the data is the most consistent with the theory of perquisite maximization. Others (e.g., Horwitz, 2005; Clement et al., 2002) at the same time find that NFP hospitals provide more charity or unprofitable care or higher quality than for-profits, which can be the result of some kind of welfare maximization. However there are several hypotheses on the real objective function of NFPs, there is no consensus in the literature about it. Malani et al. (2003) overview the empirical literature and concludes that there is not enough evidence to distinguish among different theories on the NFP objective function.

In our model, we assume that hospitals maximize a combination of monetary profits and quality level.⁶ In one extreme case of our model, hospitals maximize purely the quality level of their care regardless of monetary profits. The other extremity is the pure profit-maximizing behavior. We will refer to the hospitals following exclusively the previous strategy as purely-quality-maximizing hospitals, while to hospitals following the latter strategy as purely-profit-maximizing hospitals.

Quality improvement can be a strategy for both the purely quality and purely profit maximizing type. In contrast to quality-maximizing hospitals where quality improvements directly increase the objective function of the hospital, quality improvement only has an indirect effect on profit-maximizing hospitals. Quality increases the monetary profit through higher market shares and higher prices. The motive of a profit-maximizing hospital for quality improvement essentially differs from the motive of a purely-quality-maximizing hospital.

Specifically, we assume that hospitals maximize the weighted average of monetary profit (Π) and quality (q). The objective function of hospital i is thus:

$$G_i = \alpha\Pi_i + (1 - \alpha)q_i = \alpha D_i(q, t)(w_i - c_i) + (1 - \alpha)q_i \quad (7)$$

where Π_i denotes the monetary profit of the hospital, which is demand multiplied by price minus cost. We denote the relative weight of profit maximization to quality maximization in the decisions of the hospital by α . In case of a purely-profit-maximizing hospital, $\alpha = 1$, while in case of a purely-quality-maximizing hospital, $\alpha = 0$. Hospitals may follow partially both objectives, i.e., they have an eye on costs, but increase quality just for its intrinsic value as well (and not to seek higher market share). We assume that the value of α is the same for all hospitals in the market.

⁶The article closest to ours, Calem et al. (1999) defines the goal of non-profit hospitals in outcome maximization. Quality maximization is an alternative hypothesis that is also supported by a number of empirical studies. Quality maximization is a form of perquisite maximization defined and tested in Chang and Jacobson (2008). Further, Malani et al. (2003) could also not reject that the hypothesis that hospitals maximize non-contractible quality.

Our definition of the objective function is similar to the model of profit-deviating firms used in Lakdawalla and Philipson (1998) though they assume 'output-preferring' hospitals. It is important that we similarly to the before mentioned model do not model the not-for-profit status of hospitals (i.e., the nondistribution constraint), but focus on the profit-deviation behavior. Budget constraint for the hospitals such as a constraint for positive monetary profit is not assumed. Lakdawalla and Philipson (1998) argues that donors who gain utility from the profit-deviation can cover the negative profits. For the ease of presentation, we also disregard for a budget constraint. The inclusion of such limitation in our model would however not change the qualitative results.

2.4 Merger decision of hospitals

Two hospitals will only initiate a merger if their objective functions consequently increase, i.e., their joint gain (G_{i+j}) is higher after merger than before it.

$$\begin{aligned} G_{i+j}^{before} &< G_{i+j}^{after} \\ \alpha(D_i(w_i - c_i) + D_j(w_j - c_j)) + (1 - \alpha)\frac{q_i + q_j}{2} &< \alpha D_{i+j}(w_{i+j} - c_{i+j}) + (1 - \alpha)q_{i+j} \end{aligned} \quad (8)$$

Where q_{i+j} is the quality level after merger, c_{i+j} is the cost after the merger, D_{i+j} is the demand of the merged hospital, while w_{i+j} is the price of hospital services calculated for the merged hospital.

As described at Equation (7), α gives relative weights to monetary and non-monetary benefits in the objective function of hospitals. From Inequality (8) can be seen that a purely-quality-maximizing hospital will initiate any merger with $\frac{q_i + q_j}{2} < q_{i+j}$ irrespective to costs. Other hospitals ($0 < \alpha \leq 1$) consider both quality and cost consequences of a merger. If there are several possible mergers the hospital chooses the one that ensures the highest gain.

Specifically, we assume two effects of a merger: 1) a merger specific change in quality, Δq , and 2) a merger specific change in marginal cost, Δc .⁷ The change in quality can be an increase, assuming that e.g. larger hospitals have a better reputation and so attract better personnel. It can also be a decrease in quality, assuming that cultural differences in the two institutions make quality lower in short run. Costs may decrease or increase owing to a merger. One reason for a decrease can be the scale economy of certain activities. A cost increase, however, is possible, for example, due to higher organizational costs after the merger.

We assume that quality differences after merger are not so large that it is worthwhile for patients to pass by the nearest hospital (that is to travel more than $1/n$ of the circle): $\frac{t}{n} > |\Delta q|$. Furthermore, we only consider mergers between two neighboring hospitals, and assume that the merged hospital does not close any of its locations. The only strategic action on the part of the hospital that we explicitly consider is the decision on the merger: whether and with which (neighboring) hospital to merge.

⁷The assumption that the change in quality is merger specific means that other hospitals can not change their quality level. This is realistic to assume when for example scale effects play a role.

3 Results

To keep the presentation of results simple, we set the initial values of quality and cost level uniform for all hospitals in the market. In this way, we have two quality and two cost levels in the model: q and c for all hospitals before the merger, which changes to $q + \Delta q$ and $c + \Delta c$ for the merged hospitals after the merger (but remains q and c for all other hospitals). Furthermore, we set the transformation rate between quality and traveling at 1 ($t = 1$). Finally, we fix the number of hospitals in the market before merger at 4 ($n = 4$).

The following equation produces the gain (G_{i+j}) that merging hospitals can obtain:

$$\Delta G_{i+j} = \alpha \left[(\Delta q - \Delta c) \left(\frac{1}{4} + \frac{\Delta q}{2} \right) - \frac{(\Delta q)^2}{4} + \frac{1}{32} \right] + (1 - \alpha) \Delta q$$

As can be seen, even in the absence of cost and quality effects, hospitals gain $\frac{\alpha}{32}$ because of their increased bargaining power. Increasing costs lower the gains from the merger or do not influence it in case of purely-quality-maximizing hospitals. Effects of quality improvements depend on the level of Δc and α . Purely-quality-maximizing hospitals ($\alpha = 0$) always gain from quality improvements. Hospitals that (partially) maximize monetary profit can gain as well since better quality attracts more patients. More patients generate monetary profit if the hospital has a positive price cost margin. For $\alpha = 1$, for example, the condition for increase in gains is $\Delta c < \frac{1}{2} + \Delta q$.

3.1 Effects on different welfare measures

We will compare the effects of a merger for alternative welfare measures: simple and extended CW, and TW. Each of these measures can be used in merger control. However, they deliver diverging conclusions. Simple CW is specific to health care markets. Extended CW corresponds to CW in non-health care markets, and the definition of TW does not differ either. Reasons for and effects of applying CW or TW standard in non-health care markets has extensively been analyzed in the economic literature, while Calem et al. (1999) have described some health care specific welfare measures. We relate our findings to these previous results.

Change in (simple) consumer welfare is given by the following equation:

$$\Delta CW = \Delta q \left(\frac{1}{2} + \Delta q \right) - \frac{(\Delta q)^2}{2} - \frac{S}{2} \left[\Delta c + (\Delta q - \Delta c) \left(\frac{1}{4} + \Delta q \right) - \frac{(\Delta q)^2}{2} + \frac{1}{32} \right]$$

The first term represents the quality gain due to merger, while the last term shows the price effects. The term between $(\frac{(\Delta q)^2}{2})$ is the loss in travel time; consumers travel more because they sometimes opt for a hospital of better quality however further away than the nearest hospital. This loss from traveling is always compensated by the gain from higher quality (in the first term) otherwise patients would choose hospital differently.

The last term indicates that S mitigates the costs effects, i.e., simple CW is a harder constraint than TW when cost effects are advantageous and it is a weaker constraint when price effects are disadvantageous. Simple CW reaches its extreme value in S when the number of consumers affected directly and

indirectly coincides ($S = 1$). Consumers cover all the health care expenditures, which also yields that simple CW equals the extended CW. Generally, extended CW is the boundary of simple CW since it considers the complete cost effects in stead of partial analyses.

The concept of 'consumer welfare' and 'net social welfare' in Calem et al. (1999) is similar to our simple and extended CW, respectively. They diverge, however, in modeling the insurance market since Calem et al. (1999) do not include insurance premiums in consumer surplus, but consider out-of-pocket co-payments of consumers. Consequently, their consumer welfare concept captures the cost effects of a merger only to the extent of co-payments. They classify net social welfare as total welfare excluding hospital profits because they are hard to observe or verify. However the calculation of this and our extended CW concept coincides, the underlying idea is different. Our extended CW is not a kind of total welfare, since no profits of providers or insurers are included. If insurers made profit, we would not include it in the calculation. Extended CW is a consumer surplus taking into account all effects of a merger on consumers.

Change in total welfare is given by the following equation:

$$\Delta TW = (\Delta q - \Delta c) \left(\frac{1}{2} + \Delta q \right) - \frac{(\Delta q)^2}{2}$$

The first term represents the net gain from quality and cost effects of a merger while the second term is the loss from further traveling because of quality differences.

Considering non-health care markets, consumer and total welfare changes in the same direction and in the same instances disregarding some special cases. Exceptions are, for example, the changes in fixed costs (consumer welfare does not consider it) and price discrimination among consumers (total welfare increases while consumer welfare decreases). The reason for the discrepancy between extended CW and TW in this model is the fixed demand ($\sum_i D_i = 1$) which is specific to health care markets. Because of the insurance market (and the absence of co-payments), patients do not react to price increases; there is, thus, no dead weight loss in the presence of prices above marginal cost. Changes in the price are purely redistributive in terms of gains between hospital sector and consumers; TW remains unchanged while extended CW changes.

The further health care specific differences in welfare measures can be shown by gradually widening the group of consumers considered in the analysis. Patients directly affected by quality changes is the narrowest definition. We expect that they are less concerned with the potential costs of a merger (lowest S) because of the high externality effect. Widening the considered group, the potential clients of hospitals, consumers on the hospital market can be included in the analysis. The cost effects of the merger are considered to the extent this group will bear it. External effects due to insurance still can be present if insurers have patients on (and consequently spread health care expenditures across) more hospital markets. A complete consumer welfare analysis would embrace all consumers covered by the same insurance (extended CW). The only welfare effect excluded then is the profit of providers. TW considers this last aspect of welfare as well.

3.2 Welfare standards in merger control

Formally, the simple CW standard ignores providers' profit and the externality due to insurance. Ignoring providers' profit makes the standard stronger than the TW standard as can be seen from the results on the extended CW standard. The neglected externality can however be negative (when $\Delta c > 0$), which can outweigh the previous effect and make the simple CW standard weaker than the TW standard. In summary, the simple CW standard may both clear undesirable mergers and block desirable ones.

While previous literature found reasons why a stronger standard (CW) can be advantageous in merger control, we state that CW also can be too lenient in health care markets, which leads to clearing undesirable mergers. We describe the intuition of the externality and provide a numerical example illustrated on Figures (1-2). In this way, we disprove that CW standard is always a stronger condition than TW standard. To disprove a claim on generality, a numerical example is sufficient. Notice that the example is by no means an anomaly. We do not provide the general parameter regions where simple CW standard is a weaker standard than TW standard, since that would be technically quite cumbersome and not needed to show the point. Our goal is to show that applying the simple CW standard in health care may have unexpected results.

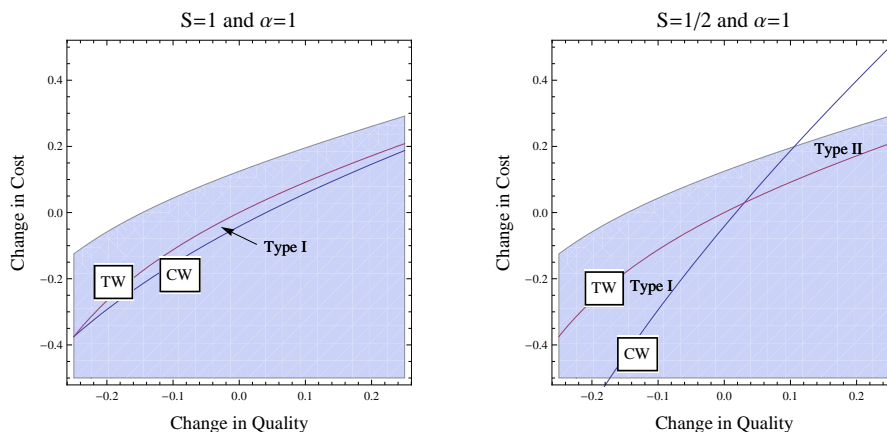


Figure 1: *Parameter ranges in which the CW standard commits type I and type II errors, respectively. The shaded area depicts the parameter ranges where the merger is profitable for a profit-maximizing hospital ($\alpha = 1$). We assume no externalities ($S = 1$) in the left panel and externalities ($S = \frac{1}{2}$) in the right panel.*

Figure (1) shows in function of Δc and Δq where changes in TW, CW and hospital gains owing to a merger is positive. The shaded area depicts merger alternatives that are profitable for purely-profit-maximizing hospitals. This is the set of merger proposals that a competition authority can expect. Below the TW line, the change in total welfare is positive. Applying TW standard, the authority thus would clear a merger in this parameter range. Applying CW standard, the authority approves every merger alternative below the CW line.

On the left panel, CW is calculated as extended CW ($S = 1$), while on the right panel, CW is the simple CW with $S = \frac{1}{2}$. Figure (2) shows similar parameter ranges for partially-quality-maximizing hospitals ($\alpha = 0.7$).

As seen on the left panel of Figure (1), extended CW standard is tougher than TW standard. Since we have chosen TW as the benchmark, we can say that the extended CW standard commits type I errors: it rejects mergers that would increase TW. Besanko and Spulber (1993) build on this characteristic of CW and state that it can contribute to the self-selection of merger proposals that increase total welfare. In the model of Lyons (2003), CW is again a tougher standard than TW. That model takes account to alternative mergers and study the decision of a competition authority in a dynamic perspective. Under CW standard, the authority is more likely to reject a merger than under TW standard. This is an advantage when an alternative merger gives higher TW. Thus in both models, the CW standard can commit type I errors, but no type II errors; i.e., it may reject mergers that increase TW, but it does not approve mergers that decrease TW. This idea coincides with our results on extended CW standard. Simple CW standard, however, may commit Type II errors as well as shown in the right panel of Figure (1). This merger standard accepts higher cost increase for given level of quality improvement than the TW standard and in this way can wave socially undesirable, costly mergers. The mechanisms described in Besanko and Spulber (1993) and Lyons (2003) do not work any more; simple CW standard cannot be preferable to TW standard.

The probability of type II errors is, however, limited as long as hospitals show profit-maximizing behavior as in in Figure (1). When hospitals intrinsically value quality as in Figure (2), they tend to accept more cost increase in turn of given level of quality improvement. As can be seen, this is the region where the simple CW standard commits type II errors. In other words, there is more chance that the simple CW standard approves socially undesirable mergers when hospitals are (partially) quality maximizing than in case of profit-maximizing hospitals. The probability of committing type I error, in contrast, decreases. Quality-maximizing hospitals initiate less mergers that lowers quality. In this respect, quality-maximizing hospitals are more restrictive in proposing a merger than the standard of the competition authority and that is why there are less proposals that the standard rejects.

Regarding to the extended CW standard in case of partially-quality-maximizing hospitals (left panel of Figure 2), it does not commit Type II error. Because the probability of Type I error is also decreasing due to hospitals' behavior, the decisions based on TW and extended CW welfare standard converge.

In conclusion, quality-maximizing behavior of hospitals has similar effects as the application of simple CW standard, i.e. the cost effects play less role in decisions. Scrutinizing whether cost increase is proportional to quality improvement is thus essential when hospitals attach high intrinsic value to quality. Simple CW standard does not concern the complete cost effects of a merger; therefore, this standard may not be hard enough to block costly, quality improving mergers.

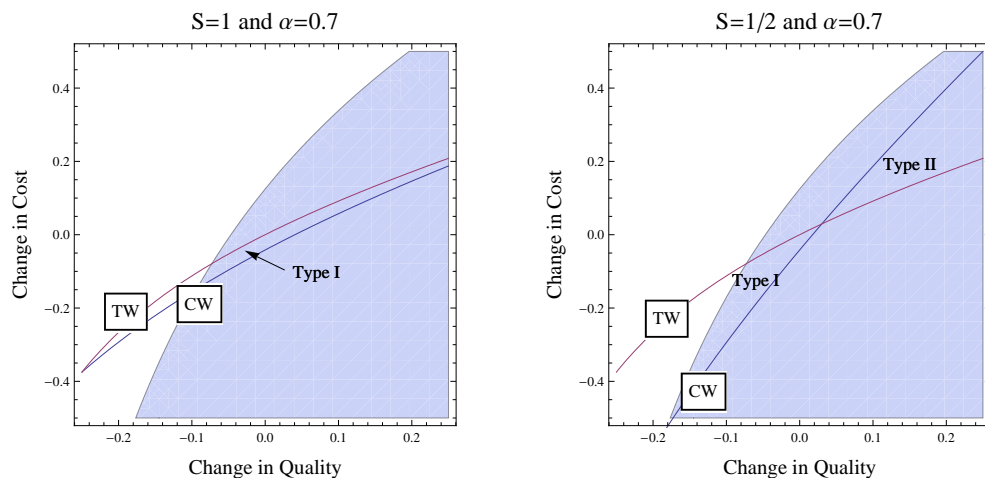


Figure 2: *Parameter ranges in which the CW standard commits type I and type II errors, respectively. The shaded area depicts the parameter ranges where the merger is profitable for a partially-quality-maximizing hospital ($\alpha = 0.7$). We assume no externalities ($S = 1$) in the left panel and externalities ($S = \frac{1}{2}$) in the right panel.*

4 Application in merger control

Most experiences with merger control in the hospital market have been in the US, Germany, and the Netherlands. In order to assess the practical value of our analysis, we briefly review the current practices. As a first observation on the discrepancy between theory and practice, it should be noted that competition authorities only make the trade-off between positive and negative effects required by the welfare standard analysis when the expectation is that the merger significantly harms competition on the relevant market. The logic behind this is that a more intrusive or far-reaching merger control would require information that authorities typically do not have.

A second observation is that in many jurisdictions, again for understandable and pragmatic reasons, most merger decisions are made by and large on purely legalistic grounds.⁸ For example, if market shares are deemed low, a merger is waived without looking at the substantive side of a case, implicitly assuming that mergers between firms with relatively low market shares are unlikely to cause problems. This implies that discussions on the choice of welfare standards are only relevant for those cases where a real welfare analysis is made.

In practice, the primary concern of the analysis by competition authorities in hospital merger cases is the expected price changes on the hospital market.

⁸Here we refer to the sequential approach in welfare analysis used, for example, in the EU, the UK and Australia. In the first step, general presumptions (e.g. on market shares) are applied to filter out unambiguous cases, i.e., when a positive or negative outcome of the analysis is highly probable. A thorough analysis is made only to the remaining more ambiguous cases. The US applies a case-by-case approach, i.e., every merger case is subject to a welfare analysis (Renckens, 2007).

However other aspects of competition such as quality might be considered as well.⁹ Evaluations of the effects of mergers are in first instance based on the expected effects on the financial side of the market. Furthermore, effects are not geared at consumers (i.e., to the premiums), but the analysis stops at the intermediate stage of insurer (i.e., hospital prices). As shown in this article, price effects at this intermediate level do not include externalities since the insurer has to bare the entire health care costs of enrollees. Using the notation of our model, the calculations address in first instance the expenditures ($\sum_{i=1}^n D_i w_i$) and disregard effects on patient welfare (PW). Consequently, calculation of competition authorities are not distorted as long as they assess exclusively price effects on insurers and do not include consumers in the analysis.

Concerns may arise when positive effects of a merger have to be pondered against negative price effects. Merging parties may want to show through an efficiency defense that benefits from quality improvements outweigh the welfare losses of possible price increase. Notice that the burden of proof that quality improvements will emerge lies with the merging parties. The exact definition of 'consumer' then becomes essential in order to calculate the exact gains for consumers. When calculating the PW derived from improved quality, there are two essential questions to answer: who benefits from the quality improvement and what is their willingness to pay for it. Competition authorities should be aware that through health insurance a large group of patients is affected by the merger but their willingness to pay for potential quality improvements probably varies. By calculating the financial effects of a merger, the 'consumer' is defined as all enrollees. Considering the quality effects, many of these consumers may not benefit directly from the potential quality improvement and have, therefore, low valuation for it.

The fact that clients of an insurer do not equally benefit from a given quality improvement of a provider can also be captured in the divergence of reported willingness to pay for it. Diener et al. (1998) distinguishes three sources of willingness to pay in his paper about the application of contingent valuation methodology in health care.¹⁰ First, people value a good or service because of its 'use value'. If they directly consume it, they are probably willing to pay a certain price for it. Second, people may expect that probably in the future they will need the good or service. In this case they may be willing to pay an 'option value' for the possibility of access in the future. Finally, the consumption of some goods and services have external effect. For example, high grade of vaccination in a population gives protection also to those not receiving the vaccine. People may be willing to pay for such 'externality value' of a good or service. Smith (2007) shows that these three values differ. However use value dominates, option value and externality value are also a significant source of the total value. In a merger control process is also necessary to consider these heterogeneities in order to come to an appropriate aggregation of patient welfare derived from the quality improvement owing to the merger.

To illustrate this point, take the example of two hospitals that promise to

⁹As an attribute of competition mentioned only in the third of court cases in the USA between 1985 and 1999 (Hammer and Sage, 2002).

¹⁰Contingent valuation method in health care aims to elicit information on willingness to pay for, for example, a health care program or medical device. In this sense, the principals of eliciting the correct willingness to pay in the population raises the same question as applying the appropriate price-quality trade-off in merger control.

invest in a dialysis center after they merge. The competition authority concludes from its research that the concentration is likely to considerably lessen competition on the hospital market. The merging parties however claim that this negative price effect would be compensated by the improved quality for consumers (the new dialysis center). How should the authority trade off the price increase and the quality improvement?¹¹ Clearly, patients currently visiting the dialysis center are going to value the improvements (use value). Consumers on the given hospital market are also going to value it because might they need kidney dialysis, they can expect a better quality service in their hospital. Their valuation (option value) is however probably lower. Consumers on other hospital markets, but in the same insurance pool, do not benefit from the improvement; and therefore, have a very low (or zero) valuation.¹²

The important conclusion of this article is that the consumer, according to the current situation and the expected future needs, may attach diverging values to given improvements in health care. In the analysis of a quality improving hospital merger, it could be a pitfall to measure the willingness to pay of patients directly benefiting from the quality improvement and generalize it to all consumers on the hospital market. Increase in PW calculated in this way overestimates the real benefits of consumers. It should not be automatically assumed that all patients on the relevant hospital market has the same willingness to pay but should be scrutinized which consumer groups are included in the analysis and how their welfare is aggregated.

5 Conclusions

Our paper contributes in four ways to the literature. First, we have shown that consumer welfare in health care markets should be interpreted in a different way than in standard markets. This difference is prompted by the fact that mergers may have consequences for other consumers than just the ones directly affected. The indirect effect runs through health insurance premiums, i.e., if after a merger the bargaining position of the merged entity drives the premium up, all clients of the insurers are affected, not just patients of the merged hospital. This external effect on consumers paying premium but actually not receiving health care has to be taken into account in the welfare standard of competition authorities.

Second, we have more specifically shown that failing to incorporate the above-mentioned external effect can make CW in case of quality enhancing mergers a weaker standard than total welfare. This result contrasts with results in non-health care markets. Consumer welfare standard in those markets is always at least as tough as total welfare standard. A further contrast to non-health care markets and a consequence of forgoing external effects is that simple CW can commit both type I and type II errors in merger control. If the externality is positive (e.g., owing to a cost reducing merger), TW enhancing mergers can be blocked, while if the externality is negative (e.g., owing to a cost increasing merger that raises premiums), TW reducing mergers that should be

¹¹This is a hypothetical example. To our best knowledge, quality and price effects have not yet been explicitly set against each other by competition authorities.

¹²In reality the competition authority also has to check whether the dialysis center is causally related to the merger and that no other alternatives exist for the quality increase.

blocked can be waived. A CW standard that includes the external effects too (i.e., the extended CW) corrects for these disadvantages, and it is similar in results to CW in non-health care markets.

Third, the non-profit nature of hospitals increases the probability that quality-improving mergers are proposed since hospitals put much weight on the intrinsic value of quality improvement. If these improvements go hand in hand with high costs, TW can be negatively affected. The more weight hospitals put on quality compared to monetary profit in their merger decisions, the more important it becomes to apply a merger standard that involves the complete cost and quality effects. In conclusion, simple CW standard is not suitable for health care markets; extended CW should be used instead.

Finally, the distinction between simple and extended CW in the practice of merger control can be reflected in the exact definition of the 'consumer' used in the welfare analysis. The choice of definition is particularly important when a merger has both price and quality effects because the group of consumers directly affected by quality improvements (or deteriorations) usually does not correspond with the population bearing the financial consequences of the merger. The externality caused by insurance is reflected in the diverging valuation of quality improvements by different groups of consumers. The conclusions for merger control in health care markets is that it is essential to scrutinize which consumer groups are involved in the welfare analysis and how their benefits (or losses) from the merger are aggregated.

Acknowledgments

We would like to thank Jan Boone for his many valuable suggestions on the model set-up. We also thank Wolf Sauter, Rein Halbersma, Ramsis Croes, Frank Pellikaan and Krijn Schep for their helpful comments on drafts of this paper. Furthermore, we are grateful to the participants of the Competition Law and Economics European Network (CLEEN) workshop 2011, participants of the Centre for Competition Policy (CCP), University of East Anglia workshop 2011, and to colleagues at TILEC, Tilburg University and at the Dutch Healthcare Authority for their comments and suggestions.

References

- Fischer S. Dornbusch R. Begg, D. *Economics, 9th edition*. London: The McGraw-Hill Companies, 2008.
- D. Besanko and D.F. Spulber. Contested mergers and equilibrium antitrust policy. *Journal of Law, Economics, and Organization*, 9(1):1–29, 1993.
- P.S. Calem, A. Dor, and J.A. Rizzo. The welfare effects of mergers in the hospital industry. *Journal of Economics and Business*, 51(3):197–213, 1999.
- C. Capps, D. Dranove, and M. Satterthwaite. Competition and market power in option demand markets. *The RAND Journal of Economics*, 34(4):737–763, 2003.
- T. Chang and M. Jacobson. What is the mission of a not-for-profit hospital? evidence from californias seismic retrofit mandate. *National Bureau of Economic Research Cambridge, Mass., USA*, 2008.
- J.P. Clement, K.R. White, and V. Valdmanis. Charity care: Do not-for-profits influence for-profits? *Medical Care Research and Review*, 59(1):59, 2002.
- D. Deneffe and R.T. Masson. What do not-for-profit hospitals maximize? *International Journal of Industrial Organization*, 20(4):461–492, 2002.
- A. Diener, B. O’Brien, and A. Gafni. Health care contingent valuation studies: a review and classification of the literature. *Health economics*, 7(4):313–326, 1998. ISSN 1099-1050.
- S.O. Fridolfsson. A Consumer Surplus Defense in Merger Control. *Working Paper Series*, 2007.
- M. Gaynor and W.B. Vogt. Competition among hospitals. *National Bureau of Economic Research Cambridge, Mass., USA*, 2003.
- P.J. Hammer and W.M. Sage. Antitrust, Health Care Quality, and the Courts. *Columbia Law Review*, 102, 2002.
- K. Heyer. Welfare standards and merger analysis: Why not the best? *EAG Discussions Papers, Department of Justice, Antitrust Division*, 2006.
- J.R. Horwitz. Making profits and providing care: Comparing nonprofit, for-profit, and government hospitals. *Health Affairs*, 24(3):790, 2005.
- J.R. Horwitz and A. Nichols. Hospital ownership and medical services: Market mix, spillover effects, and nonprofit objectives. *Journal of health economics*, 28(5):924–937, 2009.
- D.N. Lakdawalla and T. Philipson. Nonprofit production and competition. *National Bureau of Economic Research Cambridge, Mass., USA*, 1998.
- B.R. Lyons. Could Politicians Be More Right Than Economists? A Theory of Merger Standards. *European University Institute Working Paper*, 2003/14, 2003.

- A. Malani, T. Philipson, and G. David. *Theories of Firm Behavior in the Non-profit Sector. A Synthesis and Empirical Evaluation*. University of Chicago Press, 2003.
- M.A. McGuirk and F.W. Porell. Spatial patterns of hospital utilization: the impact of distance and time. *Inquiry: a journal of medical care organization, provision and financing*, 21(1):84, 1984.
- D.J. Neven and L.H. Röller. Consumer surplus vs. welfare standard in a political economy model of merger control. *International Journal of Industrial Organization*, 23(9-10):829–848, 2005.
- T. Philipson and R. Posner. *Antitrust in the not-for-profit sector*. National Bureau of Economic Research Cambridge, Mass., USA, 2006.
- R. Pittman. Consumer Surplus as the Appropriate Standard for Antitrust Enforcement. *EAG Discussions Papers, Department of Justice, Antitrust Division*, 2007.
- J. Prüfer. Competition and mergers among nonprofits. *Journal of Competition Law and Economics*, 7(1):69, 2011.
- A. Renckens. Welfare Standards, Substantive Tests, and Efficiency Considerations in Merger Policy: Defining the Efficiency Defense. *Journal of Competition Law and Economics*, 3(2):149–179, 2007. ISSN 1744-6414.
- B.D. Richman. Antitrust and nonprofit hospital mergers: a return to basics. *University of Pennsylvania Law Review*, 156:121, 2007.
- W.M. Sage, D.A. Hyman, and W. Greenberg. Why competition law matters to health care quality. *Health Affairs*, 22(2):31–44, 2003. ISSN 0278-2715.
- S. Salop. Question: What is the real and proper antitrust welfare standard? Answer: The true consumer welfare standard. *Statement before the Antitrust Modernization Commission*, 2005.
- R.D. Smith. Use, option and externality values: are contingent valuation studies in health care mis-specified? *Health Economics*, 16(8):861–869, 2007. ISSN 1099-1050.
- M.G. Vita and S. Sacher. The competitive effects of not-for-profit hospital mergers: A case study. *The Journal of Industrial Economics*, 49(1):63–84, 2001.

Welfare Standards in Hospital Mergers

Katalin Katona Marcel Canoy *

July 31, 2011

Abstract

There is a broad literature on the consequences of applying different welfare standards in merger control. Specific aspects of health care mergers, however, have not yet been considered. Two features of the health care sector are especially relevant. First, health care providers are possibly not profit oriented. Second, consumers can be covered by a mandatory health insurance and pay uniform premiums. The fact and level of payment is not connected to the consumption of health care services, which makes the concept consumer in merger control ambiguous.

Previous literature on welfare standards in merger control has often built on the general result that consumer welfare is a more restrictive standard than total welfare. We model mergers on hospital markets and allow for non-profit maximizing behavior of providers and mandatory health insurance. We show that applying a restricted interpretation of consumer in health care merger control can reverse the relation between the two standards. Consumer welfare standard can be weaker than total welfare. Consequently, applying the wrong standard can lead to both clearing socially undesirable and to blocking socially desirable mergers. The possible negative consequences of applying a simple consumer welfare standard in merger control can be even stronger when hospitals maximize quality and put less weight on financial considerations. We also relate these results to the current practice of merger control.

JEL Classification Numbers: I11, I18, L44

Keywords: merger control, hospital merger, welfare standard, consumer welfare

*Corresponding author: Katona: Dutch Healthcare Authority, P.O. Box 3017, 3502 GA Utrecht, the Netherlands, T: +31 30 296 8939, F: +31 30 296 8296, E: kkatona@nza.nl, and TILEC, Tilburg University, PO BOX 90153, 5000LE Tilburg, the Netherlands; Canoy: professor in health economics TILEC, Tilburg University, PO BOX 90153, 5000LE Tilburg, the Netherlands; and Chief economist Ecorys, Watermanweg 44, 3067GG Rotterdam, The Netherlands, E: m.canoy@uvt.nl

1 Introduction

Competition authorities that need to decide on mergers have some leeway as to the criteria for their assessment of welfare. Most authorities have decided to go for consumer welfare. However, there are some countries such as Canada and Australia where merger control seems to follow the principles of total welfare (Renckens, 2007). There is a long standing discussion in the economic literature on whether one or the other standard is preferable. The question is addressed both from practical and theoretical perspectives. We contribute to this discussion by pointing out that specific features of the health care sector reverse some key results.

Merger control of hospitals is a relatively new branch for competition authorities, and is less analyzed in the literature on optimal welfare standards. Hospital markets are liberalized in a number of countries (e.g., Switzerland, Netherlands, US) making it a sector that falls under competition law scrutiny.¹

Hospital markets have certain specific features that require attention. First, hospitals are not necessarily striving for maximum profits. When providers attach much weight on quality arguments in their merger decisions², it is more probable that mergers of socially undesirable (i.e. excessive) quality improvements are initiated. Second, the market is characterized by the fact that patients are insured. The concept 'consumer' becomes ambiguous when health insurance is mandatory, premiums are uniform regardless of heterogeneity among consumers, and there are no significant co-payments (such as is the case in Germany, France and The Netherlands). Patients receive treatment from the providers but do not directly pay for the services. Insurers reimburse providers and collect premiums from their clients. The level of premium is, however, independent from the individual consumption, making the financial and consumption side of the market for hospital services detached. Theoretically, there could be many different definitions of a 'consumer': one that actually visits the given hospital, one that might visit it, or one that through insurance premiums pays for the services offered by the given hospital. Since insurance spreads the health care expenditure across all its clients, only the most extended definition allows one to consider the whole financial effect of a merger. If we use a narrower definition, we have to take external effects of the insurance into account. Our contribution to the literature is that we explicitly model these specific hospital market features.

Depending on the definition of 'consumer', the exact meaning of consumer welfare standard also changes. Applying a narrow definition, the consumer welfare (CW) standard can result in a more lenient criterion than the total welfare (TW) standard, which is in contrast to the general view in the literature. Considering markets where consumers bear the whole benefits and costs of their consumption, the CW standard has been equal to or tougher than the TW standard. Many theoretical models (e.g., Besanko and Spulber, 1993; Lyons, 2003) have built on this feature when showing the superiority of CW standard in certain circumstances. We show that the externality effects on health care markets stemming from insurance can reverse the relationship between CW and

¹The standpoint that competition law applies to health care just like to any other sector in the US stems from the case *Goldfarb v. Virginia State Bar* in 1975 (Sage et al., 2003).

²There is no consensus in the literature about what (not-for-profit) hospitals maximize. See section 2.3 for a overview of proposed alternatives.

TW standard, which questions the generality of the claims in the literature.

From a policy perspective, a narrow definition of 'consumer' in the CW standard can lead to both approving socially undesirable mergers as well as blocking socially desirable mergers. A CW standard, which applies the most extended definition of 'consumer', repairs this problem; however, it requires to consider effects that are potentially external to the relevant hospital market of the merger. In the process of merger control, this dilemma appears in the evaluation of the potential positive (quality) effects of a merger against the negative (price) effects. The externality caused by insurance is reflected in the diverging valuation of quality improvements by different groups of consumers. The method to value potential quality improvements and aggregate it across all consumers influences the effectiveness of the merger standard.

The next subsection reviews the economic literature that investigates the reason for different welfare standards in merger control. Section 2 describes the model. Section 3 summarizes the results of our model and discusses the consequences of applying different merger standards from a theoretical perspective. Policy implications and relevance to the current practices are described in Section 4. In Section 5, we conclude.

1.1 Related literature

There are two branches of economic literature analyzing the optimal welfare standard. One compares practical and direct effects of applying TW or CW while the other branch applies the agency framework to analyze the decision problem of competition authorities. We summarize the arguments of both approaches.

Articles of the practical approach (e.g. Heyer, 2006; Salop, 2005; Pittman, 2007), focus broadly on two aspects: efficiency of production and (re)distribution among different groups of society such as providers and consumers. Regarding efficiency is analyzed whether a merger offers opportunity to produce more or better given the scarce resources. While the TW standard values every efficiency improvement, the CW standard merely acknowledges gains that are passed on to consumers. Fixed cost savings for example may weigh out the anticompetitive effects of a merger according to the TW standards but do not contribute to the CW standard. The CW standard ignores some efficiency gains and give priority to distributional aspects. In this way it can lead to a situation where consumers are the final beneficiaries of the merger, but it forgoes some efficiencies that would solely benefit providers.

About the costs and workability of one or the other welfare standard opinions diverge. The TW standard requires more information on costs of the merging firms, which is usually hardly available for competition authorities. Furthermore, it takes account (theoretically) of effects on rival firms as well. The CW standard, in contrast, focuses only on a segment of effects, namely that on consumers. The price forecast of post-merger market equilibrium is, however, burdensome irrespective the applied welfare standard.

Articles in the other branch of the literature look at the merger control process as a whole and apply principal-agent theory (e.g., Neven and Röller, 2005; Fridolfsson, 2007; Besanko and Spulber, 1993; Lyons, 2003). They assume that the ultimate goal is to maximize TW. In these models competition authority is an agent that controls mergers according a given welfare standard. The focus

of these analyses is the consequence of choosing total or consumer welfare standard as objective function of the competition authority. However the final goal is always to maximize total welfare, it sometimes can be achieved by defining CW as objective function for the agent authority. Besanko and Spulber (1993) and Lyons (2003) both build on the general result that CW standard is more restrictive than TW standard and show under which conditions the CW standard achieves higher TW than the TW standard.

Besanko and Spulber (1993) apply a model of asymmetric information to show that a tougher merger standard than the TW standard increases the societal gain from the merger. Since authorities cannot perfectly estimate the welfare consequences of a merger, their decision is a random variable from the firms perspective. Furthermore, rejection of a merger has a higher probability when CW standard (a tougher criterion) is applied than in case of TW standard. Because preparing and submitting a merger proposal is costly, firms initiate mergers that they expect to be accepted. In instance of a tougher merger standard, it results in a self selection toward socially preferable merger alternatives. The key elements in this model leading to the preference of CW standard are the costly procedure and asymmetric information.

Lyons (2003) derives the relative advantage of one or the other welfare standard from the difference in the treatment of changes in fixed costs. CW standard incorporates cost reductions only if they are passed on to consumers. Therefore, fixed cost reductions are excluded from the analysis. Welfare gain from mergers are described as the ratio of anticompetitive effects and fixed cost reductions. CW standard is a tougher standard because potential anticompetitive effects cannot be compensated by cost reductions in the analyses. Since firms prefer mergers with anticompetitive effects (higher prices), CW standard is more likely to reject the first proposal of firms than TW standard. The desirability of rejection in the long term depends on alternative mergers. If the subsequent proposal of firms yields a higher TW, then rejection was a desirable decision. If the alternative is a socially less beneficial merger, then approval by TW standard is a better strategy. Lyons (2003) models a given industry structure and analyses sequential mergers to find the equilibrium structure conditional on the merger standard.

These articles all have considered general sectors, which set-up does not fully fit health care markets. Calem et al. (1999) focus on distinguishing different welfare measures specific to health care markets. They emphasize two distinguishing characteristics of hospital (and in general health care) markets. First, health care insurance causes moral hazard in the consumption of hospital services to the extent of the co-payment rate. Second, hospitals may be non-profit; namely, they may maximize output instead of profit. Considering these characteristics of hospital markets, they compare the effects of a merger on consumer surplus (gain from hospital services minus co-payments paid by consumers), net social surplus (gain from hospital services minus price paid by the insurer) and gross social surplus (gains from hospital services minus costs born by hospitals). They model quality competition among hospitals, which may yield over-production of quality because of moral hazard problems or the non-profit nature of hospitals. Consequently, merger may be gross social welfare enhancing since it reduces quality competition and restricts excess quality. Considering only consumer surplus, which reduces with decreasing quality, can be misleading when evaluating hospital mergers. These results are health care

specific but are not explicitly linked to the literature on merger control. Our article makes this last step too. Similar to Calem et al. (1999), we compare various welfare concepts applied to health care markets; and additionally, we look explicitly at the consequences of using these measures in merger control.

Finally, we mention the strand of literature that investigates if not-for-profit (NFP) organizations should be treated differently in antitrust law than for-profits (FP). Several articles show that the behavior of NFP firms can be interpreted as a profit-maximizing behavior with lower perceived costs. Beside monetary profit, NFP firms gain additional utility from production, which makes them accept higher costs for the same level of production. This attribute of NFP appears in our model as well. Both theoretical (e.g., Philipson and Posner, 2006; Richman, 2007) and empirical (e.g., Vita and Sacher, 2001; Gaynor and Vogt, 2003) articles conclude that not-for-profit hospitals exploit their market power in a similar way than their for-profit counterparts.

Prüfer (2011) however shows that this result depend on the assumptions made on the maximand of the NFP firms. In his article, NFP firms with an owner preferring high quality produce excessive quality (from societal perspective). The merger (to monopoly) eliminates competition, which indirectly makes the firm produce lower quality increasing in this way the total welfare. Prüfer (2011) draws the attention to the importance to examine the objective of the owners of the merging NFP firms when assessing the net effects on the society.

However, it is important to notice that the not-for-profit status of hospitals is different from the possible not-profit-maximizing behavior. The first is a definition used in the context of taxation and refers roughly to two rules. NFP hospitals enjoy exemption from taxation, and they are not allowed to pay rents to their owners (non-distribution constraint). The not-profit-maximizing behavior refers to the objective function of the hospital that is revealed in its decisions. In this article, we consider this second possibility but do not discuss the case of not-for-profit status.

2 Model

Our static model includes three players; hospitals deciding whether to initiate a merger, consumers paying the insurance premium and choosing a hospital when they fall ill, and a competition authority blocking or approving the merger. The standard that the competition authority applies in merger control is either the TW standard or a version of the CW standard. In both cases, the authority approves the merger if the standard indicates net gains and blocks the merger if the standard indicates net losses. We do not model the insurance market explicitly. This assumption is not restrictive for the purpose of our research.

2.1 Hospital market and consumer preferences

We characterize the market for hospital services and consumer preferences by applying the circular city model. Distance to hospital is an important choice factor of consumers (see, e.g., McGuirk and Porell, 1984) which makes substitutability of providers asymmetric, i.e., dependent on distance from the consumer's location. Location models fit this characteristic of the market. Furthermore, we

focus on effects of a merger and consider hospitals in any other aspect symmetric. The circular model, in contrast to linear models, allows for this.

Let the n hospitals offering treatment to patients be located on a circle of unit circumference at equal distance from each other. Besides this horizontal differentiation, hospitals may also vary in quality of services offered. Patients³ are uniformly distributed on the circumference of the circle. We assume that every patient prefers hospital services of higher quality to that of lower quality and that they dislike traveling. They trade-off quality and distance from the hospital uniformly in ratio t . Patients do not pay directly for the treatment; therefore, price does not play a role in their hospital choice. Thus, the utility derived from receiving hospital treatment includes two terms; the quality of the services in the visited hospital (q_i) and the distance to the hospital (x).

$$U = q_i - tx \quad (1)$$

The demand for hospital i 's services (equation 2) consists of the sum of two 'half demands': the demand in the market segments where hospital i competes with hospital $i + 1$ and $i - 1$ respectively. In each segment, the demand is derived by determining the position of the indifferent patient based on the utility function (equation 1).

$$D_i(q_i, q_{i-1}, q_{i+1}, t) = \frac{1}{n} + \frac{q_i - q_{i-1}}{2t} + \frac{q_i - q_{i+1}}{2t} \quad (2)$$

Equation (3) describes the utility that patients of hospital i derive from their visit. We refer to this value as patient welfare produced by a given hospital (PW_i). Equation (4) defines the (total) patient welfare (PW) which is the sum of the welfare produced by each hospital.

$$PW_i = \int_0^{\frac{1}{2n} + \frac{q_i - q_{i-1}}{2t}} (q_i - tx) dx + \int_0^{\frac{1}{2n} + \frac{q_i - q_{i+1}}{2t}} (q_i - tx) dx \quad (3)$$

$$PW = \sum_{i=1}^n PW_i \quad (4)$$

We do not model the insurance market and the hospital - insurer relationship explicitly but make some simplifying assumptions. In the insurance market, we assume Bertrand competition among symmetric firms, which results in premiums at the level of the uniform marginal cost. The single role of insurance market in this model is to pool patients health care expenditure and set a uniform premium for all consumers. On the prices between insurers and hospitals we assume that they are results of negotiations. Instead of modeling the negotiations, we make two assumptions on the outcomes and incorporate these simplified solutions in the further steps of the model. These assumptions are common in the literature and are not restrictive for this model.

First, insurers reimburse the costs of the hospitals. Above that they pay a share of the added value produced by the hospital minus the difference in expenditure caused by including the given hospital in the insurers network, similarly to the idea of option demand markets in Capps et al. (2003). The added value of a given hospital is defined as the total patient welfare assuming patients may

³We use the term patient to refer to a consumer who needs hospital treatment.

attend to all hospitals in the market minus the total patient welfare assuming that patients may attend any but the given hospital in the market. This value represents the added utility that patients derive from the existence of that given hospital. Note that this formula yields higher added value for a hospital of a high quality or in an isolated location than for a hospital of average quality in a densely populated location. The underlying intuition is that dropping high-quality low-density hospital from the market leads to consumers substituting it for a hospital of considerably lower quality or for one lying relatively far away.

Second, in order to keep the model simple, we assume that insurer and hospital share the added value in a given proportion, namely 50-50%. We apply thus the following formula to determine the price of hospital i 's services (w_i)

$$w_i = c_i + \left(\frac{PW - PW_{-i}}{D_i} - \frac{TE - TE_{-i}}{D_i} \right) \frac{1}{2}$$

where c_i denotes the constant average cost of hospital i , TE denotes the total expenditures of insurers, which is defined as $TE = \sum_{i=1}^n D_i w_i$. PW_{-i} denotes the total PW when hospital i is not in the market and similarly TE_{-i} is the total expenditure of insurers when hospital i is not in the market.⁴ Note that we assume hospitals to agree on the same price with all the insurers, i.e., a hospital has a single price. Since insurers are symmetric in the model, this is a logical assumption.

Following a merger, the merged hospitals negotiate with the insurers together. If they fail to agree, both of their locations become unavailable for patients. PW_{-i} is thus calculated by dropping both hospitals from the market. Therefore, patients have to travel further for a substitute than before merger, and the added value of the hospital increases. A merger leads to higher prices, *ceteris paribus*, reflecting the increased market power of the merged hospitals.

Note that the price depends only on the value that hospitals add to patient welfare. Hospitals of higher than average quality produce more added value; therefore, have higher prices. This is, however, independent of the hospital's objective function. Similarly, the price of the merged hospital increases regardless its maximand. This result is in line with the literature on NFP hospitals, which finds that NFP hospitals exploit their market power similarly than their FP counterparts. Our results coincide with this, although we model a bargaining outcome in contrast to the usually assumed price setting behavior.

2.2 Welfare measures

Based on the exact definition of 'consumer' used in the merger analysis, we identify two different consumer welfare standards. We define 'simple CW' as the difference of the PW and the share patients pay from health care expenditures. Simple CW measures the direct effect of a merger, and does not consider external effects introduced by health insurance. The concept 'consumer' is defined here as patients visiting the hospital, which is a narrow exposition because it excludes a large group of healthy consumers or consumers in other hospital markets.

An extended definition of 'consumer' that we use involves everyone affected by the merger. This is all people covered by the same insurance because through

⁴Note that $PW_{-i} \neq PW - PW_i$ (and $TE_{-i} \neq TE - TE_i$). The left hand side describes the patient welfare (total expenditure) calculated for $n - 1$ hospitals in the market, while the right hand side represents the patient welfare (total expenditure) in a part of the market.

the uniform premium they pay they are affected by changes in the hospital prices. Furthermore, we assume that consumers from other hospital markets can also be pooled by the same insurance and so can be affected by the merger. Expenditures can be shared among consumers in a larger region than the hospital market each patient considers. We will call the welfare measure calculated as PW derived from hospital services minus health care expenditure as 'extended CW'.

The difference between simple and extended CW is in the cost component. Patients visiting the hospital enjoy all benefits of a potential quality increase (reflected in increasing PW), but pay only a proportion of potential extra costs. When considering all consumers affected by the merger, PW is still completely considered, and costs are also fully taken into account. Calculating the extended CW, we internalize the external effects of insurance on consumers paying premium but not visiting the given hospital.

To formalize the concept of simple CW and extended CW, let us define the ratio

$$S = \frac{\text{Number of patients directly affected}}{\text{Number of all affected consumers}}$$

Equation (5) defines simple CW, while Equation (6) defines extended CW. Note, that S can also be interpreted as the ratio of consumers that are included in the merger analysis. In this way, S is a continuous variable that determines the level of externality and the distortion introduced by partial analysis that excludes a group of consumers paying premiums. Equation (6) shows that the extended CW can be written as the sum of simple CW and the externality effect caused by health insurance.

$$CW_{simple} = PW - S \sum_{i=1}^n D_i w_i \quad (5)$$

$$CW_{ext} = PW - \sum_{i=1}^n D_i w_i = PW - S \sum_{i=1}^n D_i w_i - (1 - S) \sum_{i=1}^n D_i w_i \quad (6)$$

TW is defined as the difference of PW and the cost of its production, which equals the sum of the welfare of all groups in society.⁵ Similar to the theoretical strand of the literature, we use TW as the benchmark.

$$TW = PW - \sum_{i=1}^n D_i c_i$$

⁵First, considering the extended definition of consumer, TW is the sum of CW and suppliers surplus, i.e. $TW = (PW - \sum_{i=1}^n D_i w_i) + (\sum_{i=1}^n D_i w_i - \sum_{i=1}^n D_i c_i)$. Second, considering the restricted definition of consumer and so calculating with the simple CW, we can write TW as $TW = (PW - S \sum_{i=1}^n D_i w_i) + (\sum_{i=1}^n D_i w_i - \sum_{i=1}^n D_i c_i) - ((1 - S) \sum_{i=1}^n D_i w_i)$. The first term equals the simple CW, the second term is the suppliers surplus, while the third term is the externality effect, i.e. effect on other consumer groups in the society. In the calculations of TW, externalities have to be taken into account since they form costs (or benefits) for the society although not for the group defined as 'consumers' or 'suppliers' in the analysis. It can be compared to the textbook example of production or consumption externalities. The individual and social costs of consumption diverge, which results in externalities that are not considered by the consumers but that are costs for the society. See, e.g., in Begg (2008, p.304).

2.3 Objective function of hospitals

The term NFP hospitals suggest that the objective function of these organizations deviates from purely monetary profit maximization. This hypothesis is tested by several empirical articles such as Chang and Jacobson (2008); Deneffe and Masson (2002); Horwitz and Nichols (2009). They confirm that the maximand of NFP hospitals is not the monetary profit. Deneffe and Masson (2002) and Horwitz and Nichols (2009) find that NFP hospitals are most likely to maximize output or a mix of monetary profit and output, while Chang and Jacobson (2008) conclude that the data is the most consistent with the theory of perquisite maximization. Others (e.g., Horwitz, 2005; Clement et al., 2002) at the same time find that NFP hospitals provide more charity or unprofitable care or higher quality than for-profits, which can be the result of some kind of welfare maximization. However there are several hypotheses on the real objective function of NFPs, there is no consensus in the literature about it. Malani et al. (2003) overview the empirical literature and concludes that there is not enough evidence to distinguish among different theories on the NFP objective function.

In our model, we assume that hospitals maximize a combination of monetary profits and quality level.⁶ In one extreme case of our model, hospitals maximize purely the quality level of their care regardless of monetary profits. The other extremity is the pure profit-maximizing behavior. We will refer to the hospitals following exclusively the previous strategy as purely-quality-maximizing hospitals, while to hospitals following the latter strategy as purely-profit-maximizing hospitals.

Quality improvement can be a strategy for both the purely quality and purely profit maximizing type. In contrast to quality-maximizing hospitals where quality improvements directly increase the objective function of the hospital, quality improvement only has an indirect effect on profit-maximizing hospitals. Quality increases the monetary profit through higher market shares and higher prices. The motive of a profit-maximizing hospital for quality improvement essentially differs from the motive of a purely-quality-maximizing hospital.

Specifically, we assume that hospitals maximize the weighted average of monetary profit (Π) and quality (q). The objective function of hospital i is thus:

$$G_i = \alpha\Pi_i + (1 - \alpha)q_i = \alpha D_i(q, t)(w_i - c_i) + (1 - \alpha)q_i \quad (7)$$

where Π_i denotes the monetary profit of the hospital, which is demand multiplied by price minus cost. We denote the relative weight of profit maximization to quality maximization in the decisions of the hospital by α . In case of a purely-profit-maximizing hospital, $\alpha = 1$, while in case of a purely-quality-maximizing hospital, $\alpha = 0$. Hospitals may follow partially both objectives, i.e., they have an eye on costs, but increase quality just for its intrinsic value as well (and not to seek higher market share). We assume that the value of α is the same for all hospitals in the market.

⁶The article closest to ours, Calem et al. (1999) defines the goal of non-profit hospitals in outcome maximization. Quality maximization is an alternative hypothesis that is also supported by a number of empirical studies. Quality maximization is a form of perquisite maximization defined and tested in Chang and Jacobson (2008). Further, Malani et al. (2003) could also not reject that the hypothesis that hospitals maximize non-contractible quality.

Our definition of the objective function is similar to the model of profit-deviating firms used in Lakdawalla and Philipson (1998) though they assume 'output-preferring' hospitals. It is important that we similarly to the before mentioned model do not model the not-for-profit status of hospitals (i.e., the nondistribution constraint), but focus on the profit-deviation behavior. Budget constraint for the hospitals such as a constraint for positive monetary profit is not assumed. Lakdawalla and Philipson (1998) argues that donors who gain utility from the profit-deviation can cover the negative profits. For the ease of presentation, we also disregard for a budget constraint. The inclusion of such limitation in our model would however not change the qualitative results.

2.4 Merger decision of hospitals

Two hospitals will only initiate a merger if their objective functions consequently increase, i.e., their joint gain (G_{i+j}) is higher after merger than before it.

$$\begin{aligned} G_{i+j}^{before} &< G_{i+j}^{after} \\ \alpha(D_i(w_i - c_i) + D_j(w_j - c_j)) + (1 - \alpha)\frac{q_i + q_j}{2} &< \alpha D_{i+j}(w_{i+j} - c_{i+j}) + (1 - \alpha)q_{i+j} \end{aligned} \quad (8)$$

Where q_{i+j} is the quality level after merger, c_{i+j} is the cost after the merger, D_{i+j} is the demand of the merged hospital, while w_{i+j} is the price of hospital services calculated for the merged hospital.

As described at Equation (7), α gives relative weights to monetary and non-monetary benefits in the objective function of hospitals. From Inequality (8) can be seen that a purely-quality-maximizing hospital will initiate any merger with $\frac{q_i + q_j}{2} < q_{i+j}$ irrespective to costs. Other hospitals ($0 < \alpha \leq 1$) consider both quality and cost consequences of a merger. If there are several possible mergers the hospital chooses the one that ensures the highest gain.

Specifically, we assume two effects of a merger: 1) a merger specific change in quality, Δq , and 2) a merger specific change in marginal cost, Δc .⁷ The change in quality can be an increase, assuming that e.g. larger hospitals have a better reputation and so attract better personnel. It can also be a decrease in quality, assuming that cultural differences in the two institutions make quality lower in short run. Costs may decrease or increase owing to a merger. One reason for a decrease can be the scale economy of certain activities. A cost increase, however, is possible, for example, due to higher organizational costs after the merger.

We assume that quality differences after merger are not so large that it is worthwhile for patients to pass by the nearest hospital (that is to travel more than $1/n$ of the circle): $\frac{t}{n} > |\Delta q|$. Furthermore, we only consider mergers between two neighboring hospitals, and assume that the merged hospital does not close any of its locations. The only strategic action on the part of the hospital that we explicitly consider is the decision on the merger: whether and with which (neighboring) hospital to merge.

⁷The assumption that the change in quality is merger specific means that other hospitals can not change their quality level. This is realistic to assume when for example scale effects play a role.

3 Results

To keep the presentation of results simple, we set the initial values of quality and cost level uniform for all hospitals in the market. In this way, we have two quality and two cost levels in the model: q and c for all hospitals before the merger, which changes to $q + \Delta q$ and $c + \Delta c$ for the merged hospitals after the merger (but remains q and c for all other hospitals). Furthermore, we set the transformation rate between quality and traveling at 1 ($t = 1$). Finally, we fix the number of hospitals in the market before merger at 4 ($n = 4$).

The following equation produces the gain (G_{i+j}) that merging hospitals can obtain:

$$\Delta G_{i+j} = \alpha \left[(\Delta q - \Delta c) \left(\frac{1}{4} + \frac{\Delta q}{2} \right) - \frac{(\Delta q)^2}{4} + \frac{1}{32} \right] + (1 - \alpha) \Delta q$$

As can be seen, even in the absence of cost and quality effects, hospitals gain $\frac{\alpha}{32}$ because of their increased bargaining power. Increasing costs lower the gains from the merger or do not influence it in case of purely-quality-maximizing hospitals. Effects of quality improvements depend on the level of Δc and α . Purely-quality-maximizing hospitals ($\alpha = 0$) always gain from quality improvements. Hospitals that (partially) maximize monetary profit can gain as well since better quality attracts more patients. More patients generate monetary profit if the hospital has a positive price cost margin. For $\alpha = 1$, for example, the condition for increase in gains is $\Delta c < \frac{1}{2} + \Delta q$.

3.1 Effects on different welfare measures

We will compare the effects of a merger for alternative welfare measures: simple and extended CW, and TW. Each of these measures can be used in merger control. However, they deliver diverging conclusions. Simple CW is specific to health care markets. Extended CW corresponds to CW in non-health care markets, and the definition of TW does not differ either. Reasons for and effects of applying CW or TW standard in non-health care markets has extensively been analyzed in the economic literature, while Calem et al. (1999) have described some health care specific welfare measures. We relate our findings to these previous results.

Change in (simple) consumer welfare is given by the following equation:

$$\Delta CW = \Delta q \left(\frac{1}{2} + \Delta q \right) - \frac{(\Delta q)^2}{2} - \frac{S}{2} \left[\Delta c + (\Delta q - \Delta c) \left(\frac{1}{4} + \Delta q \right) - \frac{(\Delta q)^2}{2} + \frac{1}{32} \right]$$

The first term represents the quality gain due to merger, while the last term shows the price effects. The term between $(\frac{(\Delta q)^2}{2})$ is the loss in travel time; consumers travel more because they sometimes opt for a hospital of better quality however further away than the nearest hospital. This loss from traveling is always compensated by the gain from higher quality (in the first term) otherwise patients would choose hospital differently.

The last term indicates that S mitigates the costs effects, i.e., simple CW is a harder constraint than TW when cost effects are advantageous and it is a weaker constraint when price effects are disadvantageous. Simple CW reaches its extreme value in S when the number of consumers affected directly and

indirectly coincides ($S = 1$). Consumers cover all the health care expenditures, which also yields that simple CW equals the extended CW. Generally, extended CW is the boundary of simple CW since it considers the complete cost effects in stead of partial analyses.

The concept of 'consumer welfare' and 'net social welfare' in Calem et al. (1999) is similar to our simple and extended CW, respectively. They diverge, however, in modeling the insurance market since Calem et al. (1999) do not include insurance premiums in consumer surplus, but consider out-of-pocket co-payments of consumers. Consequently, their consumer welfare concept captures the cost effects of a merger only to the extent of co-payments. They classify net social welfare as total welfare excluding hospital profits because they are hard to observe or verify. However the calculation of this and our extended CW concept coincides, the underlying idea is different. Our extended CW is not a kind of total welfare, since no profits of providers or insurers are included. If insurers made profit, we would not include it in the calculation. Extended CW is a consumer surplus taking into account all effects of a merger on consumers.

Change in total welfare is given by the following equation:

$$\Delta TW = (\Delta q - \Delta c) \left(\frac{1}{2} + \Delta q \right) - \frac{(\Delta q)^2}{2}$$

The first term represents the net gain from quality and cost effects of a merger while the second term is the loss from further traveling because of quality differences.

Considering non-health care markets, consumer and total welfare changes in the same direction and in the same instances disregarding some special cases. Exceptions are, for example, the changes in fixed costs (consumer welfare does not consider it) and price discrimination among consumers (total welfare increases while consumer welfare decreases). The reason for the discrepancy between extended CW and TW in this model is the fixed demand ($\sum_i D_i = 1$) which is specific to health care markets. Because of the insurance market (and the absence of co-payments), patients do not react to price increases; there is, thus, no dead weight loss in the presence of prices above marginal cost. Changes in the price are purely redistributive in terms of gains between hospital sector and consumers; TW remains unchanged while extended CW changes.

The further health care specific differences in welfare measures can be shown by gradually widening the group of consumers considered in the analysis. Patients directly affected by quality changes is the narrowest definition. We expect that they are less concerned with the potential costs of a merger (lowest S) because of the high externality effect. Widening the considered group, the potential clients of hospitals, consumers on the hospital market can be included in the analysis. The cost effects of the merger are considered to the extent this group will bear it. External effects due to insurance still can be present if insurers have patients on (and consequently spread health care expenditures across) more hospital markets. A complete consumer welfare analysis would embrace all consumers covered by the same insurance (extended CW). The only welfare effect excluded then is the profit of providers. TW considers this last aspect of welfare as well.

3.2 Welfare standards in merger control

Formally, the simple CW standard ignores providers' profit and the externality due to insurance. Ignoring providers' profit makes the standard stronger than the TW standard as can be seen from the results on the extended CW standard. The neglected externality can however be negative (when $\Delta c > 0$), which can outweigh the previous effect and make the simple CW standard weaker than the TW standard. In summary, the simple CW standard may both clear undesirable mergers and block desirable ones.

While previous literature found reasons why a stronger standard (CW) can be advantageous in merger control, we state that CW also can be too lenient in health care markets, which leads to clearing undesirable mergers. We describe the intuition of the externality and provide a numerical example illustrated on Figures (1-2). In this way, we disprove that CW standard is always a stronger condition than TW standard. To disprove a claim on generality, a numerical example is sufficient. Notice that the example is by no means an anomaly. We do not provide the general parameter regions where simple CW standard is a weaker standard than TW standard, since that would be technically quite cumbersome and not needed to show the point. Our goal is to show that applying the simple CW standard in health care may have unexpected results.

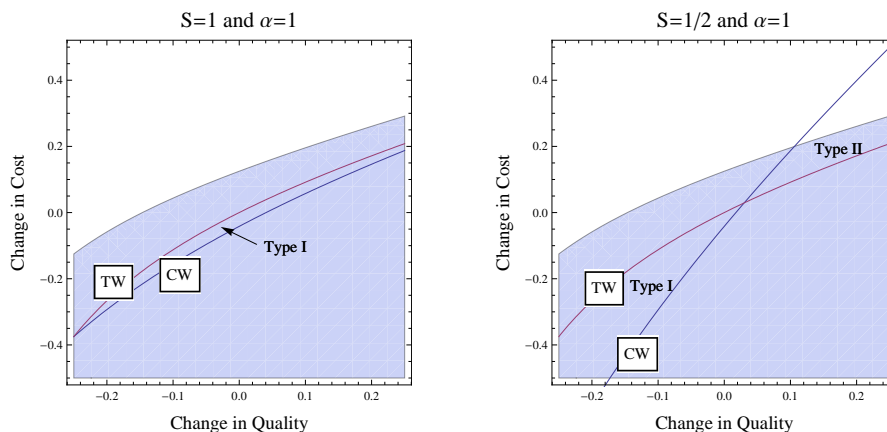


Figure 1: *Parameter ranges in which the CW standard commits type I and type II errors, respectively. The shaded area depicts the parameter ranges where the merger is profitable for a profit-maximizing hospital ($\alpha = 1$). We assume no externalities ($S = 1$) in the left panel and externalities ($S = \frac{1}{2}$) in the right panel.*

Figure (1) shows in function of Δc and Δq where changes in TW, CW and hospital gains owing to a merger is positive. The shaded area depicts merger alternatives that are profitable for purely-profit-maximizing hospitals. This is the set of merger proposals that a competition authority can expect. Below the TW line, the change in total welfare is positive. Applying TW standard, the authority thus would clear a merger in this parameter range. Applying CW standard, the authority approves every merger alternative below the CW line.

On the left panel, CW is calculated as extended CW ($S = 1$), while on the right panel, CW is the simple CW with $S = \frac{1}{2}$. Figure (2) shows similar parameter ranges for partially-quality-maximizing hospitals ($\alpha = 0.7$).

As seen on the left panel of Figure (1), extended CW standard is tougher than TW standard. Since we have chosen TW as the benchmark, we can say that the extended CW standard commits type I errors: it rejects mergers that would increase TW. Besanko and Spulber (1993) build on this characteristic of CW and state that it can contribute to the self-selection of merger proposals that increase total welfare. In the model of Lyons (2003), CW is again a tougher standard than TW. That model takes account to alternative mergers and study the decision of a competition authority in a dynamic perspective. Under CW standard, the authority is more likely to reject a merger than under TW standard. This is an advantage when an alternative merger gives higher TW. Thus in both models, the CW standard can commit type I errors, but no type II errors; i.e., it may reject mergers that increase TW, but it does not approve mergers that decrease TW. This idea coincides with our results on extended CW standard. Simple CW standard, however, may commit Type II errors as well as shown in the right panel of Figure (1). This merger standard accepts higher cost increase for given level of quality improvement than the TW standard and in this way can wave socially undesirable, costly mergers. The mechanisms described in Besanko and Spulber (1993) and Lyons (2003) do not work any more; simple CW standard cannot be preferable to TW standard.

The probability of type II errors is, however, limited as long as hospitals show profit-maximizing behavior as in in Figure (1). When hospitals intrinsically value quality as in Figure (2), they tend to accept more cost increase in turn of given level of quality improvement. As can be seen, this is the region where the simple CW standard commits type II errors. In other words, there is more chance that the simple CW standard approves socially undesirable mergers when hospitals are (partially) quality maximizing than in case of profit-maximizing hospitals. The probability of committing type I error, in contrast, decreases. Quality-maximizing hospitals initiate less mergers that lowers quality. In this respect, quality-maximizing hospitals are more restrictive in proposing a merger than the standard of the competition authority and that is why there are less proposals that the standard rejects.

Regarding to the extended CW standard in case of partially-quality-maximizing hospitals (left panel of Figure 2), it does not commit Type II error. Because the probability of Type I error is also decreasing due to hospitals' behavior, the decisions based on TW and extended CW welfare standard converge.

In conclusion, quality-maximizing behavior of hospitals has similar effects as the application of simple CW standard, i.e. the cost effects play less role in decisions. Scrutinizing whether cost increase is proportional to quality improvement is thus essential when hospitals attach high intrinsic value to quality. Simple CW standard does not concern the complete cost effects of a merger; therefore, this standard may not be hard enough to block costly, quality improving mergers.

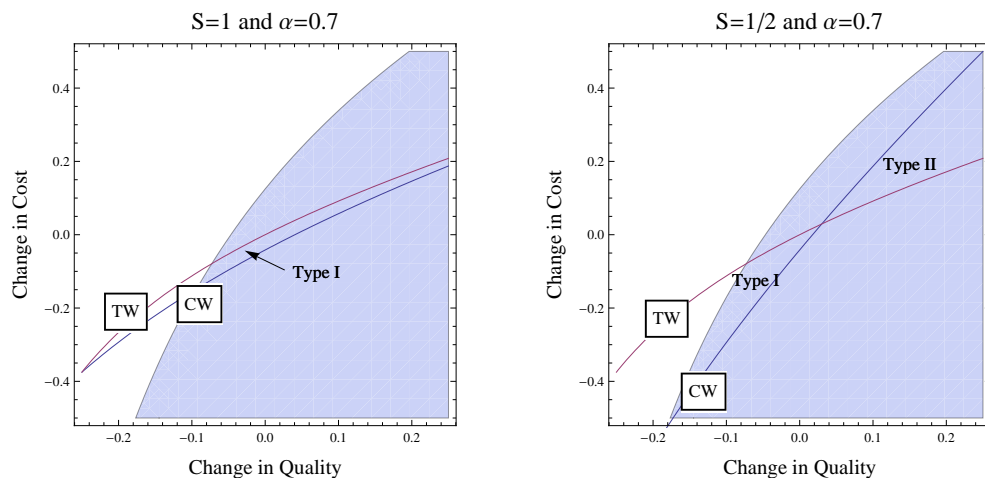


Figure 2: *Parameter ranges in which the CW standard commits type I and type II errors, respectively. The shaded area depicts the parameter ranges where the merger is profitable for a partially-quality-maximizing hospital ($\alpha = 0.7$). We assume no externalities ($S = 1$) in the left panel and externalities ($S = \frac{1}{2}$) in the right panel.*

4 Application in merger control

Most experiences with merger control in the hospital market have been in the US, Germany, and the Netherlands. In order to assess the practical value of our analysis, we briefly review the current practices. As a first observation on the discrepancy between theory and practice, it should be noted that competition authorities only make the trade-off between positive and negative effects required by the welfare standard analysis when the expectation is that the merger significantly harms competition on the relevant market. The logic behind this is that a more intrusive or far-reaching merger control would require information that authorities typically do not have.

A second observation is that in many jurisdictions, again for understandable and pragmatic reasons, most merger decisions are made by and large on purely legalistic grounds.⁸ For example, if market shares are deemed low, a merger is waived without looking at the substantive side of a case, implicitly assuming that mergers between firms with relatively low market shares are unlikely to cause problems. This implies that discussions on the choice of welfare standards are only relevant for those cases where a real welfare analysis is made.

In practice, the primary concern of the analysis by competition authorities in hospital merger cases is the expected price changes on the hospital market.

⁸Here we refer to the sequential approach in welfare analysis used, for example, in the EU, the UK and Australia. In the first step, general presumptions (e.g. on market shares) are applied to filter out unambiguous cases, i.e., when a positive or negative outcome of the analysis is highly probable. A thorough analysis is made only to the remaining more ambiguous cases. The US applies a case-by-case approach, i.e., every merger case is subject to a welfare analysis (Renckens, 2007).

However other aspects of competition such as quality might be considered as well.⁹ Evaluations of the effects of mergers are in first instance based on the expected effects on the financial side of the market. Furthermore, effects are not geared at consumers (i.e., to the premiums), but the analysis stops at the intermediate stage of insurer (i.e., hospital prices). As shown in this article, price effects at this intermediate level do not include externalities since the insurer has to bare the entire health care costs of enrollees. Using the notation of our model, the calculations address in first instance the expenditures ($\sum_{i=1}^n D_i w_i$) and disregard effects on patient welfare (PW). Consequently, calculation of competition authorities are not distorted as long as they assess exclusively price effects on insurers and do not include consumers in the analysis.

Concerns may arise when positive effects of a merger have to be pondered against negative price effects. Merging parties may want to show through an efficiency defense that benefits from quality improvements outweigh the welfare losses of possible price increase. Notice that the burden of proof that quality improvements will emerge lies with the merging parties. The exact definition of 'consumer' then becomes essential in order to calculate the exact gains for consumers. When calculating the PW derived from improved quality, there are two essential questions to answer: who benefits from the quality improvement and what is their willingness to pay for it. Competition authorities should be aware that through health insurance a large group of patients is affected by the merger but their willingness to pay for potential quality improvements probably varies. By calculating the financial effects of a merger, the 'consumer' is defined as all enrollees. Considering the quality effects, many of these consumers may not benefit directly from the potential quality improvement and have, therefore, low valuation for it.

The fact that clients of an insurer do not equally benefit from a given quality improvement of a provider can also be captured in the divergence of reported willingness to pay for it. Diener et al. (1998) distinguishes three sources of willingness to pay in his paper about the application of contingent valuation methodology in health care.¹⁰ First, people value a good or service because of its 'use value'. If they directly consume it, they are probably willing to pay a certain price for it. Second, people may expect that probably in the future they will need the good or service. In this case they may be willing to pay an 'option value' for the possibility of access in the future. Finally, the consumption of some goods and services have external effect. For example, high grade of vaccination in a population gives protection also to those not receiving the vaccine. People may be willing to pay for such 'externality value' of a good or service. Smith (2007) shows that these three values differ. However use value dominates, option value and externality value are also a significant source of the total value. In a merger control process is also necessary to consider these heterogeneities in order to come to an appropriate aggregation of patient welfare derived from the quality improvement owing to the merger.

To illustrate this point, take the example of two hospitals that promise to

⁹As an attribute of competition mentioned only in the third of court cases in the USA between 1985 and 1999 (Hammer and Sage, 2002).

¹⁰Contingent valuation method in health care aims to elicit information on willingness to pay for, for example, a health care program or medical device. In this sense, the principals of eliciting the correct willingness to pay in the population raises the same question as applying the appropriate price-quality trade-off in merger control.

invest in a dialysis center after they merge. The competition authority concludes from its research that the concentration is likely to considerably lessen competition on the hospital market. The merging parties however claim that this negative price effect would be compensated by the improved quality for consumers (the new dialysis center). How should the authority trade off the price increase and the quality improvement?¹¹ Clearly, patients currently visiting the dialysis center are going to value the improvements (use value). Consumers on the given hospital market are also going to value it because might they need kidney dialysis, they can expect a better quality service in their hospital. Their valuation (option value) is however probably lower. Consumers on other hospital markets, but in the same insurance pool, do not benefit from the improvement; and therefore, have a very low (or zero) valuation.¹²

The important conclusion of this article is that the consumer, according to the current situation and the expected future needs, may attach diverging values to given improvements in health care. In the analysis of a quality improving hospital merger, it could be a pitfall to measure the willingness to pay of patients directly benefiting from the quality improvement and generalize it to all consumers on the hospital market. Increase in PW calculated in this way overestimates the real benefits of consumers. It should not be automatically assumed that all patients on the relevant hospital market has the same willingness to pay but should be scrutinized which consumer groups are included in the analysis and how their welfare is aggregated.

5 Conclusions

Our paper contributes in four ways to the literature. First, we have shown that consumer welfare in health care markets should be interpreted in a different way than in standard markets. This difference is prompted by the fact that mergers may have consequences for other consumers than just the ones directly affected. The indirect effect runs through health insurance premiums, i.e., if after a merger the bargaining position of the merged entity drives the premium up, all clients of the insurers are affected, not just patients of the merged hospital. This external effect on consumers paying premium but actually not receiving health care has to be taken into account in the welfare standard of competition authorities.

Second, we have more specifically shown that failing to incorporate the above-mentioned external effect can make CW in case of quality enhancing mergers a weaker standard than total welfare. This result contrasts with results in non-health care markets. Consumer welfare standard in those markets is always at least as tough as total welfare standard. A further contrast to non-health care markets and a consequence of forgoing external effects is that simple CW can commit both type I and type II errors in merger control. If the externality is positive (e.g., owing to a cost reducing merger), TW enhancing mergers can be blocked, while if the externality is negative (e.g., owing to a cost increasing merger that raises premiums), TW reducing mergers that should be

¹¹This is a hypothetical example. To our best knowledge, quality and price effects have not yet been explicitly set against each other by competition authorities.

¹²In reality the competition authority also has to check whether the dialysis center is causally related to the merger and that no other alternatives exist for the quality increase.

blocked can be waived. A CW standard that includes the external effects too (i.e., the extended CW) corrects for these disadvantages, and it is similar in results to CW in non-health care markets.

Third, the non-profit nature of hospitals increases the probability that quality-improving mergers are proposed since hospitals put much weight on the intrinsic value of quality improvement. If these improvements go hand in hand with high costs, TW can be negatively affected. The more weight hospitals put on quality compared to monetary profit in their merger decisions, the more important it becomes to apply a merger standard that involves the complete cost and quality effects. In conclusion, simple CW standard is not suitable for health care markets; extended CW should be used instead.

Finally, the distinction between simple and extended CW in the practice of merger control can be reflected in the exact definition of the 'consumer' used in the welfare analysis. The choice of definition is particularly important when a merger has both price and quality effects because the group of consumers directly affected by quality improvements (or deteriorations) usually does not correspond with the population bearing the financial consequences of the merger. The externality caused by insurance is reflected in the diverging valuation of quality improvements by different groups of consumers. The conclusions for merger control in health care markets is that it is essential to scrutinize which consumer groups are involved in the welfare analysis and how their benefits (or losses) from the merger are aggregated.

Acknowledgments

We would like to thank Jan Boone for his many valuable suggestions on the model set-up. We also thank Wolf Sauter, Rein Halbersma, Ramsis Croes, Frank Pellikaan and Krijn Schep for their helpful comments on drafts of this paper. Furthermore, we are grateful to the participants of the Competition Law and Economics European Network (CLEEN) workshop 2011, participants of the Centre for Competition Policy (CCP), University of East Anglia workshop 2011, and to colleagues at TILEC, Tilburg University and at the Dutch Healthcare Authority for their comments and suggestions.

References

- Fischer S. Dornbusch R. Begg, D. *Economics, 9th edition*. London: The McGraw-Hill Companies, 2008.
- D. Besanko and D.F. Spulber. Contested mergers and equilibrium antitrust policy. *Journal of Law, Economics, and Organization*, 9(1):1–29, 1993.
- P.S. Calem, A. Dor, and J.A. Rizzo. The welfare effects of mergers in the hospital industry. *Journal of Economics and Business*, 51(3):197–213, 1999.
- C. Capps, D. Dranove, and M. Satterthwaite. Competition and market power in option demand markets. *The RAND Journal of Economics*, 34(4):737–763, 2003.
- T. Chang and M. Jacobson. What is the mission of a not-for-profit hospital? evidence from californias seismic retrofit mandate. *National Bureau of Economic Research Cambridge, Mass., USA*, 2008.
- J.P. Clement, K.R. White, and V. Valdmanis. Charity care: Do not-for-profits influence for-profits? *Medical Care Research and Review*, 59(1):59, 2002.
- D. Deneffe and R.T. Masson. What do not-for-profit hospitals maximize? *International Journal of Industrial Organization*, 20(4):461–492, 2002.
- A. Diener, B. O’Brien, and A. Gafni. Health care contingent valuation studies: a review and classification of the literature. *Health economics*, 7(4):313–326, 1998. ISSN 1099-1050.
- S.O. Fridolfsson. A Consumer Surplus Defense in Merger Control. *Working Paper Series*, 2007.
- M. Gaynor and W.B. Vogt. Competition among hospitals. *National Bureau of Economic Research Cambridge, Mass., USA*, 2003.
- P.J. Hammer and W.M. Sage. Antitrust, Health Care Quality, and the Courts. *Columbia Law Review*, 102, 2002.
- K. Heyer. Welfare standards and merger analysis: Why not the best? *EAG Discussions Papers, Department of Justice, Antitrust Division*, 2006.
- J.R. Horwitz. Making profits and providing care: Comparing nonprofit, for-profit, and government hospitals. *Health Affairs*, 24(3):790, 2005.
- J.R. Horwitz and A. Nichols. Hospital ownership and medical services: Market mix, spillover effects, and nonprofit objectives. *Journal of health economics*, 28(5):924–937, 2009.
- D.N. Lakdawalla and T. Philipson. Nonprofit production and competition. *National Bureau of Economic Research Cambridge, Mass., USA*, 1998.
- B.R. Lyons. Could Politicians Be More Right Than Economists? A Theory of Merger Standards. *European University Institute Working Paper*, 2003/14, 2003.

- A. Malani, T. Philipson, and G. David. *Theories of Firm Behavior in the Non-profit Sector. A Synthesis and Empirical Evaluation*. University of Chicago Press, 2003.
- M.A. McGuirk and F.W. Porell. Spatial patterns of hospital utilization: the impact of distance and time. *Inquiry: a journal of medical care organization, provision and financing*, 21(1):84, 1984.
- D.J. Neven and L.H. Röller. Consumer surplus vs. welfare standard in a political economy model of merger control. *International Journal of Industrial Organization*, 23(9-10):829–848, 2005.
- T. Philipson and R. Posner. *Antitrust in the not-for-profit sector*. National Bureau of Economic Research Cambridge, Mass., USA, 2006.
- R. Pittman. Consumer Surplus as the Appropriate Standard for Antitrust Enforcement. *EAG Discussions Papers, Department of Justice, Antitrust Division*, 2007.
- J. Prüfer. Competition and mergers among nonprofits. *Journal of Competition Law and Economics*, 7(1):69, 2011.
- A. Renckens. Welfare Standards, Substantive Tests, and Efficiency Considerations in Merger Policy: Defining the Efficiency Defense. *Journal of Competition Law and Economics*, 3(2):149–179, 2007. ISSN 1744-6414.
- B.D. Richman. Antitrust and nonprofit hospital mergers: a return to basics. *University of Pennsylvania Law Review*, 156:121, 2007.
- W.M. Sage, D.A. Hyman, and W. Greenberg. Why competition law matters to health care quality. *Health Affairs*, 22(2):31–44, 2003. ISSN 0278-2715.
- S. Salop. Question: What is the real and proper antitrust welfare standard? Answer: The true consumer welfare standard. *Statement before the Antitrust Modernization Commission*, 2005.
- R.D. Smith. Use, option and externality values: are contingent valuation studies in health care mis-specified? *Health Economics*, 16(8):861–869, 2007. ISSN 1099-1050.
- M.G. Vita and S. Sacher. The competitive effects of not-for-profit hospital mergers: A case study. *The Journal of Industrial Economics*, 49(1):63–84, 2001.