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Different techniques to define a market can result in widely varying conclusions on market structure, and, hence, widely varying conclusions in antitrust cases.
Discuss with reference to a specific market.

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Abstract

Market definition is usually the first step in the evaluation of a proposed merger; therefore it plays a crucial role in determining the underlying market structure and the possible effects of the merger. In the US between the mid-1990s and 2005 a number of hospital mergers were challenged by the Federal Trade Commission, but in each case the court ruled that no evidence of future anticompetitive harm was found and thus the merger was permitted. However, recent studies show that (some) of these were indeed anticompetitive and contributed to the 'substantial lessening of the competition' in the market. This paper examines the various techniques used for market definition and their suitability for the analysis of hospital mergers, pointing out possible limitations. It also surveys the alternative approaches that have been suggested in light of the criticism regarding the traditionally used techniques. Empirical evidence is reviewed using the merger cases challenged by the antitrust authorities and the findings of empirical studies.

Contents

1 Introduction

In 2004 the Federal Trade Commission (FTC) initiated to retrospectively challenge a merger that took place between Evanston Northwestern Healthcare Corporation (ENH) and Highland Park Hospital in Illinois in 2000. The complaint submitted by the FTC stated that "ENH was able to raise its prices far above price increases of other comparable hospitals as a result of the merger"[1]. The initial decision made in 2005 found the merger anticompetitive and the court acknowledged that it indeed contributed to the acquisition of substantial market power by ENH. Moreover, the principal method (the Elzinga-Hogarty test) used in the original merger case for market definition was found to be inappropriate for the analysis of hospital mergers[2]. Later the court's ruling gained further supported by the retrospective study of Haas-Wilson and Garmon (2011) who also concluded that ENH's market power increased as a direct result of the merger. As a consequence "four of the five commercial insurers were forced to raise their prices by at least 10 percentage points more at the merged hospital relative to other Chicago area hospitals" (p.28).

The acquisition and exercise of market power by firms is a major concern for antitrust authorities. The exercise of market power means the ability of a firm to raise prices profitably (above marginal cost). In the United States, the Department of Justice's Antitrust Division and the Federal Trade Commission are the agencies responsible for monitoring merger activities. How could it be determined if a firm has acquired market power? Normally it is done through calculating market shares, and then looking at industry concentration ratios or, perhaps more frequently, the Herfindahl-Hirschman Index (HHI)[3], a measure of industry concentration.

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[1] https://www.ftc.gov/news-events/press-releases/2004/02/ftc-challenges-hospital-merger-allegedly-led-anticompetitive, (accessed: 22/03/16)

[2] Initial Decision of Chief Administrative Law Judge Stephen J. McGuire, 21st October 2005 Available at https://www.ftc.gov/enforcement/cases-proceedings/0110234/evanston-northwestern-healthcare-corporation-enh-medical-group (accessed: 22/03/16)

[3] $HHI = \sum_{i=1}^{N} {s_i}^2$ where s_i is firm i's market share (in percentages) and N is the number of firms in the industry. According to the United States Department of Justice Horizontal Merger Guidelines (last updated in 2010) if the post-merger HHI is below 1000, the merger normally does not raise concerns regarding the resulting competitive conditions in the industry. If it is between and 1000 and 1800 and the change in the HHI is greater than 100, then it requires further investigation; and if the post-merger HHI exceeds 1800 and change in the HHI is greater than 50, then the market is regarded as highly concentrated and the merger is likely to raise concerns .
Available at: https:// https://www.justice.gov/atr/horizontal-merger-guidelines-08192010 and https://www.justice.gov/atr/15-concentration-and-market-shares (accessed: 22/03/16)

However, to be able to calculate market shares, first the boundaries of the market must be specified. The example above clearly shows that selecting and applying the appropriate technique(s) for delineating markets matters. However, the decision regarding which method to apply is done at the discretion and experience of the experts analysing the specific case. The relevant question for this paper is how the use of these different techniques modifies the results regarding the underlying market structure, and consequently the decisions made by the antitrust authorities.

When the objective is to define the relevant market, the first important thing to note is that it has two dimensions: the product and geographic market. How to decide which products and areas as to initially consider as part of this market? Normally the process begins with a search for appropriate substitutes. In fact, taking into account demand-side and supply-side substitutability is of crucial importance in the process of delineating markets. Demand-side substitutability examines the question of "reasonable interchangeability" [4] from the consumers' point of view and therefore refers to the available substitutes they can alternatively purchase (and consume) if the price of the product increases. Similarly, supply-side substitutability is the ability of producers to change production processes and supply the product in question in response to an increase in price of that product[5].

Another crucial distinction exists between economic and antitrust markets. The concept of an economic market is generally based on the criterion of similar price movements, as stated by Marshall in Scheffman and Spiller (1987): "prices of the same goods tend to equality with due allowance for transportation costs" (p.124). The term antitrust market – adopted by the 1982 U.S. Department of Justice Merger Guidelines (Guidelines) – shifted the focus from the price criterion to the estimation of market power and possible anticompetitive effects that might arise from a merger. Nowadays, in line with the Guidelines, in most cases an SSNIP test is carried out which is explained in the following section.

This paper seeks to explore and compare the various techniques used for market delineation and the implications these can have for the underlying market structure and therefore also for

[4] Term originally used in the United States Department of Justice Horizontal Merger Guidelines (last updated in 2010) in relation to carry out the hypothetical monopolist or SSNIP test.

[5] For example, the definition followed by the European Commission can be found at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=URISERV%3Al26073, (accessed: 28/11/15)

the decisions made in antitrust cases. As the FTC v. Evanston Northwestern Health Care example suggests, the focus will be on the US hospital industry.

The paper is structured as follows. Section two provides a general overview of the literature regarding the most widely used techniques for market definition that correspond to four broad categories: price correlations, the use of shipment data, residual demand analysis and critical loss analysis. Section three briefly considers the issues related to product market definition specific to the hospital industry. Section four examines the limitations that some of the techniques outlined in the literature review might have when it comes to geographic market delineation in hospital merger cases. Section five outlines some of the recently developed methods for geographic hospital market definition. Section six analyses the empirical evidence and section seven concludes.

2 Literature review

2.1 Price correlations

One method to test whether two products belong to the same geographical market is based on the idea that the price of a single good in two separate areas (belonging to the same market) cannot justifiably differ by more than the corresponding transportation cost (as predicted by the law of one price). Consequently, it compares the price movements of the good in the two areas of interest and if the prices show a similar pattern of movement over time, there is evidence that the two areas constitute a geographic market. Stigler and Sherwin (1985) propose calculating a correlation coefficient using the first differences in the logarithms of prices and conclude that a sufficiently high value of the correlation coefficient would be compatible with the existence of a single market for the good; however the threshold for a sufficiently high value remains unclear. The authors also adapt the method for product market delineation: two different products with similar price movements (more precisely with high cross-price elasticity of demand or supply) are believed to constitute a relevant product market in antitrust cases. Again, the critical value of the correlation coefficient remains unspecified. In addition to the lack of a universal threshold for determining a sufficiently high correlation, this approach has been criticised from a methodological point of view as well. Some of the method's possible pitfalls are acknowledged by the authors themselves which include serial correlation in the first differences of the logarithms of prices, price alterations

that are due to common supply or demand side shocks or cases when a high correlation coefficient between the prices of two goods is purely coincidental.

A more sophisticated method was put forward by Horowitz (1981) who uses a regression-based technique to test whether the long-run price differences among different products and regions tend to an equilibrium over time and therefore constitute the relevant product or geographic market. Slade (1986) argues that this model can yield misleading results if the series exhibits autocorrelation, seasonality or a trend. She also points out that in the Horowitz method the adjustment process to the long-run equilibrium is specifically characterized by a first-order autoregressive process which she considers too restrictive. Furthermore, the test she proposes for market delineation focuses on establishing "if price determination in one market is exogenous to price formation in another and vice versa" (p.296, Slade, 1986) instead of examining the long-run adjustment process. Moreover, Stigler and Sherwin (1985) claim that the Horowitz model "has no general validity as an approach to (and departure from!) equilibrium" (p.584) and highlight that it also fails to determine a time interval over which the adjustment process takes place.

2.2 The use of shipment data and the Elzinga-Hogarty test

The approach proposed by Elzinga and Hogarty (1973) primarily addresses the problem of geographic market delineation (in general assuming that the relevant product market has already been defined) and uses shipments to estimate market areas. Their choice of shipment data is not coincidental: the authors argue that essentially all factors that affect price will also have an influence on shipments (quantity). The method considers a market area to be separate if a substantial proportion of the products produced within that area is consumed in that same area and only a small percentage of the products consumed in the area has been produced outside that area. The measure that corresponds to the former criterion is the "little out from the inside" (LOFI) element and can be approximated by the ratio LOFI = local[6] producers' sales to local customers / local producers' sales to all customers (p.58). The measure corresponding to the latter criterion is the "little in from the outside" (LIFO) element, approximated by the ratio LIFO = amount of locally produced product consumed in the area / total consumption in the area (p.54). If both measures exceed the 0.75 benchmark (this can be

[6] In this context 'local' refers to producers (plants) and consumers located within the allegedly separate market area.

modified to 0.90 or to any value that the investigator sees fit), then the test identifies the area as a separate geographic market. Due to the arbitrary nature of the threshold to be used, the test has been subject to criticism (for example Shrieves, 1978).

Similarly, Shrieves (1978) also proposes an approach to geographic market delineation based on shipment (distribution) data: the Shrieves test identifies two areas to be in the same geographic market if a considerable amount of the quantity consumed of a particular good in the two areas comes from a common supplier (or suppliers). He uses a measure of similarity in supply patterns to obtain the percentage of the total consumption in each of the areas that comes from a common supplier and also a second measure about consumption patterns to determine whether the areas are significant consumers of this good. Again, if these two measures simultaneously exceed a certain minimum value, than the two areas belong to the same geographic market. Hence market delineation again depends upon an arbitrarily chosen threshold. However, Shrieves argues that when these two are used together with data on adjusted price differentials (essentially an adjusted price uniformity test for the pairs of market areas identified in the previous step) the procedure leads to correctly identified geographic markets.

Werden (1981) concludes that both methods suffer from substantial problems and argues that "shipments data, while useful, simply are not sufficient to define markets" (p.720). In his critique he explains that the Elzinga-Hogarty test (E-H test) establishes two areas as separate geographic markets if essentially no cross shipments take place between them and therefore does not consider cross-price elasticities of demand when estimating a market which can lead to incorrect conclusions about market boundaries. The second point he makes is that both tests can fail to allow for the possibility of delineating markets within markets (in particular he notes that the Shrieves test cannot identify markets within markets at all). In case of the E-H test this occurs because post-merger shipment data are not used as part of the market delineation process (prediction is required a priori). In addition to these problems Werden emphasizes that the Shrieves test essentially establishes markets as consuming areas which is inappropriate if the objective is to analyse mergers for which producing areas should be considered. Elzinga (1981) responds to Werden's critique stating that the E-H test "is a conservative one in that it estimates only a minimum size" (p.743), thus admits that the relevant market area can be larger than the one estimated using shipment data. Stigler and

Sherwin (1985) also remark that shipment patterns are not sufficient to determine whether two areas belong to the same market.

2.3 The SSNIP test and residual demand analysis

In 1982 the U.S. Department of Justice Merger Guidelines established a new approach to antitrust market delineation and proposed a test (the SSNIP test, or sometimes the hypothetical monopolist test) which seeks to identify the narrowest market for which the hypothetical monopolist would find it profitable to impose a "small but significant and nontransitory increase in price" (SSNIP, usually assumed to be 5%), as explained in Scheffman and Spiller, 1987, p.125. If such price increase turns out to be profitable, then the range of products or the area in which the monopolist operates is defined as the relevant market. Stigler and Sherwin (1985) consider the Guidelines' definition to be non-operational and highlight the lack of guidance regarding the test's implementation and also argue that the test tends to define wider market areas when the initial price is higher than the competitive one. The extreme case is known as the "cellophane fallacy" when the relevant market is already controlled by a monopolist and thus in case of a price increase customers will regard less similar products as substitutes, leading to wider product market boundaries.

Scheffman and Spiller (1987) turned to residual demand analysis to delineate geographic antitrust markets under the Guidelines: the underlying idea is that a firm enjoys substantial market power if and only if its residual demand curve is sufficiently inelastic (and hence the number of available substitutes is relatively low) which leads to the conclusion that the area in which the firm sells its products is a separate geographic market. Similarly, Baker and Bresnahan (1988) applied the residual demand approach for the case of differentiated products providing a framework for product market delineation.

2.4 Critical loss analysis

The critical loss analysis was proposed by Harris and Simons (1989) and also examines the problem of market definition under the Guidelines aiming to propose a measure ('critical loss') for market definition that is not arbitrarily chosen and at the same time seeks to satisfy the criteria that only reasonably interchangeable products belong to the same market. The critical loss is defined as "for any given price increase, the percentage loss in sales necessary to make the specified price increase unprofitable" (p.211). In case of two merging firms, if the

percentage loss in sales is less than the critical loss, then the relevant market would contain these two firms and conversely if the percentage loss in sales is more than the critical loss, then the market boundaries would need to be expanded. The formula (X = Y/(Y+CM), where X is the reduction in sales given the price increase, Y is the hypothesized price increase and CM is the contribution margin; CM = (P-AVC)/P where P is the initial price and AVC is the average variable cost, p.161) proposed for the calculation of the critical loss requires data only on current price and average cost.

Despite its straightforward applicability, O'Brien and Wickelgren (2003) note that this technique has two major drawbacks: first, they find evidence that "holding cross elasticities between the merging firms constant, a given price increase is more likely to be profitable the larger is the margin" (p.171). This is contrary to the result drawn from critical loss analysis which suggests that firms with higher initial margins tend to have greater profit losses from the price increase. The authors explain this contradiction based on the theory that firms with higher initial margins usually face less price sensitive consumers which implies a lower profit reduction than in the case where the initial profit margin is smaller. Their second objection is that critical loss analysis fails to consider cross-price elasticities and point out that a firm selling multiple products with high cross-price elasticities among them may find it profitable to reduce the price of one product and still increase its overall profit by enjoying higher revenues from the sales of the other products.

2.5 An illustration

Scheffman and Spiller (1987) offer an illustration of the differences between the resulting market areas when different methods are used for market definition using the case of gasoline refining in the eastern part of the United States. They originally suggest four possible geographic areas: "(a) the whole area east of the Rocky Mountains (PADs I-III[7]); (b) the Gulf Coast together with the East Coast; (c) PAD I; and (d) the Northeast alone" (p.136). Using price correlation tests they conclude that "they whole area east of the Rockies should be an antitrust market since prices are very highly correlated" (p.145) which turns out to be too wide compared to the predictions of the other techniques. Their analysis also concludes that the E-H test identifies the combined areas of the Gulf Coast and Northeast as a relevant

[7] PAD: Petroleum Administration for Defense districts; PAD I covers the Northeast (p.135, Scheffman and Spiller, 1987)

market, but fails to consider the case where each of these separately constitute an antitrust market. Their results from the residual demand analysis and price elasticity tests suggest that from the four originally proposed market areas only the Northeast alone may not constitute a relevant antitrust market. Given the geographic extent of the US, the market areas defined by the different methods above exhibit significant variation, which are likely to result in varying values of the HHI.

2.6 Summary

As is has been pointed out, each of these methods have their respective strengths and limitations and so far no consensus has been reached regarding which technique should be primarily used for antitrust analysis. Nonetheless, the techniques described in this section can be 'divided' into two categories: the ones that delineate economic markets and the ones that define antitrust market areas. Price correlations and shipment data analysis belong to the former group and therefore rely on historical data, making the prediction about consumers' future decisions more difficult. Since the objective outlined in the Guidelines is to predict the future effects of a proposed merger, attention needs to be paid to incorporate this dimension into the analysis. Given that residual demand analysis and the critical loss method have been developed to carry out the SSNIP test described in the Guidelines, they naturally define antitrust markets and put the emphasis on answering the question 'What would consumers do in case of a price increase'.

3 Product market for hospitals

Gaynor et al (2011) observes that the standard definition used for hospital product market is "general acute care hospital services" (p.8). They also point out that this definition appears to be little disputed: of the eight merger cases challenged by the antitrust authorities between 1994 and 2005 in only one case they sought to apply a definition different than the 'standard' one (p.8, 2011). Why is this approach appears to be accepted for most mergers? Would a different definition of the product market lead to different results in antitrust cases?

In order to attempt to answer this question, an alternative approach would be to consider smaller product markets, as was done by Sacher and Silvia (1998). They group the various treatments offered by hospitals into what they call 'Zwanziger Services Categories'

(henceforth ZSCs[8]), based on supply-side substitutability[9]. The idea behind this approach is to consider treatments as substitutes (belonging to the same product market) if a physician with specialised training in the field is able to carry out those procedures (for example a general surgeon should be equally capable to perform an appendectomy or hernia repair surgery), given that other hospital inputs (such as equipment) are fixed. What effect does this approach has on the corresponding geographic market? Would it change the outcome of an antitrust investigation? To try to answer these questions Sacher and Silvia (1998) examined the hypothetical merger between two hospitals in San Luis Obispo, California. First, they defined a product market for the overall cluster (which would correspond to the 'standard' definition) and also separately considered the 17 ZSCs that account for the majority of the hospitals' output. For the geographic market, they specified three possibilities: (a) San Luis Obispo City only, (b) San Luis Obispo County and (c) the county plus the area of the nearby Santa Maria (p.193). Using the E-H method, patient flow data revealed that for the overall cluster the city alone would not constitute a separate market, while the other two proposed geographic areas do satisfy the weak market criteria (i.e. the LOFI and LIFO measures are greater than 0.75). Conversely, when the ZSCs were examined individually, the results showed that in four cases (for example for categories such as surgical orthopaedics or surgical cardiology) the geographic area covering the county did not satisfy the E-H criteria. This means that when the product market is more narrowly defined, then the corresponding geographic area appear to be broader. As the authors point out, this result is interesting in itself since "the overall cluster may also mask differences in concentration in individual services" (pp.193-194, 1998), but the relevant question here is whether this would have an impact on the market structure and the decision made in a merger case. When they turned to calculate the post-merger HHI for the overall cluster and the individual ZSCs, the results showed that using the 'standard' definition did not change the outcome and the merger would be, in fact, anticompetitive. The exceptions to this were the two treatments where each of these was only offered at one of the two hospitals. This result also indicates that defining smaller product markets is crucial when evaluating mergers between hospitals that offer highly specialised services. Furthermore, they

[8] Originally this method of grouping treatments was suggested by Zwanziger, J., Melnick, G., & Eyre, K. M. (1994). Hospitals and antitrust: defining markets, setting standards. Journal of Health Politics, Policy and Law, 19(2), 423-447.

[9] Perhaps a more natural and intuitive approach would be to regard each and every treatment a hospital offers as a separate category (and hence as a separate product market). However, as Sacher and Silvia (1998) remarks, this method would lead to an unnecessarily large number of markets to examine (p. 183).

also find that the results essentially remain unchanged when the case of a proposed merger between two hospitals in a more urban setting is analysed.

To conclude, the general consensus regarding hospital product market definition – "general acute care hospital services" – appears to be supported by empirical evidence and therefore is adequate for assessing merger cases where non-specialist hospitals are involved.

4 Geographic market for hospitals: limitations of the Elzinga-Hogarty test and critical loss analysis

The E-H test has been widely applied for the analysis of hospital mergers using patient flow data (admissions and discharges). In these cases, a geographic area is identified as a separate market if the majority of patients who live locally (within the market) attend local hospitals (LOFI criterion) and if few patients coming from other areas receive treatment of those hospitals (LIFO criterion). In the literature concerning geographic markets for hospitals usually there are two major arguments against the use of the E-H and the critical loss methods: the "silent majority fallacy" and the "payer problem". In addition to this, the market boundaries defined using the E-H test appear to be sensitive to the specifications of ranking zip codes. Furthermore, the misuse of the "contestable zip codes" argument could lead to erroneous conclusions when applying critical loss analysis.
Given the respective limitations and possible practical obstacles with carrying out the E-H test, during the past decade significant doubt has been cast on the application of this technique for hospital market definition.

4.1 The silent majority fallacy

The problem of consumer (or patient for the case of hospitals) heterogeneity (also known as the "silent majority fallacy" after Capps et al (2001)) refers to the fact that patients generally tend to have different preferences about hospital choice. This limitation was first discussed by Werden (1989). He used a model similar to Hotelling's linear city to show that if patients can choose between two hospitals located at two different points, then if due to the perceived quality differences a significant number of patients decides to attend the 'higher quality' hospital, then the techniques using patient flow data would show that the two hospitals belong to the same geographic market. Werden believes this claim to be false and argues that the

'higher quality' hospital would be able to profitably raise prices, thus the geographic scope of the market should be smaller than the one the test reveals.

This idea is supported by Capps et al (2001) who intuitively explain the fundamental idea behind this critique: the fact that some patients decide to travel further (i.e. outside the proposed geographic market) for hospital services does not necessarily imply that in case of an actual price increase those patients who previously have received treatment within the area will also choose to travel. Why would this be the case? Essentially, because hospital services are generally regarded as highly differentiated products and hence it is reasonable to assume that patients base their decisions as to in which hospital they wish to be treated on a series of non-monetary factors (one important example would be the aforementioned perceived quality differences) as well. Consequently, the authors argue, assuming that patients who previously showed preference for receiving treatment locally (within the geographic market) would react in the same way to an increase in price as those who were already willing to travel further would – in many cases – overestimate the number of patients ready to travel outside the area. This would result in a failure to satisfy the E-H criteria and lead to too broadly delineated geographic markets.

This critique is further supported by Elzinga and Swisher (2011) who emphasise that the patients' patterns of behaviour before a merger do not necessarily (positively) correlate with the post-merger situation (p.136). However, they also state that this possibility of overestimating the extent of the market does not mean that the test will always produce incorrect results. In conclusion, the authors acknowledge the problem of ending up with too large markets using methods based on patient flow data and warn against the application of such techniques without properly considering the preferences and characteristics of the affected population (p.138).

Given this drawback, why has the E-H test been so widely used in the cases involving hospital mergers? One explanation is that when the E-H test was originally developed, the primary area of application was homogeneous consumer goods (Elzinga and Hogarty (1973) used an example from the beer industry). In that case the assumption that a price increase would lead to many consumers switching to substitute products or buying from suppliers in different areas was sufficiently reasonable, since even when we account for consumers' individual preferences for the different types of beer, these are likely to be sold at various locations.

Hence, if the price of brand A at location B goes up, consumers can 'substitute away' by buying brand C (which only marginally differs from A) or purchasing brand A at location D.

4.2 The payer problem

The second criticism (commonly referred to as the "payer problem") comes from the fact that the previously discussed techniques implicitly assume that consumers are price sensitive (i.e. tend to modify their choices if a change in price occurs). However, as explained by Haas-Wilson in Elzinga and Swisher (pp.138-139, 2011), given the built-up and the nature of competition in the US health care markets – where first insurers negotiate prices with hospitals to be included in their networks and then they sell the insurance plans to consumers – most patients do not directly face the prices charged by the hospitals. Even if a hospital were to increase its prices for the various treatments and insurers eventually passed through this increase to the consumers, the effect would not be direct, nor intermediate. Elzinga and Swisher (2011) also explores this issue and concludes that patients are indeed not price sensitive and non-monetary factors are very influential in their choice of hospital, which are not reflected in the E-H test.

4.3 Robustness checks for the Elzinga-Hogarty test

In addition to the theoretical drawbacks of these methods, there are also practical considerations to examine. One related issue was explored by Frech et al (2004) who implemented various specifications of the E-H test. They also observed that generally the E-H test examines the patients' hospital choice, which corresponds to the second stage of the competition in health care markets described above. Putting the question whether the first or the second stage is more relevant to analyse aside, they started with the analysis of the issues surrounding the implementation of the test. This process involves constructing the relevant 'service area' of the merging hospitals which is commonly done by ranking zip codes (i.e. they expand the initial geographic area by adding the zip codes that could possibly form part of the market). The authors identified three ways to carry this out: add zip codes based on (a) the distance between the patients' home address and the hospital, (b) the number of patients from one zip code who use the hospital(s) in question and (c) using the market shares of the hospitals within the particular zip code. Another, perhaps more pressing issue for the analysis of hospitals mergers, is the case of calculating service areas for multiple hospitals. They also outlined the two different approaches can be used in this case: first, what they go on to call the

'rank, then combine' approach and second, the 'combine, than rank' approach. The former method considers each hospital's service area separately and then puts the relevant zip codes together; meanwhile the latter adds to the market only those zip codes that are relevant for all the hospitals involved. They show that the resulting geographic markets can be notably dissimilar for the two approaches (pp. 928-932, 2004). Given the sensitivity of results based on the specification of the test, they propose two alternatives to construct the service areas: the expanding radius approach and the contiguous search approach. The expanding radius approach is believed to be less adequate by the authors as it adds areas as circles to the initial market that satisfy the E-H criteria, sometimes resulting in geographically unrealistic markets (for example ignoring lakes or uninhabited areas). The contiguous search method to some extent relies on the previous one, but eliminates the "circular area" restraint as it adds the zip code that produces the highest LIFO and LOFI measures. Based on the arguments considered above, the authors concluded that the E-H method gives the most accurate results (in terms of market boundaries conforming with the Guidelines) when the contiguous search specification is applied. The empirical evidence – explained in more detail in section six – reveals that the subsequent market areas and market structure are sensitive to the approach selected and thus appear to be little reliable.

4.4 Critical loss analysis and "contestable zip codes"

The term "contestable zip code(s)", outlined briefly by Frech et al (2004), refers to the area(s) in the proposed geographic market where a significant number of patients (usually assumed to be 20%) already receives treatment outside this area. In a number of cases the merging hospitals maintained the view that in case of a merger and subsequent price increase even more patients would travel outside the area and as a consequence the price increase would not be profitable (one such argument was accepted in FTC v. Tenet Healthcare (1998)). Simpson (2001) argues that this would not always be the case. He analysed the post-merger behaviour of patients for two selected hospitals in California and found evidence that "a large price increase prompted little switching by those patients that used the merging hospitals and lived in contestable zip codes" (p.3, 2001).

5 Geographic market for hospitals: alternative approaches

In order to avoid the limitations discussed in the previous section, new methods have been developed to assess the competitive effects of the mergers. Often times these techniques aim to directly estimate the consequences of a price increase, but can also be used for market definition. The approaches explored in this section also have the objective to carry out the SSNIP test described in the Guidelines, and therefore produce antitrust markets. Capps et al (2001, 2002) proposed three alternative techniques: the time-elasticity approach, the competitor share approach and the option demand approach. Gaynor et al (2011) suggested a fully structural method. This section very briefly explains the main idea behind each of these approaches.

5.1 Competitor share approach

First proposed by Capps et al (2001, 2002), the competitor share approach calculates the price elasticity of the merging hospitals, expressed as "a function of the market shares of other firms competing for the same consumers" (p.700, 2002). Consequently, it analyses how the degree of overlap between the services the two merging hospitals offer affects the price increase in case of a hypothetical merger. The authors gave the extreme example when there are two hospitals and two distinct treatments, each offered only at only one of the hospitals; then a merger between the two facilities would be allowed to go ahead as they operate in different submarkets (p.700, 2002).

5.2 Time-elasticity approach

The time-elasticity approach was also first described by Capps et al (2001, 2002) and uses travel time as a proxy to evaluate patients' "price sensitivity" for hospital services. The authors proposed to estimate the time-elasticity of demand by hypothetically increasing the travel time to a hospital by 10%. If appropriate substitutes are available, then patients are likely to substitute away to those. Then the same question was asked to identify the effects if two hospitals jointly increase their travel time by 10%. Then the predicted price increases are calculated, which in turn are used to evaluate the effects of the (hypothetical) merger and also can be applied to delineate markets (pp.696-698).

5.3 Option demand approach

The option demand approach (sometimes also willingness-to-pay (WTP) approach) was first mentioned by Capps et al (2002), but the presentation here follows Capps et al (2003). The

authors define option demand markets as "markets in which intermediaries sell networks of suppliers to consumers who are uncertain about their needs "option demand markets"." (Capps et al, 2003, p.737). The US health care market is a typical example. As a first step, the authors calculated each patient's ex ante WTP (reflecting the situation when patients are uncertain about the treatments that will become necessary in the future) for a particular hospital to be included in the insurer's network. The population's ex ante WTP to include that particular hospital in the network is the sum of the individual WTPs. Next they modelled said bargaining process between the hospital(s) and the insurer(s). Naturally, the higher is patients' WTP for a hospital to be included in the network, the higher is that hospital's bargaining power. Using the hypothesis that "a hospital's profitability is directly related to consumers' WTP for the inclusion in the network" (p.743, 2003), they specify a profit function for each hospital in order to determine how much it gains from this process. For market definition purposes first Capps et al (2003) "estimate the increase in profit that hospitals can obtain postmerger… then estimate the associated change in prices" (p.757).

5.4 A fully specified structural model

Gaynor et al (2011) suggested this approach to carry out the SSNIP test. The basis of this method is a differentiated product oligopoly model, modified to fit specifically the parameters of the hospital industry (adapted from Gaynor and Vogt, 2003). They specified a model of demand at the level of individual patients using a discrete choice model, and then calculated the demand faced by each hospital. On the supply side, hospitals are assumed to compete à la Bertrand. These consequently allow the estimation of own-price and cross-price elasticities (pp.15-17). Finally, they defined the antitrust market as "the SSNIP criterion states that for given hospital j, a SSNIP market is the smallest set of hospitals for which an increase in price at this set of hospitals (including hospital j) would increase the collective profits in the systems of which these hospitals are member" (p.18, 2011). Therefore, if after an increase in price (usually 5%) total profits for all the hospitals in the market increase, then area constitutes the relevant geographic market.

5.5 Summary

These alternative methods in general take into account consumer heterogeneity by estimating hospital choice at the individual level. At the same time, they also tend to reflect more accurately the nature of competition in (US) health care markets by modelling it as a two-step

process (the competitor share and time-elasticity approaches also begin with estimating individual patient choice). Despite being highly sophisticated, these techniques also have their respective limitations. For example, Capps et al (2002) note that the competitor share and time-elasticity methods "compute postmerger shares using premerger prices" (p.694), which makes drawing inferences about future consumer behaviour harder. On the practical side, accurate and quite detailed data are necessary for their implementation, which are not always readily available (for instance Capps et al (2001) also use confidential data provided by an insurer).

6 Empirical evidence

The empirical evidence used to compare and contrast (some) of the methods analysed in this paper is of two types. First, I will review the some of the mergers litigated by the US antitrust authorities between 1995 and 2005 (the year that marked the FTC's successful retrospective challenge of the ENH and Highland Park Hospital). The primary method used in these cases (and accepted by the court) was the E-H test and occasionally critical loss analysis. However, even when the same technique was applied, the two parties (the plaintiff and defendant(s)) often expressed diverging opinions about the scope of the relevant market. Second, I will consider the differences in the resulting market areas when the alternative approaches detailed in the previous section are applied. Here, I will rely on the results obtained by the respective authors; nonetheless, at times the comparisons offered deal with hypothetical mergers, rather than actual ones. Even so, the examples clearly show the differences between the methodologies and the resulting market areas.

6.1 Hospital mergers challenged by US antitrust authorities

6.1.1 FTC v. Freeman Hospital (1995)

The case involved a proposed merger between two hospitals (Freeman Hospital and Tri-State Osteopathic Hospital Association) in the Joplin area, Missouri. The FTC argued that the merger was a violation of the Clayton Act[10] and as such would 'substantially lessen the

[10] Section 7 of the Clayton Act deals with mergers and acquisitions and prohibits those "where the effect may be substantially to lessen competition, or to tend to create a monopoly.", The Antitrust Laws, FTC, available at: https://www.ftc.gov/tips-advice/competition-guidance/guide-antitrust-laws/antitrust-laws, (accessed: 15/04/16)

competition in the market'. As usual, the product market was defined as "acute care inpatient services"[11]. To delineate the geographic market, the economic expert of the FTC applied the E-H method and based on the supply-side substitutability, using the 'weak' market definition identified the service area "consisting of all zip codes within a 27-mile radius of Joplin"[12]. After considering demand-side substitutability, he concluded that all hospitals within this area were part of the relevant market. In the final decision the court did not accept this market definition and pointed out important flaws in the application of the method. These included issues regarding the accuracy and reliability of the data used and the specification selected to carry out the test. Another question that received significant attention was how to determine patients' process of looking for alternative hospitals in the event of a price increase. Again, the FTC's expert relied on historical data in his analysis ("the current usage method") which was ruled to be inadequate since it focuses on patients' pre-merger choices and thus ignores the effects the merger has on patients' behaviour (which would be in line with the Guidelines). On the other hand, the expert arguing for the hospitals based his findings on the method of "geographic proximity". This approach includes a hospital among the competitors if the distance between that hospital and the patient's town (or zip code area where he/she resides) is not greater than the distance between the merging hospitals and the patient's town (so no extra travel is required to attend that particular hospital). Together with the supply-side analysis, he concluded that the relevant geographic market encompasses "seventeen hospital campuses located within 54 miles of Joplin"[13] and the court accepted this result. The post-merger HHI (below 1800) for this 54 miles area surrounding Joplin showed no evidence of competitive harm; meanwhile for the smaller market proposed by the FTC it would have raised concerns regarding the merger.

6.1.2 United States v. Mercy Health Services (1995)

The US v. Mercy Health Services case was a proposed merger between two hospitals (Mercy Health Center and Finley Hospital) in Dubuque, Iowa. The 'standard' product market definition was not challenged and therefore the definition of "acute care inpatient services"[14]

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[11] FTC v. Freeman Hosp., 911 F. Supp. 1213 (W.D. Mo. 1995)
Available at: http://law.justia.com/cases/federal/district-courts/FSupp/911/1213/1970734/ (accessed: 15/04/16)
[12] Ibid.
[13] Ibid.
[14] United States v. Mercy Health Services, 902 F. Supp. 968 (N.D. Iowa 1995),

was used. The government proposed two areas for the relevant geographic market: (a) "Dubuque County, Iowa and a half-circle with a 15 mile radius extending from Dubuque County's eastern edge into Illinois and Wisconsin"[15] and (b) the city of Dubuque only. The first market comprises the two merging hospitals and a rural facility; meanwhile the second one would include only Mercy and Finley hospitals. One of the techniques used to arrive at this conclusion was the E-H method according to which the first specification corresponds to a 'weak' market with the respective LIFO and LOFI measures being 76% and 88%[16]. Conversely, a 90% 'strong' market was never formally specified as expanding the area as much as a "35 mile radius around Dubuque"[17], the criteria were still not satisfied. This analysis was primarily based on the assumptions of strong patient loyalty to physicians and that even in the case of an increase in price patients would not be willing to travel outside the area to receive medical treatment. Even though the market area proposed by the government later gained support in the work of Simpson (2001) who concluded that "a 5 percent price increase at … the Dubuque hospitals would likewise prompt only a very small percentage of the patients at these hospitals to switch to more distant hospitals" (p.24), in 1995 the court found these assumptions to be unrealistic and concluded that the area suggested by the merging hospitals would constitute the relevant market. Thus, it encompasses "Mercy, Finley, the seven closest rural hospitals and the regional hospitals situated in Cedar Rapids, Waterloo, Iowa City, Davenport, and Madison"[18]. This proposition mainly relied on the SSNIP test using critical loss analysis, and is broader than the one suggested by the government.

6.1.3 FTC v. Tenet Healthcare (1998)

This was a proposed merger between two hospitals (Lucy Lee Hospital and Doctors Regional Medical Center, DRMC) located in Poplar Bluff, Missouri. The merger was first ruled to be anticompetitive, but after the merging hospitals' appeal it was allowed to go ahead. The decision presented here is the one that found the merger to be anticompetitive. As usual, the product market definition was accepted by both parties; however on this occasion it excluded tertiary care services ("general acute care in-patient hospital services, including primary and

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Available at: http://law.justia.com/cases/federal/district-courts/FSupp/902/968/2597303/ (accessed: 15/04/16)

[15] Ibid.

[16] Ibid.

[17] Ibid.

[18] Ibid.

secondary services"[19]). For the definition of the relevant geographic market, the E-H test again played an important role. The FTC proposed a market that included seven hospitals in total (the two merging and five rural in the local area), "comprising a 50 mile radius from Poplar Bluff"[20]. On the other hand, the merging hospitals argued that the geographic market "is much broader and actually consist of a 65 mile radius from Poplar Bluff"[21] and therefore includes fifteen additional hospitals. In addition to the standard statistical evidence (most notably the E-H test), the court also put an unusually large weight on the so-called 'anecdotal evidence' that included testimonies from employers and third-party payors. These results, together with the patient flow analysis carried out by the FTC's economist supported the claim that the two hospitals – once merged – could significantly increase their prices. The hospitals were unable to show that the relevant market comprises a bigger area after the court ruled the "contestable zip codes" argument and the telephone survey conducted regarding patients' propensity to switch to be invalid. One of the major reasons for the survey to fail to provide useful insights was the fact that it hypothesised a $200 price increase, meanwhile "a standard commercially insured patient … would only pay an additional $40"[22]. The critique of O'Brien and Wickelgren (2003) points out that even if the telephone survey is adequately conducted, failure to consider the results together with the information about pre-merger margins can lead to erroneous conclusions (the problem of ignoring what margins suggest about the price sensitivity of consumers is a major drawback of critical loss analysis, as explained is section two). Despite the evidence provided by the FTC in 1999 the decision was reversed and the two hospitals merged.

6.2 Empirical studies

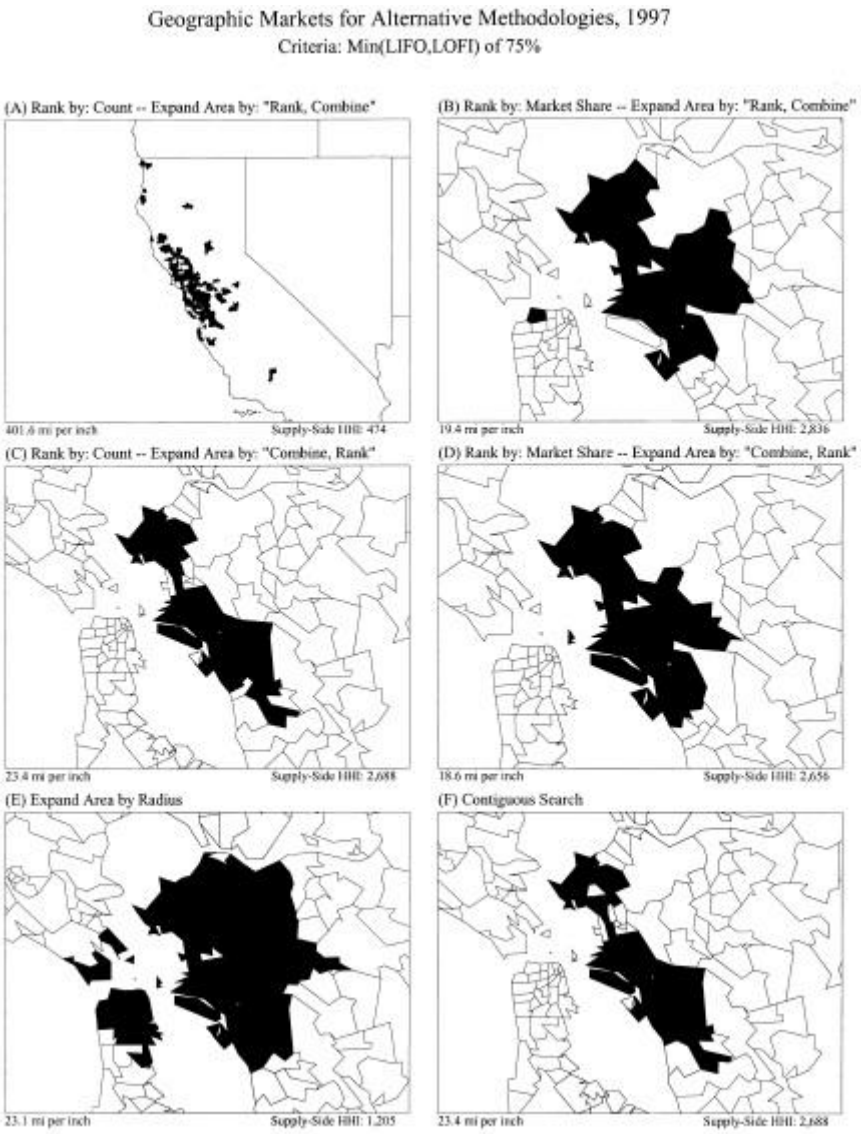
6.2.1 Robustness of the Elzinga-Hogarty test for the California v. Sutter merger

The case study of the California v. Sutter merger (originally taking place in 1999) by Frech et al (2004) examined the effects the different specifications of the E-H test has on the resulting 'service areas' for hospitals. Their results showed that the 'rank, then combine' method gives

[19] FTC v. Tenet Healthcare Corp., 17 F. Supp. 2d 937 (E.D. Mo. 1998)
Available at: http://law.justia.com/cases/federal/district-courts/FSupp2/17/937/2488902/ (accessed: 15/04/16)
[20] Ibid.
[21] Ibid.
[22] Ibid.

inconsistent results for the cases based on the number of patients and market shares (the case using distances was not examined) and hence cause notable variation in the HHI values. Moreover, the 'rank, then combine' method for the specification using patient numbers produces "E-H markets that are … approximately 400 to 600 miles long and 200 miles wide" (p.943, 2004). Given the fact that the local nature of hospital competition is well documented in the economics literature[23], these findings also support the argument against the application of this technique. At the same time the authors remarked that the 'combine, then rank' method seems to give more plausible markets; however the results are sensitive to the specification used. In addition, their analysis concluded that no E-H market is found that satisfies the 90% LIFO and LOFI ('strong market') criteria. This coincides with the findings in the United States v. Mercy Health Services (1995) merger case where the government was not able to define a 'strong' market.

[23] This is also supported by the decision made in United States v. Rockford Memorial (1989), cited in Frech et al (2004).



Geographic market areas for the different specifications of the E-H test

Source: Frech et al (2004), p.944 (chart 3)

6.2.2 The competitor share, time-elasticity and option demand approach for San Diego hospitals

Capps et al (2002, 2003) examined the hypothetical merger between hospitals in Chula Vista (a suburb of San Diego) and other facilities located nearby this area. They argued that the E-H test would not identify the suburb as a separate geographic market, precisely because of the high patient outflow (LOFI) ratio. Meanwhile, the time-elasticity method suggests that jointly increasing travel time by 10% for two of the hospitals would lead to significant changes in prices; consequently Chula Vista is a separate market. The conclusions drawn from the competitor share technique are qualitatively similar; therefore also confirm the suburb to be a

separate market. The results from applying the option demand approach indicate that "mergers in this suburb could lead to significant increases in profits" (p.758, 2003) and when this is translated into increases in price, the method also clearly identifies the suburb as the relevant geographic market.

6.2.3 The structural approach (SSNIP test) for the case of hospitals in California

Gaynor et al (2011) compared the results of their fully specified structural model with the outcomes produced by the E-H test and critical loss analysis. First, the authors presented the differences for all hospitals in California. The E-H test suggests that the median hospital has twelve competitors in its market and critical loss analysis predicts this number to be sixteen. The respective post-merger HHI values do not raise concerns regarding possible mergers. When the SSNIP test was implemented using the structural model, the resulting market was much smaller and highly concentrated with typically four hospitals in it.

Table 4

(N=368)

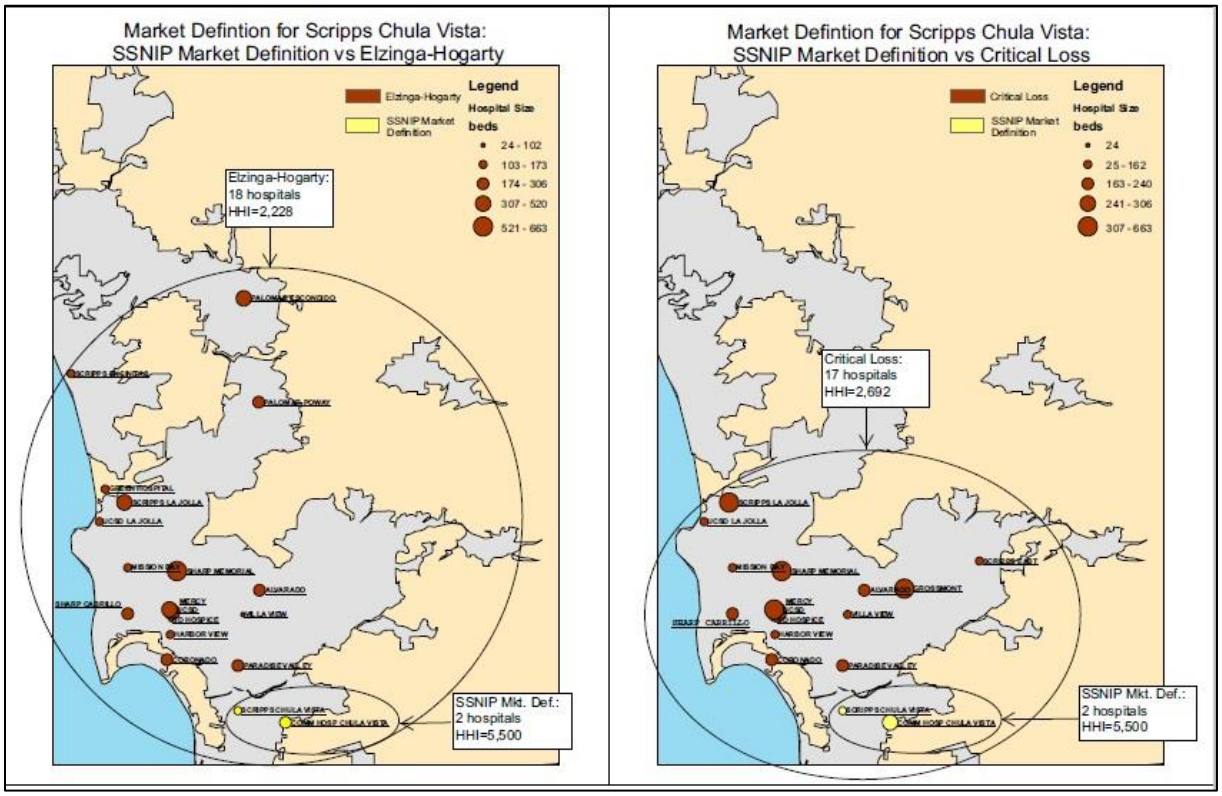
		Method of Market Definition				
		Critical Loss	Elzinga-Hogarty	SSNIP Mkt. Def.	HSA	MSA/PMSA*
Number of Hospitals in a Market						
	Mean	26.75	22.43	3.78	54.38	41.83
	std. dev	25.63	20.54	2.06	56.18	40.62
	Median	16	13	3	16	18
	Max	89	78	14	130	100
	Min	2	1	2	1	2
Hospital HHIs (beds)						
	Mean	1505	1460	3874	1031	1005
	std. dev	1511	1392	1418	1377	1070
	Median	875	1026	3683	832	714
	Max	6914	10000	8911	10000	5947
	Min	183	211	1054	118	158
Hospital System HHIs (beds)						
	Mean	1891	1899	3989	1386	1398
	std. dev	1716	1577	1442	1500	1260
	Median	1194	1499	3814	1191	1191
	Max	10000	10000	8911	10000	10000
	Min	356	439	1244	327	366

* The number of MSAs in California is 24. The number of hospitals in the sample that are located in a MSA is 312.

Number of hospitals in the relevant market, sorted by the method used

Source: Gaynor et al (2011) p.58 (Table 4)

Acknowledging the differences in hospital concentration between rural and metropolitan areas, next they turned to examine the case of San Diego hospitals. The E-H test identifies market areas that encompass 14-19 hospitals and the critical loss method suggests that a typical market can comprise as many as 38 hospitals (with the minimum being 13). Once again, the structural approach concludes that no market includes more than four hospitals. When the HHI was calculated, for almost all cases it identified highly concentrated markets (with values above 1800).



Market areas for the hypothetical merger between two hospitals (Scripps Memorial Hospital and Chula Vista) using the E-H test, critical loss analysis and the structural SSNIP test

Source: Gaynor et al (2011) p.68 (Figure 3)

6.3 Summary

The hospital mergers presented in this section[24] often relied on the use of shipment data and critical loss analysis. Despite the FTC's (or the government's) efforts these mergers could not

[24] Other cases often discussed in the theoretical and empirical literature are: FTC v. Butterworth Health Corporation (1996), United States v. Long Island Jewish Medical Center (1997) and California v. Sutter (1999). Meanwhile an analysis of these merger challenges would also provide additional useful insights, these are not covered here due to space limitations.

be successfully challenged at the time, however retrospective analysis and evidence is often consistent with possible anticompetitive effects (for example, see Tenn (2011) for the California v. Sutter merger, who argued that it resulted in notably higher prices at one of the merging hospitals, p.66). Since then, notable limitations regarding these methods have been pointed out: the silent majority fallacy and the payer problem, both unaccounted for in the aforementioned cases. Similarly, the validity of the "contestable zip codes" argument has been also questioned. The alternative techniques that have been proposed since then indeed tend to delineate smaller markets (which was typically the aim of the antitrust authorities in the mergers they challenged) and if the post-merger competitive effects calculations (for example HHI values) support it, they consequently can lead to different decisions regarding the mergers. At the same time, the level of sophistication and the data requirements of these approaches can make their use burdensome. Furthermore, with the exception of Gaynor et al (2011), to my knowledge, no (comprehensive) empirical study has been carried out to explicitly test the differences between these methods and the ones historically used by the antitrust authorities and hospitals involved in the mergers.

7 Conclusion

This paper has reviewed the different techniques used for market definition and in particular examined the case of the US hospital industry. The experiences from the mergers challenged by antitrust authorities since the 1990s show that the 'standard' product market definition ("general acute care hospital services") is less disputed. This claim is supported by the work of Sacher and Silvia (1998) who argue that the definition leads to sufficiently narrow markets when the merger does not involve hospitals offering specialist services. Consequently the debate has focused on the questions relating to geographic market delineation.

Historically the primary quantitative techniques used for geographic market definition include the E-H test and critical loss analysis. While these methods are relatively easy to implement and have modest data requirements (such as hospital admissions and discharges statistics), they also suffer from significant drawbacks which – if unaccounted for – can lead to inappropriately defined (too broad) markets. These limitations most notably include the issue of patient heterogeneity (the "silent majority fallacy"), the payer problem and the "contestable zip codes" argument often accepted by the courts. Moreover, the E-H test – perhaps the most

widely used method – appears to be sensitive to the particular specification used to carry out the test, which again casts reasonable doubt on its general applicability.

The alternative techniques developed in light of this criticism tend to have sound theoretical foundations and in general reflect better the built-up and characteristics of US health care markets, and local nature of hospital competition (resulting in smaller market areas). At the same time, this high level of sophistication requires reasonable expertise to implement any of these methods and the data necessary for doing so is often unavailable.[25] Another concern is that these techniques have seldom been put into practice and therefore the available empirical evidence is rather limited.

The empirical evidence surveyed in this paper suggests that in comparison to the alternative methods, the E-H test and critical loss analysis used in the mergers challenged by the antitrust authorities indeed delineated sometimes significantly broader markets. As a result, mergers that retrospectively were proven to be anticompetitive were allowed to go ahead. One example is the ENH and Highland Park Hospital case which received considerable attention when it was retrospectively challenged by the FTC in 2004. The merger was ruled to have been anticompetitive and remedies had to be put in place to restore the competition.[26] The aim of the antitrust laws would be to prevent these situations and market definition plays a significant role in it. Therefore developing and applying the appropriate tools for delineating markets is of crucial importance. Ideally these techniques would combine solid theoretical underpinnings (based on the Guidelines' SSNIP test) with practicability (no major issues relating to obtaining accurate, reliable data and relatively easy implementation). The experience of the past decades shows that these two parts are difficult to conciliate. It also suggests that the more intuitive methods (such as patient flow analysis) can be of great use to initially investigate the scope of the relevant market. The more complex, in-depth techniques that attempt to avoid the limitations of those can significantly contribute to refine the analysis – if required and possible – at a more advanced stage.

[25] For example, see Capp et al, 2001: "Due to the lack of accurate price and cost data on the hospitals we study, our actual estimates of price increases are only a best guess" (p.28).

[26] https://www.ftc.gov/news-events/press-releases/2008/04/ftc-issues-final-opinion-and-order-restore-competition-lost, (accessed: 16/04/16)

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