Oxera

Techniques for defining markets for private healthcare in the UK

Literature review

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Office of Fair Trading

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Executive summary

The Office of Fair Trading (OFT) has carried out a market study into privately funded private healthcare services in the UK (PH). Although it has not been necessary for the purposes of the market study for the OFT to arrive at conclusions on market definition, the OFT nevertheless considered that it would be useful, as part of the market study, to undertake an analysis of different market definition techniques in order to inform any potential future competition analysis in this sector, including in relation to mergers. In addition, some lessons from the review may have wider applicability to the healthcare market, including competition analysis carried out in the NHS sector.

In this context, it commissioned Oxera to provide a critical review of the literature on the techniques for market definition in PH, and to provide recommendations on their application to the UK PH sector. This report provides a practical guide for stakeholders by setting out different approaches to defining markets for PH. It examines the advantages and disadvantages of the approaches considered and comments on the suitability of the methods for the UK PH market.[1]

Market definition in private healthcare

Certain features of the market for PH mean that the standard market definition techniques are difficult to apply:

– the majority of patients pay for their PH through private medical insurance (PMI), which may mean that they are not sensitive to price changes made by individual hospitals.[2] Standard techniques that define markets by imposing hypothetical price rises are therefore not well suited;

– the majority of patients may not have the knowledge or experience to determine which hospital or consultant will provide them with the best treatment, and may therefore not be able to determine the correct trade-off between price and quality;

– unlike many other markets, each healthcare treatment involves interactions between a number of parties. These include patients, private medical insurance (PMI) providers, consultants, private hospitals or private patient units, and GPs.

A market definition exercise is traditionally undertaken as part of assessing competitive constraints in a market.[3] Both the product and geographic dimensions of the market in question are considered. The starting point for defining the product market is to identify whether the product in question has any close substitutes from the patient's perspective (ie, demand-side substitution) and from the supplier's perspective (ie, supply-side substitution).

From the patient's perspective, there is likely to be very limited (if any) substitutability across types of treatment. In some cases there is evidence that supply-side substitution would be a constraint on a hypothetical monopolist of a particular treatment. However, for certain

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[1] The report presents Oxera's analysis and does not necessarily represent the views of the OFT. The report should not be taken as indicating the range of evaluation methods that the OFT may use in future cases.

[2] The OFT may use different terms such as 'PH facilities' for reference in the market study, however, the international literature reviewed uses various terminology depending on the structure on different healthcare systems. For this reason and for ease of reference, in this report Oxera refers mainly to 'private hospitals'.

[3] Although in certain cases (particularly mergers), there is an ongoing trend towards bypassing the market definition stage, and testing the competitive effects directly.

treatments there may be no such supply-side constraint, or the constraint may be asymmetric. In the absence of sufficient demand- or supply-side substitution, individual treatments should be ideally defined as separate markets. For practical purposes, however, competition authorities in different jurisdictions and US courts (in merger cases in particular) have often aggregated individual services into clusters based on them being provided by a common set of competitors.

The literature review in this report does not discuss product market definition in PH in detail. The product market definition will often draw on clinical expertise and judgement, and may also depend on the particular attributes of the competition case being considered. Instead, the report focuses on the techniques for geographic market definition, and comments on the interactions between geographic and product market definition where relevant.

The geographic market definition in PH is likely to have both national and local aspects. National contracting occurs between PMI providers and suppliers of PH, but in most cases patients have to travel to hospitals to receive treatment, and, because consumers prefer to minimise the distance travelled, there will also be a local element to geographic market definition.[4] Much of the academic literature and case law on PH market definition has focused on quantifying this local geographic element.

Nevertheless, it is useful to bear in mind that geographic market definition is likely to be affected by the product market definition. A reasonable hypothesis would be that patients may be willing to travel different distances depending on the type of treatment.

Techniques for geographic market definition in private healthcare

Techniques for geographic market definition in PH have been examined in great detail in the academic literature, as well as in government reports, competition investigations and court cases. The majority of the literature differentiates between the traditional, simpler techniques developed in the 1980s and 1990s, and the more complex and recent approaches. Overall, these techniques represent a broad spectrum of approaches that are characterised by different degrees of theoretical soundness, complexity, data requirements and the extent to which they have been tested empirically or have established precedent. These are shown in the figure below.

[4] This assumes that there is no perfect chain of substitution covering the whole of the UK.

Figure 1   Spectrum of the main techniques for geographic market definition in the literature
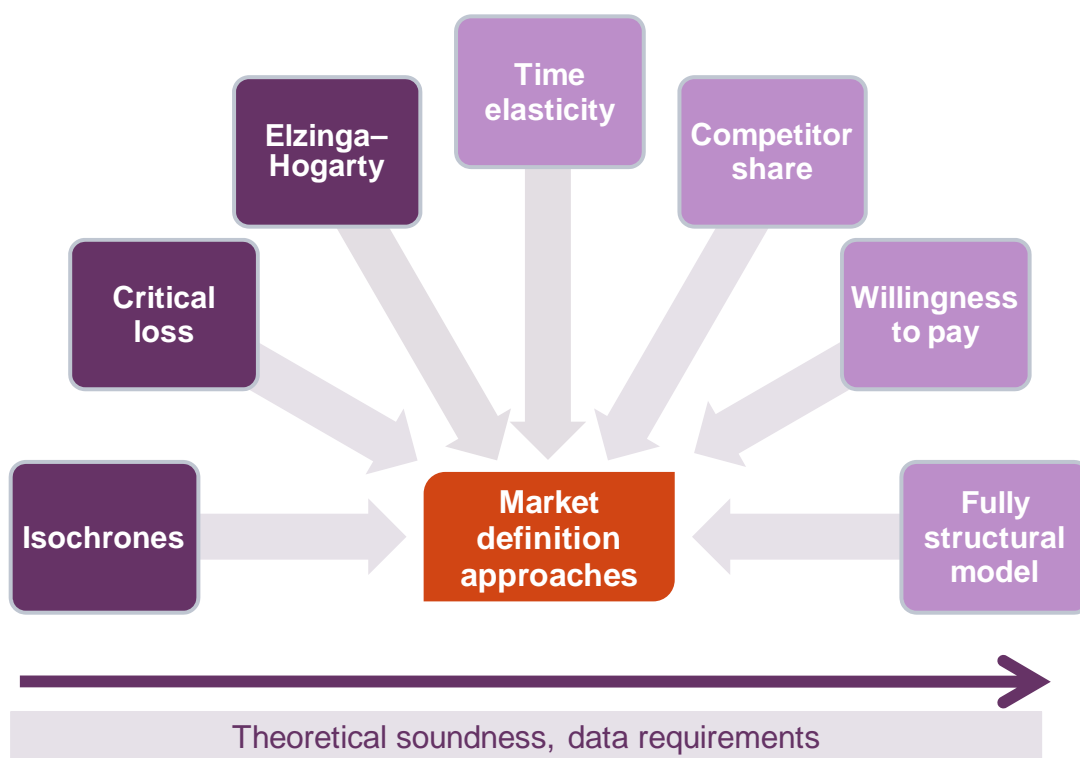
Source: Oxera analysis.

The techniques can be broadly divided into two categories. The earlier techniques—catchment area analysis and isochrones/fixed radii; Elzinga–Hogarty; and critical loss—are often conceptually less well-grounded, but benefit from a simplicity of application and lower data requirements. The more recent techniques—time elasticity; willingness to pay; competitor share; and Gaynor–Vogt structural merger simulation model (MSM) approaches—are more sophisticated, but are also complex to apply and characterised by substantial data requirements. Some empirical studies also use more informal approaches to explore geographic markets based on the roles of other key market participants, such as isochrones/fixed radii around consultants or GP practices.

The literature review reveals that earlier techniques typically do not capture certain characteristics of PH markets. As a result, the use of these techniques may lead to defining broad geographic markets, and there is therefore some precedent in accepting such broad markets.

Empirical evidence is increasingly calling these decisions into question by showing that relevant markets for hospitals can be very narrow, especially in urban areas, and that earlier acceptance of broad markets in courts may have permitted mergers that led to a significant increase in market power. This has resulted in the development of more sophisticated approaches that seek to align the underlying model assumptions with the realities of the PH market. The assessment of techniques for geographic market definition therefore needs to account for the following characteristics of PH markets.

–   **Heterogeneity of patients and hospitals**—a good geographic market definition technique would recognise that preferences (such as willingness to pay or willingness to travel) may differ among patients; such a technique would also recognise that hospital characteristics can differ (for example, by location or quality of service).

- **Lack of patient price sensitivity**—the majority of consumers pay for their PH through PMI, and are therefore insensitive to immediate increases in the price of treatment. Therefore, any technique that relies on the patient's direct reaction to price is unlikely to capture the geographic market accurately. In the long run, when high treatment prices translate into higher PMI premiums, the likely outcome would be a reduction in demand for PMI rather than switching between hospital; this is known as the 'payer problem'.

- **Hospital networks**—competition between hospitals in the PH market often takes place between hospital chains as well as between individual hospitals.

The next step is to consider which of the geographic market definition techniques are well-suited to the UK market. To do this, it is useful to consider some of the key features of how this market works and how it may be different from markets such as those in the USA and the Netherlands, which have received ample attention in the literature. These features include:

- the central role of GPs as gatekeepers for private care;
- the presence of the NHS alongside the PH market;
- limited data availability because of the separation between the NHS and private hospitals; and
- significant functional separation (and often separate billing of patients and PMI providers) between the contributions of a consultant and of a private hospital to any given medical treatment.

These features of the market indicate that some considerations (such as data availability) are likely to be more important than others for selecting the right geographic market definition technique for the UK. In addition to data availability, five other criteria have been chosen to assess which techniques are best suited to the UK:

- theoretical underpinning;
- data requirements;
- complexity;
- conceptual suitability for the UK market; and
- established case practice.

The assessment against the five criteria of the earlier techniques—catchment area analysis and isochrones/fixed radii; Elzinga–Hogarty; and critical loss—shows that the techniques suffer from conceptual shortcomings, in particular having arbitrary cut-off points, not recognising the heterogeneity of hospitals and patients, and not addressing the lack of price sensitivity of patients. However, there are practical solutions which could, at least to some extent, alleviate these problems, such as adopting narrower product market definitions and undertaking sensitivity checks around the cut-off points. On the other hand, the techniques score well on the criteria of data requirements and complexity of application, since the data required to apply the techniques may be accessible in the context of competition investigations or can be obtained by means of a survey; and all models are simple to apply in practice. There is also established precedent of using the techniques in competition cases in the UK (with the exception of Elzinga–Hogarty) and in other countries.

The assessment of the more recent techniques—time elasticity; option demand/willingness to pay; competitor share approach; and Gaynor–Vogt structural MSM approach—shows that these techniques have more solid theoretical foundations than the earlier techniques. The time-elasticity and willingness-to-pay approaches recognise that patients do not pay for treatment directly, but that the treatment is paid for through their PMI. The willingness-to-pay approach also has the significant advantage of reflecting the option demand nature of the market in circumstances where PMI providers' hospital networks do not have full coverage. The Gaynor–Vogt structural model and the competitor share approach both attempt to model more realistic competitive behaviour between hospitals. All models suffer from some drawbacks, however, often caused by sensitivity to the underlying assumptions.

Furthermore, none of the models successfully takes into account all the characteristics of the UK PH market discussed above. The advanced techniques also require highly granular data, which would be difficult or impossible to obtain in the UK due to the effective separation of the NHS and the individual networks of private hospitals; this limits significantly the extent to which these methods could be applied in the UK.

Overall, the comparative assessment of the techniques reveals that there is a trade-off between theoretical soundness and the feasibility of applying a technique in practice. In general, there is no single technique that scores highly on every one of the five suitability criteria. The earlier techniques tend to score less on the theoretical underpinnings but more on ease of application, data requirements and established case practice. The more recent techniques tend to score more on the theoretical underpinnings, but less well on the other criteria.

Recommendations

As a result of the assessment, the following recommendations are made.

– Advanced techniques based on merger simulation are likely to be useful in the UK only in rare cases, where data availability is very good (and the competition authority has the resources/capacity and time to undertake advanced analysis).

– In light of the conceptual appeal of the more complex techniques and the fact that the current level of data does not allow for their application, it may be desirable to put in place measures that encourage the recording and storage of the data required for these more advanced techniques, so that they could be used in competition cases.

– Earlier techniques are appropriate in many circumstances where the time or budget available for analysis is more limited, or where information is unobtainable. If the techniques are applied in the right way, it is possible to avoid, or at least mitigate, the concerns levelled at these techniques in the academic literature.

– Within the set of earlier techniques, Elzinga–Hogarty and critical loss are likely to be less appropriate than isochrone-type measures based on catchment area analysis. In the case of Elzinga–Hogarty, the lack of a central data source of patient locations and treatment makes its application more difficult in the UK than in some other countries. Therefore, the additional benefit from applying this technique compared with the isochrone-type measures (in terms of increased precision) may be outweighed by the burden of the additional data requirements. In the case of critical loss, the insurance-based model in the UK creates a fundamental hurdle (as patients are not price-sensitive) that is unlikely to be fully overcome. In cases involving hospitals where there are fewer PMI-funded patients—such as those specialising in elective cosmetic surgery—critical loss would be more appropriate.

– When applying catchment area (isochrone or fixed-radius) techniques, the issues raised above should be borne in mind. As far as possible, it may be sensible to avoid assessments that bundle together treatments or groups of patients with systemically different willingness to travel. Assessments should also take into account the potential heterogeneity of hospitals, so it may be appropriate to apply different-sized isochrones to different types of hospital.

– As far as possible, given the significance of the impact of product market definition on geographic market definition, when applying the catchment area techniques, empirical analysis should be undertaken to examine the difference in travel times for patients undergoing different types of treatment included in the product bundle in order to prevent bundling together patients with different willingness to travel.

- In the specific case of merger analysis, it might often be more appropriate to focus more directly on the likely competitive effects of the transaction rather than on precisely defining the market and calculating market shares. The local nature of competition makes the direct assessment of competitive effects in specific local areas attractive. Assessments that take into account the fact that demand is not symmetric around a hospital should be used where possible, such as those that use postcode-based patient discharge data to build a topographic picture of demand for a particular hospital.[5]

- For Competition Act cases (those involving suspected abuse of dominance or anti-competitive agreements), this direct analysis is less likely to be appropriate. In such cases, it may be necessary for the OFT to form a more precise definition of the relevant market (although in some cases the OFT may be able to apply threshold tests to different candidate markets in order to establish that the relevant legal test is met).

- In the case of market investigations, a precise market definition is less essential, but the nature of the analysis, which must cover many hundreds of local areas, means that a hospital-by-hospital analysis of local competition is unlikely to be useful or feasible.

- The literature refers to, but does not explore in detail, some of the less common approaches, such as GP- and consultant-based radii, and only limited empirical evidence is available on these techniques. Given that the more advanced techniques appear to be less appropriate for the UK due to data availability issues, it may be desirable to explore these techniques empirically to determine whether they could provide a suitable alternative to the more complex methods used elsewhere.

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[5] See, for example, Office of Fair Trading (2008), 'Completed acquisition by Spire Healthcare Limited of Classic Hospitals Group Limited', para 20.

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1 Introduction

1.1 Context of the report

The Office of Fair Trading (OFT) has carried out a market study into privately funded private healthcare services in the UK (PH). The aim of the study was to examine whether the market was working well for consumers and, if not, whether there was potential for improvements.

Although it has not been necessary for the purposes of the market study for the OFT to arrive at conclusions on market definition, the OFT nevertheless considered that it would be useful, as part of the market study, to undertake an analysis of different market definition techniques in order to inform any potential future competition analysis in this sector, including in relation to mergers. In addition, some lessons from the review may have wider applicability to the healthcare market, including competition analysis carried out in the NHS sector.

In this context, it commissioned Oxera to provide a critical review of the literature on the techniques for market definition in PH, and to provide recommendations on their application to the UK PH sector.

1.2 Purpose of the report

The aim of Oxera's study is to:

–   provide a comprehensive overview of the relevant UK and international precedent identified by the OFT in relation to the approaches used to define product and geographic markets for PH;

–   highlight, and set in a coherent framework, the issues and difficulties encountered in defining markets in this sector;

–   assess critically the previous approaches used for market definition, by exploring the strengths and weaknesses of each approach (in terms of theoretical underpinning or practical application), as well as clearly stating the assumptions behind them;

–   provide a commentary on which approaches might be the most appropriate (based on their relative merits) for defining PH markets in the UK.

Overall, the report aims to provide stakeholders with a practical guide that sets out different approaches to defining markets for PH. It highlights the advantages and disadvantages of these approaches and, in so doing, aims to inform the stakeholders' approach and decisions in relation to defining the markets for PH in the UK. In light of its generality, the framework described in the report is likely to be useful for various stakeholders including the OFT and other authorities and parties involved.

1.3 Structure of the report

The report is structured as follows.

–   Section 2 sets out the principles of market definition in PH.

–   Section 3 provides a comprehensive overview of the literature on the techniques used for defining geographical markets in PH. This section sets out the advantages and criticisms of each method that are commonly cited in the literature, describes the data

requirements for each technique, and summarises the precedent of using the techniques in competition cases.

– Section 4 provides Oxera's critical assessment of the techniques and examines their applicability to the UK market for PH. The section concludes with recommendations resulting from this assessment.

2 Principles of market definition in private healthcare

2.1 The concept of market definition in competition analysis

Market definition has traditionally been the first step in the assessment of the competitive constraints in competition cases. The purpose of undertaking this step is to delineate the market such that the relevant competitive constraints of the case can be isolated, and their strength assessed. Market definition can be undertaken in different contexts, including merger inquiries, market investigations and abuse of dominance cases.

A standard approach to market definition that is generally accepted in many jurisdictions is the hypothetical monopolist test (HMT). The HMT works by defining a set of products or services as a 'candidate market' and then asking whether a hypothetical monopolist of that set of products could profitably raise prices by a small but significant amount over the competitive level.[6] If the answer is yes, then that set of products is defined as a relevant market. The test is iterative, starting with the smallest reasonable set of products (in the case of mergers, this is usually the products sold by the merging firms) and widening the set of products each time the question is answered negatively, up to the point where the question is answered positively.[7]

In certain competition cases (particularly mergers), however, there is an ongoing trend towards bypassing the market definition stage, and testing competitive effects directly. For example, the Competition Commission (CC) and the OFT joint merger guidelines state that market definition is just a starting point for competition analysis.[8]

> Market definition is a useful tool, but not an end in itself, and identifying the relevant market involves an element of judgement. The boundaries of the market do not determine the outcome of the Authorities' analysis of the competitive effects of the merger in any mechanistic way. In assessing whether a merger may give rise to an SLC [significant lessening of competition] the Authorities may take into account constraints outside the relevant market, segmentation within the relevant market, or other ways in which some constraints are more important than others.

Some of the methods discussed in this report focus solely on defining the market, while others originate in merger simulation analysis and examine the effects of a merger directly. However, a number of these merger simulation models (MSMs) can be used for both market definition and the direct assessment of merger effects.

2.2 Market definition in the PH sector

The PH sector covers a very wide range of treatments, from brain surgery to Botox injections, and from biopsies to heart surgery. As set out in the OFT report, the market for PH encompasses a range of medical treatments which are privately funded and provided to

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[6] The HMT was first popularised following its use in the 1982 US merger guidelines. The test is also known as the SSNIP test, because it asks whether the hypothetical monopolist could profitably impose a Small but Significant and Non-transitory Increase in Price (SSNIP).

[7] Niels, Jenkins and Kavanagh (2011), pp. 37–42.

[8] Office of Fair Trading and Competition Commission (2010), 'Merger Assessment Guidelines', para 5.5.2.

patients via PH facilities, through the services of consultants and medical professionals who work within these facilities.[9]

The PH services that form the focus of the OFT's market study exhibit certain features that make the application of standard market definition techniques difficult.[10]

– **Separation of payment from consumption**. Due to the widespread use of PMI (more than 60% of patients who are treated by PH providers are PMI-funded), many patients are not sensitive to price changes made by individual hospitals and so standard techniques that define market markets by imposing hypothetical price rises are not well suited.

– **Asymmetry of information between consumers and providers**. The majority of patients may not have the knowledge or experience to determine which hospital or consultant will provide them with the best treatment. Similarly, most patients may not be able to determine the correct trade-off between price and quality. As a result, the expectation is that many consumers of PH services are relatively passive, in the sense that they are unwilling or unable to shop around for the best deals—at least when it comes to choosing how and where to be treated. Instead, as indicated by the OFT's research into the patient journey, many patients are willing to rely on the advice of health professionals such as their GP or the consultant to whom they are referred.

– **Complex interactions between a number of parties**. In many markets, the relationship between parties in the supply chain is clear; however, each healthcare treatment involves interactions between a number of parties. This is partly a function of insurance-based systems, which include separate bilateral interactions between:

    – patients;
    – private medical insurance providers (PMI providers);
    – consultants/surgeons;
    – private hospitals or private patient units.[11]

In the UK, a further level of complexity is added through the role of GPs, who act as gatekeepers to acute PH and refer patients to consultants for further examination and treatment.

As a result, it is not straightforward to determine which interactions are most relevant for the purposes of market definition. To some extent, all of the interactions are relevant, but the most relevant ones will depend on the particular competition issue being investigated and the 'theory of harm' being tested.

Techniques for market definition in PH have been adapted to deal with these features. A number of techniques have been proposed in the academic literature and, in some cases, have been employed in merger investigations and court cases.

2.2.1 Product market definition

As with many market definition exercises, the two main elements are the product and the geographic dimensions. The starting point for defining the product market is to identify whether the product in question has any close substitutes from the patient's perspective

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[9] For the purposes of the market study, the OFT defined acute care as short-term treatment via a range of medical and surgical procedures commonly delivered by PH facilities with in- and outpatient settings. This excludes treatment for long-term conditions.

[10] Some, but not all, of the features listed correspond to features listed in Competition Commission (2000).

[11] The OFT may use different terms such as 'PH facilities' for reference in the market study, however, the international literature reviewed uses various terminology depending on the structure on different healthcare systems. For this reason and for ease of reference, in this report Oxera refers mainly to 'private hospitals'.

(ie, demand-side substitution) and from the supplier's perspective (ie, supply-side substitution).

From the patient's perspective, there is likely to be very limited (if any) substitutability across types of treatment, since, for example, knee surgery is unlikely to be an adequate substitute for a hip replacement. However, for a particular treatment type there may be several approaches that are to some extent substitutable (eg, different types of hip replacement).

From the supply side perspective the question is whether any attempt to raise prices (or reduce service quality or increase waiting times) by a hypothetical monopolist of a particular treatment would lead to providers of similar treatments switching to supply the specific treatment in question. If this would be the case, it may be appropriate to include the capacity of those providers in the market. However, in some cases there may be no evidence that supply-side substitution would be a constraint on a hypothetical monopolist, or the constraint may be asymmetric. These issues were considered in the assessment of a merger between two public sector NHS Trusts in the UK.[12]

In the absence of sufficient demand- or supply-side substitution, individual treatments should be defined as separate markets. For practical purposes, however, courts and competition authorities often aggregate individual services into clusters based on their being provided by a common set of competitors. The Federal Trade Commission (FTC) in the USA aggregates markets on this basis, and has typically defined the product market for hospital services as inpatient acute care services.[13] Similar product market definitions have been defined in the Netherlands and Germany.[14]

From both the demand- and supply-side substitution perspectives, the appropriate groupings for product market definition are likely to require a degree of clinical judgement, so it may be necessary to rely on medical experts. There may be some scope for economic analysis to cross-check the assessment of a medical expert, by, for example, comparing the costs and prices for different treatments. Whether such a cross-check is appropriate and feasible is likely to be determined by the aspects of the individual case and the availability of data.

There is little discussion of product market definition in PH as the product market definition will often draw on clinical expertise and judgement, and may also depend on the particular attributes of the competition case being considered. The literature review in this report does not discuss product market definition in PH in detail. The product market definition will often draw on clinical expertise and judgement, and may also depend on the particular attributes of the competition case being considered. Therefore, the literature review in this report (section 3) focuses on the techniques for geographic market definition, and comments on the interactions between geographic and product market definition where relevant.

2.2.2 Geographic market definition

Geographic market definition in PH is likely to have both national and local aspects. National contracting occurs between PMI providers and suppliers of private medical services (PH providers), but in most cases patients have to travel to hospitals to receive treatment, and, because it is assumed that they prefer to minimise the distance travelled, there will be a local element to geographic market definition.[15] However, this local element should not be interpreted as meaning that consumers are willing to travel only a certain distance to receive

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[12] Co-operation and Competition Panel (2011), 'Merger of Nuffield Orthopaedic Centre NHS Trust and Oxford Radcliffe Hospitals NHS Trust', September 30th.

[13] See, for example, Chapter 4 of the FTC and DOJ report 'Improving Health Care: A Dose of Competition', available at www.justice.gov/atr/public/health_care/204694/chapter4.htm.

[14] See, for example, decision of the Netherlands Competition Authority in Case 6424/Walcheren Hospital - Oosterschelde Hospitals, and Federal Cartel Office 10th Decision Division B 10 – 123/04 analysing the proposed acquisition by Rhön-Klinikum AG of the district hospitals (Kreiskrankenhäuser) of the Rhön-Grabfeld District, namely Bad Neustadt/Saale and Mellrichstadt District Hospitals.

[15] This assumes that there is no perfect chain of substitution covering the whole of the UK.

treatment. Given the positive impact that the treatments covered by the OFT study can have on a patient's quality of life, it is likely that they could be willing to travel very large distances if there was no hospital close by. The local element to PH competition should instead be interpreted as the patient's preference to minimise their travel time, all else being equal.

Much of the academic literature and case law on PH market definition has focused on quantifying this local geographic element. This is discussed in detail in section 3.

## 2.3 The interaction between product and geographic market definition

Geographic market definition is likely to be affected by the product market definition. A reasonable hypothesis would be that patients may be willing to travel different distances depending on the type of treatment. For example, one would expect patients requiring complex treatment for a life-threatening or specialised condition (other than emergencies) to be willing to travel further for medical care than patients who require only a relatively minor and commonplace treatment. This points to patient heterogeneity within the wider market of PH treatments.

In practice, product markets are often defined broadly. For example, in US and UK hospital merger cases, markets have been defined as 'acute general hospital care' (Gaynor and Vogt, 1999; Gaynor and Town, 2011; Zwanziger, Melnick and Eyre, 1994). By expanding market boundaries in this way, the authorities avoid the need to determine whether there would be a substantial lessening of competition in each procedure in which the hospitals overlap.

When the product market is widened through supply-side substitution or clustering of services based on the common set of competitors, this also has an impact on how geographic market definition should be considered. Simpler geographic market methodologies do not account for patient heterogeneity. Indeed, any of the simpler approaches to market definition generally work best for candidate markets where the products are relatively homogeneous. The combination of a product market widened through supply-side substitution (or clustering based on the common set of competitors) and a simple approach to geographical boundaries could lead to overly broad geographic markets because differences relating to specific treatments are ignored. The situation could arise, for example, where a broad product market is defined covering hip operations and heart surgery (such as a market for inpatient care), but where hip operation patients have a strong preference for local hospitals and heart surgery patients do not. In this case, the geographic market boundary would be drawn too wide for hip operations, leading to the possibility of pockets of market power within the geographic market as defined.

Figure 2.1 demonstrates this point: the merger of hospitals A and B would be allowed based on aggregate willingness to travel (bringing hospitals C, D and E into the market), but patients with a lower willingness to travel and requiring a particular type of surgery would face a reduction in competition from two to one.

Figure 2.1   The impact of defining the product market too broadly in a merger
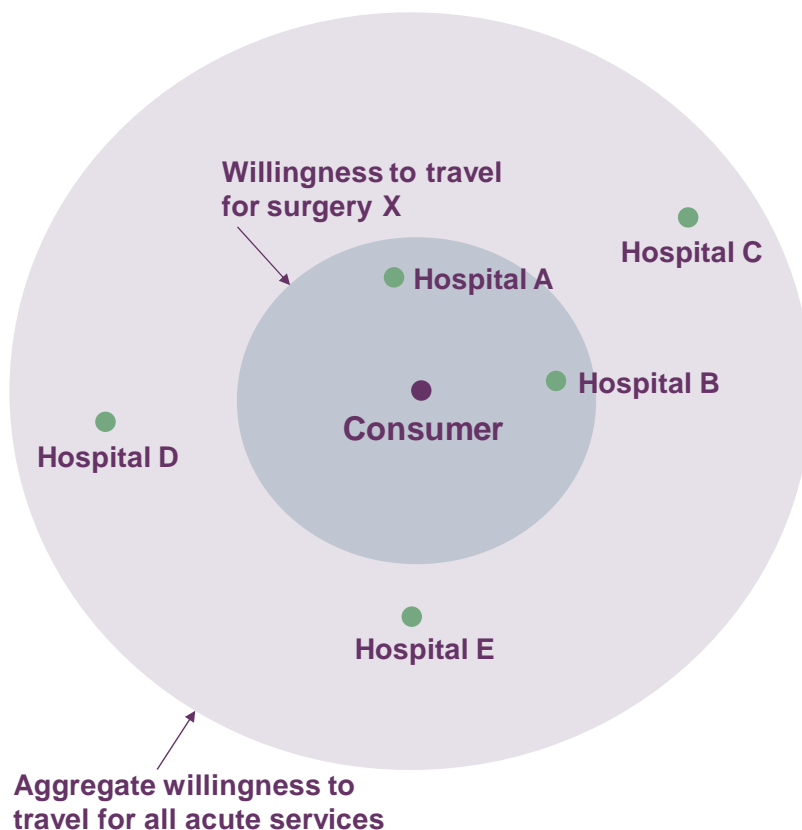
Source: Oxera analysis.

There is a growing volume of evidence to show that, in practice, patient preferences are more disaggregated than the broad 'general care' product definition. For example, Capps et al. (2001) studied hospital choices in California in 1991 and found that patients with severe health problems were more willing to travel. A study comparing patients' aversion to travel times for orthopaedic care and neurosurgery in the Netherlands also reports that patients tend to travel further to receive complex treatments (Varkevisser and van der Geest (2007), p. 7).

In light of this, some sort of clustering may be necessary to group treatments so as to achieve patient homogeneity in those clusters. The following approaches have been suggested in the literature as alternatives to defining the product market as 'acute hospital care'.

–   Varkevisser et al.(2004), cited in Varkevisser, Capps and Schut (2008), identify five groups of specialist care in Dutch hospitals: i) high-volume complex specialities; ii) low-volume complex specialities; iii) high-volume regular specialities; iv) low-volume regular specialities; and v) specialities that can be provided by general or specialised hospitals and stand-alone ambulatory surgeries.

–   Zwanziger, Melnick and Eyre (1994) recommend an alternative disaggregated approach to reflect differentiation in inpatient care. Factors to consider are: i) the extent to which treatments for two diseases can be performed by the same personnel and equipment; and ii) the cost for a hospital to convert from providing one treatment to providing another treatment. The authors argue that physicians (consultants) are the key inputs into hospital care, and cluster diseases based on the least-specialised physician capable of treating them.

– There is also some precedent for disaggregating acute hospital services into clusters that form separate product markets for the NHS hospital mergers. In the assessment of the merger between Basingstoke and North Hampshire–Winchester and Eastleigh NHS Trusts, the Co-operation and Competition Panel (CCP) recognises that there are groups of treatments that face similar competitive constraints as they generally tend to be provided together. The CCP identifies four such clusters: inpatient elective services, inpatient non-elective services (eg, emergency and maternity services), community services and outpatient services. The CCP, however, notes that if there are reasons to believe that competitive constraints for a particular treatment are different from those for the overall cluster, then the treatment can be assessed separately (ie, as a separate product market).[16]

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[16] Co-operation and Competition Panel (2011), 'Merger of Basingstoke and North Hampshire NHS Foundation Trust with Winchester and Eastleigh Healthcare NHS Trust', August 5th.

3 Techniques for geographic market definition in private healthcare

3.1 Overview

Techniques for geographic market definition in PH have been examined in great detail in the academic literature as well as in government reports, competition investigations and court cases. The majority of the literature differentiates between the traditional, simpler techniques, which were developed in the 1980s and 1990s, and the more complex and recent approaches.

These techniques represent a broad spectrum of approaches that are characterised by different degrees of theoretical soundness, complexity, data requirements and the extent to which they have been tested empirically or have established precedent. This spectrum is illustrated in Figure 3.1 below. It can be broadly divided into two categories. The techniques on the left-hand side (shown in dark purple) are the earlier techniques; these are often conceptually less well grounded but benefit from simplicity of application and lower data requirements. The techniques on the right-hand side are more recent; these are more conceptually sophisticated but their application is complex and they are characterised by substantial data requirements.

Figure 3.1 Spectrum of the main techniques for geographic market definition in the literature
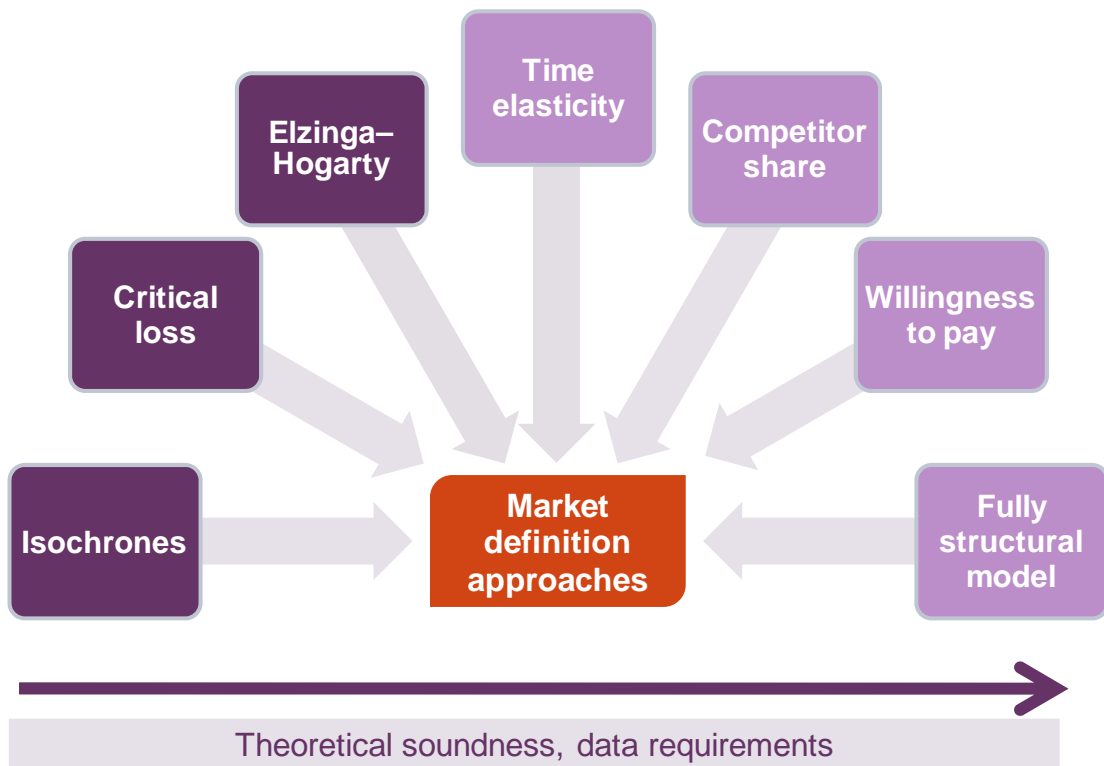
Source: Oxera analysis.

The remainder of this section provides a comprehensive overview of the literature relating to these and other techniques that could be used to define the geographic market for PH. This literature review sets out the relative strengths and weaknesses of each approach discussed in the literature, as well as data requirements and the precedent for their use in competition cases.

The literature review indicates that earlier techniques typically do not capture certain key characteristics of the PH market (such as heterogeneity of patients, heterogeneity of suppliers, lack of sensitivity of patients to prices of treatments, and the fact that competition between hospitals takes place at a network level as well as at an individual hospital level).[17] As a result, the use of these techniques may lead to defining broad geographic markets, and there is some precedent in accepting such broad markets. Empirical evidence is increasingly calling this into question by showing that relevant markets for hospitals can be very narrow in urban areas (Dafny, 2009), and that earlier acceptance of broad markets in courts may have permitted mergers that led to a significant increase in market power (eg, Ashenfelter et al., 2011). This has led to the development of more sophisticated approaches, which try to align the underlying model assumption with the realities of the PH market. The assessment of the techniques for geographic market definition therefore needs to account for the following characteristics of PH markets.

– Heterogeneity of patients and hospitals—a good geographic market definition technique would recognise that patients' preferences (such as willingness to pay or willingness to travel) may differ between patients; such a technique would also recognise that hospital characteristics can differ (by, for example, location or quality of service).

– Lack of patient price sensitivity—the majority of consumers pay for their PH through private medical insurance (PMI), and are therefore insensitive to immediate increases in the price of treatment. Therefore, any technique which relies on the patient's reaction to price is unlikely to capture the geographic market accurately. In the long run, when high treatment prices translate into higher PMI premiums, the likely outcome would be a reduction in demand for PMI rather than switching between hospitals; this is known as the 'payer problem'.

– Hospital networks—competition between hospitals in the PH market often takes place between hospital chains as well as between individual hospitals.

Table 3.1 summarises how the different techniques for geographic market definition discussed in detail in the remainder of the section take (or do not take) into account these characteristics of the market for PH.

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[17] Although in some cases it is possible to adjust the technique so as to address this issue, at least partially, as discussed in section 4.3.

Table 3.1   Summary of techniques for geographic market definition in PH

Technique	Underlying concept/model	Data requirements	Heterogeneity of patients and suppliers	Lack of patient price sensitivity	Insurer and hospital networks
Catchment area analysis	Distance between patient and hospital	Location of patients of the focal hospital and location of the focal hospital	Not captured, but adjustments can be made to partly resolve the problem	Implicitly captured through patients' choice of hospital	Considers competition between individual hospitals but not between networks
Elzinga–Hogarty	Distance between patient and hospital	Location of patients and location of a hospital (for patients treated at the focal hospital and outside of focal hospital)	Not captured	Implicitly captured through patients' choice of hospital	Considers competition between individual hospitals but not between networks
Critical loss	Measures reaction of patients in response to a small price increase	% of customer switching following a 5% price increase. Hospital's profit margins	Not captured (unless detailed surveys are used)	The test suffers from the 'payer problem' unless a time- or quality-based measure is used in place of 5% price increase	Considers competition between individual hospitals but not between networks
Time elasticity	Logit discrete choice demand function	Data on patients' demographics, diagnoses and treatment choices. Data on hospital characteristics	Captured	Captured, since the model does not rely on price information	Considers competition between individual hospitals but not between networks
Option demand/ willingness to pay	Logit discrete choice demand function	Data on patients' demographics, diagnoses and treatment choices. Data on hospital characteristics and profits. Data on PMI providers' hospital networks	Captured	Captures the option value of PMI	Captures insurer hospital network effects and insurer–hospital bargaining. Omits collective bargaining by hospital chains
Competitor share approach	Logit discrete choice demand function	Price data for each insurer–treatment pair. Data on patients' demographics, diagnoses and treatment choices. Data on hospital characteristics	Captured	Patients are assumed to be sensitive to price changes	Considers competition between individual hospitals but not between networks. Some insurer–hospital bargaining captured through insurer price data

Technique	Underlying concept/model	Data requirements	Heterogeneity of patients and suppliers	Lack of patient price sensitivity	Insurer and hospital networks
Gaynor–Vogt (2003) structural merger simulation model (MSM) approach	Differentiated product oligopoly, logit discrete choice demand function	Data on patients' demographics, diagnoses and treatment choices. Data on hospital characteristics. Data on hospital's costs, revenues, charges to PMI providers and information about the structure of any hospital chain operating nearby	Captured	Patients are assumed to be sensitive to prices to an extent	Captured
GP referral mapping	Distance between GP and hospital	Location of GP and hospitals to which patients were referred	Some patient heterogeneity captured through diagnosis-specific radii	Not captured	Not captured
Hospital HHI versus system HHI[1]	Change in concentration	Patient discharge data by treatment group for all hospitals in the area of interest	Some patient heterogeneity captured through diagnosis-based HHIs	Not captured	Not captured
Physician-based radii	Physician's willingness to travel	Location of hospitals where the physician provides treatments and/or home address	Not captured	Not captured	Not captured

Note: [1] HHI is the Herfindahl–Hirschman Index, which is used to measure the size of a firm relative to the industry or the overall level of concentration in the industry as a whole.
Source: Oxera analysis.

The literature review in the remainder of this section is structured as follows: section 3.2 examines the traditional methods; section 3.3 reviews more recent methods; and section 3.4 summarises all other methods.

A number of the more recent techniques have been developed in the context of mergers; these include time-elasticity, willingness to pay, competitor share and the fully structured models. This may be due to the fact that the majority of competition cases in PH tend to be mergers. These techniques are included in the literature review because many of the approaches can also be used to define markets in other types of competition case; this is discussed in more detail under the description of the individual models to which this applies.

3.2 Earlier methods

3.2.1 Catchment area analysis and fixed radii/isochrones
The basic approach to geographic market definition that has been taken in a variety of industries is a customer (or, in the case of PH, patient) catchment area analysis. The catchment area analysis captures the distance around the hospital from which a certain

percentage of the hospital patients originate, often taken as 80–90%. This method is commonly used as a starting point for examining the relevant geographic markets.

The catchment area measures the distance that the majority of patients would be willing to travel to reach a hospital. The geographic market around a hospital is defined on this basis as either a fixed radius (of, for example, 30 miles) or a fixed drivetime (of, for example, 30 minutes) based on the catchment area analysis. Any hospitals within this distance from the focal hospital could be regarded as placing a competitive constraint on the focal hospital. The same radius or drivetime is often used for all hospitals of interest, regardless of their features and location. The geographic market has been defined using this method in a variety of retail industries including groceries, cinemas and health foods outlets.[18]

The techniques are usually simple to apply but are not specifically tailored to healthcare markets, and therefore do not take into account the unique characteristics of the market, such as the high heterogeneity of products and consumers, and consumers' limited sensitivity to prices.

The main criticism of this approach that is commonly cited in the literature is that it lacks economic theoretical underpinnings; as a result, the method for choosing the radius or the drivetime—a crucial driver of the results—is inherently subject to some discretion, and potentially contestable. This is because there is no guidance on what the cut-off point should be for the percentage of patients that should be included in the catchment area analysis, so this cut-off point selection is arbitrary (to a degree). Section 4.3 discusses the practical approaches which can be used to at least partly address this issue.

Another criticism is that if the same radius or drivetime is used for all hospitals regardless of their features and location then the heterogeneity of patients and hospitals might not be accounted for, meaning that this approach may ignore the preferences and travel patterns of certain patients. As a result, the geographic market definition based on this method may not be representative of a patient's true travel patterns.

Cooper et al. (2010), for example, argue that the bias in fixed-radius market definition is often correlated with urban density, such that markets in metropolitan areas where population is dense are defined too widely when the same fixed radius is applied as in less densely populated, rural areas. The isochrone method has an advantage over the fixed-radius approach, since it takes into account the local road networks. The geographic markets are therefore less likely to be distorted by urban density, since this will be reflected in the fact that urban areas would have lower speed limits, thereby leading to narrower geographic markets compared with rural areas (Cooper et al., 2010).

Data requirements
The information needed to estimate patient catchment areas is the location of patients in relation to the hospital. This would generally be available from hospital records. Alternatively, when such records are unavailable, it may be possible to establish a typical catchment area by asking the patients directly where they travel from to get to hospital. This would typically be achieved by means of a patient survey. It may be possible to target PH patients if their contact details could be obtained. If not, a national telephone survey could be carried out (using respondents' contact details obtained from a phone directory) to obtain a sufficient sample of PH patients who have recently had private treatment.

Precedent
The academic literature does not discuss applications of patient catchment area analysis in detail, although there is some precedent of it being used successfully in court. In particular, in

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[18] Competition Commission (2008), 'The supply of groceries in the UK: market investigation', April 30th. Office of Fair Trading (2005), 'Acquisition by Terra Firma Investments (GP) 2 Ltd of United Cinemas International (UK) Limited and Cinema International Corporation (UK) Limited', January 7th. Competition Commission (2009), 'NBTY and Julian Graves: A report on the completed acquisition by NBTY Europe Limited of Julian Graves Limited', August 20th.

US v. Long Island Jewish Medical Center 1997 (Long Island), the merging parties used patient catchment areas to argue successfully that the US Department of Justice (DOJ) had failed to define the relevant geographic market and overturn the challenge to the merger (Gaynor, Kleiner and Vogt, 2011).

Patient catchment areas have also been used in UK hospital merger investigations to inform choice of isochrone sizes. For example, during the GHG–Abbey (Office of Fair Trading, 2010) and GHG–Nuffield (Office of Fair Trading, 2008a) merger investigations, both the OFT and the merging parties used the finding that around 80% of private hospital patients come from areas within a 30-minute drivetime from the hospital to justify using this isochrone size as a proxy for geographic markets in PH. The 30-minute isochrone was also used by the OFT in analysing the extent of the overlap between the parties in the Spire–CHG merger investigation. For some hospitals the OFT also considered overlaps based on the 80% patient catchment areas, observing that sometimes areas from which private hospitals drew the majority of their patients could be skewed in one direction by the socioeconomic factors (Office of Fair Trading, 2008b).

There is some evidence of fixed radii being used by UK competition authorities, although without specific references to patient catchment areas to determine radius length. In particular, the CC report on the BUPA–CHG transaction refers to the OFT having defined geographic markets using 20-mile radii around hospitals as part of its preliminary investigation (Competition Commission, 2000).

Isochrone analysis has also been used for defining geographic markets in the NHS hospital mergers. For the most recent NHS merger between Basingstoke and North Hampshire Trust and Winchester and Eastleigh Trust, the CCP defined the relevant geographic market as hospital sites within a 30–40 minute drive time of each hospital operated by the merging parties. This isochrone size is based on a range of factors including patient referral patterns and catchment areas for local hospitals.[19]

3.2.2 Elzinga–Hogarty (EH)

The EH test is one of the most widely applied approaches for defining hospital markets, and it has been frequently used in contested merger cases in the USA. This method uses hospitals' patient flow data to gradually expand the geographic area around the focal hospital(s) until the inflows of patients from outside the area into local hospital(s) and the outflows of local patients to external hospitals both fall below an effectively arbitrary 10–25% threshold.

The benefits of using EH are not the primary focus of the literature—indeed most of the recent research tends to focus on criticising this method. Nonetheless, there is a general agreement that there are advantages, since it is relatively straightforward to implement and has moderate data requirements—it requires only data on patient flows to hospitals within an area, which can be obtained from centralised patient discharge databases.

Despite its attractive simplicity, use of EH to define markets in hospital care has been widely criticised on a number of grounds; in fact, Elzinga (one of the academics who developed the test) has testified in court that the approach, originally developed to analyse shipments, does not address the relevant question of interest in the case of a hospital merger.[20]

The most frequent and significant criticisms of EH focus on its inability to deal with the complexity of how patients choose hospitals in practice. For example, the EH method implicitly assumes that patients who travel further for hospital services have the same characteristics as those who travel shorter distances, and thus that the currently 'loyal'

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[19] Co-operation and Competition Panel (2011), 'Merger of Basingstoke and North Hampshire NHS Foundation Trust with Winchester and Eastleigh Healthcare NHS Trust', August 5th.
[20] Elzinga and Swisher (2011).

patients would switch if the hospital raised prices. This assumption does not typically hold in practice; patients are highly heterogeneous, and, while some may travel long distances, perhaps to receive a one-off complex treatment that is not available in any nearby hospitals, the majority are likely to have a strong preference for a local hospital. As a result, the presence of a travelling patient sub-group need not constrain a hospital's market power over most of the patients in its catchment area, giving rise to the 'silent majority fallacy' of EH (Capps et al., 2001; Elzinga and Swisher, 2011).

Many commentators observe that this shortcoming of EH is exacerbated by wide product market definition.[21] If product clusters for hospital merger analysis are too general, the size of the relevant market is likely to be overestimated. This is because a minority of patients may be willing to travel far for a highly differentiated product (possibly not even offered in the merging hospitals), which would affect the EH results but which has no relevance for the market power of the hospitals over the general care patients.

The implicit assumption that patient flows to hospitals are sensitive to prices is another commonly cited reason why EH may be conceptually less suitable for hospital markets (eg, Elzinga and Swisher, 2011; Varkevisser et al., 2008). In practice, an anticompetitive merger would first increase prices paid by PMI providers, and patients would be affected only when PMI providers pass on the costs in higher premiums. This 'payer problem' implies that the output reduction will be from consumers or firms not purchasing PMI, not from them switching between hospitals as is assumed in EH.

EH has been criticised on a number of other methodological grounds. Kemp and Severijnen (2010) observe that, although 10% and 25% cut-offs for inflows and outflows are commonly used, these values have no theoretical or empirical foundations, leaving open the question of the correct threshold where this choice makes a material difference to the case. Similar scope for discretion exists in the process chosen to expand the geographical area if the starting point does not satisfy the thresholds (eg, one can add individual zip codes sequentially, ranked by market share, or gradually expanding the radius around the hospital of interest). This makes the size and shape of the resulting market sensitive to alternative implementations of the test (H.E. French in expert evidence aggregated by The Federal Trade Commission and Department of Justice. 2004). The EH approach is also inherently backward-looking due to its use of existing patient flow data, which may be suitable for abuse of dominance cases, which tend to focus on historical behaviour, but not for predicting post-merger behaviour (Varkevisser and Schut, 2009).

Finally, there is a growing volume of empirical evidence that the markets defined by EH tend to be too broad (Haas-Wilson and Garmon, 2011; Capps et al., 2001; and Geynor, Kleiner and Vogt, 2011). These findings are also supported by ex post studies of effects of mergers cleared on the basis of EH analysis. For example, Ashenfelter et al. (2011) report that courts explicitly relied on EH results to define a broad geographic market in *California v. Sutter Health System 1999* (Sutter), a contested hospital merger in San Francisco. A recent ex post study of this transaction by Tenn (2011) indicates that this merger had significant anti-competitive effects, with the acquired hospital raising its prices by significantly more than the control group. This also suggests that the geographic market for the merger was narrower than suggested by EH.

Data requirements
The limited data requirements of the EH test may help to explain its wide usage despite its theoretical shortcomings. There are two key data requirements. The first is data on patients from outside the focal area who attend hospital(s) within the candidate area. Since hospitals hold details of each patient's home address, it is a straightforward task to determine the geographic area that captures, for example, 75% of a hospital's patients. The second requirement is for data on patients from within the candidate area who are treated at

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[21] See, for example, Elzinga and Swisher (2011); Zwanziger et al. (1994); Varkevisser et al. (2008); and FTC and DOJ (2004).

hospitals outside the focal area. This data may be more difficult to acquire for parties which are the focus of the competition investigation, but it may be possible for competition authorities to request this data from hospitals outside the candidate area. In some cases, the hospitals involved in the case will be part of chains and will be able to provide data on patients from within the candidate area who are treated at hospitals in the same chain outside the area.

Precedent

The EH test has been used in a number of contested hospital merger cases in the USA, including *Sutter*, *FTC v. Freeman Hospital 1995*, and *FTC v. Butterworth Health Corp 1996*. The test's influence, however, has recently waned. In an ex post litigation of an approved merger against Evanston Northwestern Healthcare Corporation (ENH), the FTC defined the geographic market as the area 'in which a significant number of individuals who seek hospital care at the three ENH hospitals reside' (FTC and DOJ, 2004), evidenced by, among other things, ENH's 'ability to profitably impose significant and non-transitory price increases'. The court confirmed the limited market size, using a larger market than that proposed by the FTC, but smaller than that proposed by the merging parties. Furthermore, based on the testimony of Professor Elzinga, the administrative law judge concluded that 'Patient-flow data and the Elzinga–Hogarty test are inapplicable to geographic market definition for a differentiated product such as hospital services.'[22]

The EH test has also been used in the Netherlands in the NMa investigation of the merger between the Hilversum and Gooi-Noord hospital groups.[23] This was the first Phase 2 hospital investigation in the Netherlands. The NMa identified two separate product markets: one for inpatient, and one for outpatient general hospital care. In the first assessment, the NMa used the Elzinga–Hogarty approach to define the geographic market, leading to the conclusion that the relevant geographic market was narrow because patients prefer local hospitals and the merger would therefore lessen competition. The second phase used additional research: i) interviews with GPs, hospitals and PMI providers; ii) conjoint analysis of patient preferences; and iii) econometric simulations using patients' revealed preferences.

3.2.3 Critical loss (CL) analysis

CL is a standard technique that is widely used to define markets in antitrust and merger analysis. It provides a formal method for market definition based on the idea that if a hypothetical monopolist of a set of products would be able to profitably raise prices then the relevant market is no wider than that set of products. The CL test trades off the two effects of a price rise: an increase in revenue from the higher price and a reduction in demand resulting from the higher price. The CL is the percentage of sales at which the hypothetical monopolist makes the same profit before and after the small but significant increase in price. If the actual sales loss following the increase in price is higher than the CL then the price increase is unprofitable and the market is therefore wider than that defined. If the actual loss is below the CL, the price increase is profitable and the defined market is the relevant market.[24] A more detailed description of the test is set out as follows.

- **Step 1**—For a set of firms that are presumed to form a geographic market, calculate the percentage reduction in demand that would render a fixed price increase (usually 5%) unprofitable, as a function of the price increase and the gross margin of the firm.[25] For firms with high margins, the loss of even a few consumers would materially reduce profitability, so the CL is likely to be low.

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[22] Federal Trade Commission (2005), p. 30, para. 216.

[23] Niels, Jenkins and Kavanagh (2011), p. 63, footnote 36.

[24] Niels, Jenkins and Kavanagh (2011), p. 57.

[25] The gross margin is defined as the difference between price per unit and average variable cost. Its estimation is often a highly contested issue but, by the way of illustration, margins used in previous hospital cases ranged from 41% in *California ex rel. Lokyer v. Sutter* to 66% in *FTC v. Tenet Healthcare* (Gaynor, Kleiner and Vogt, 2011).

- **Step 2**—Calculate the actual percentage of sales that the firm would be expected to lose if its price increases by 5% (estimated loss). For hospital mergers in the USA this estimate is often obtained using the contestable zip code approach. This involves identifying areas in which at least a fixed percentage (eg, 25%) of patients travel to hospitals other than those presumed to constitute a market. These patient flows are assumed to reveal the existence of other substitutes, which is taken as evidence that a substantial number of currently loyal patients would switch if the hospitals in the hypothesised market increased prices. The rate of patient switching is assumption-based (eg, 30% of patients of hospitals of interest in contestable zip codes will switch as a result of a 5% price increase).

- **Step 3**—Compare the estimated loss with the CL. If the estimated loss is higher (showing that the small price increase is not profitable), expand the market by adding hospitals that are viewed as the closest substitutes to hospitals already included.

CL is a classic market definition methodology, which has been widely used in hospital and other markets, and so has been subject to rigorous examination as it directly implements the SSNIP test used by competition authorities in defining markets.[26] It is also attractive due to its conceptual simplicity and relatively simple data requirements.

Many of the standard criticisms of the CL approach are valid in the context of defining markets for hospital care. O'Brien and Wickelgren (2003) argue, for example, that most applications of CL do not take into account substitutability among products on which the price increase is being considered, whereas in actuality, large cross-elasticities would allow a firm to profit from a price increase by capturing lost sales through its other products. The authors also observe that the argument that there would be a material actual loss of sales as a result of a price increase, which is often accepted in courts, is generally inconsistent with the existence of high margins.

Academic research identifies further potential problems with using CL in the context of hospital markets. First, Varkevisser et al. (2008) observe that Elzinga and Swisher's 'payer problem' described for the EH test also applies to the CL analysis, as lack of price sensitivity among PMI-funded patients suggests that the traditional SSNIP test does not seem to be conceptually applicable.[27] Second, the hospital-specific approach to estimating actual loss as a result of a price increase using contestable postcodes has attracted criticism similar to the 'silent majority fallacy' argument against EH by Capps et al. (2001). This approach assumes that patients currently using the merging hospital are sufficiently similar to the travelling patients in switching hospitals after the merger, which is often not plausible due to patient heterogeneity (Gaynor, Kleiner and Vogt, 2011). A study of ex post effects of a merger in the form of observed post-merger price increases by Simpson (2001) adds empirical support to this criticism by finding that in all but one area that would have been deemed 'contestable' using the standard definition, an actual 5% increase reduced the merging hospital's market share by less that 6%, significantly less than the estimated loss accepted by the courts.

Using hypothetical merger simulations among hospitals in the San Diego area, Gaynor, Kleiner and Vogt (2011) demonstrate that as a result of these methodological issues, the CL approach, like EH, tends to define excessively broad markets. This distortion is particularly pronounced in urban areas.

Data requirements
The standard implementation of CL has two components: data on hospitals' variable profit margins and information on expected customer switching following a 5% price increase. If the latter element is estimated using the contestable postcode approach specific to hospital

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[26] For example, Competition Commission (2003); and Federal Trade Commission and Department of Justice (2010).

[27] In this context, 'lack of price sensitivity' refers to the fact that the patient chooses the service provider with no knowledge of the price and no incentive to change its behaviour regardless of the price rather than low price elasticity of demand.

mergers, predicted actual loss can be estimated instead by combining data on the distribution of hospital patients across postcodes with assumptions on switching rates. This requires data on hospital discharges both from the hospitals under investigation and other hospitals in the area. (Simpson, 2001; Gaynor, Kleiner and Vogt, 2011). The main alternative way of estimating actual loss uses consumer survey data—the customers can be asked directly how they would change their behaviour in response to a hypothetical price increase (or a change in a characteristic which approximates the price increase).

Precedent

There are several precedents of successful use of CL analysis in the US courts. In one contested hospital merger, *FTC v. Tenet Healthcare 1999* (*Tenet*), the circuit court specifically gave very great weight to the defendants' CL analysis in ruling that the geographic market was as wide as 65 miles in radius, and reversing the district court decision to block the merger (Ashenfelter et al., 2011; Gaynor, Kleiner and Vogt, 2011). Moreover, CL was applied in *United States v. Mercy Health Services* 1995 (Mercy), in which the DOJ originally challenged a hospital merger in Dubuque, Iowa, which left only one small competitor in the 15-mile radius. The defendants used CL to argue for a very wide market, including hospitals as far as 100 miles away, leading the court to clear the merger (Ashenfelter et al., 2011). Gaynor, Kleiner and Vogt (2011) also report that CL was used by both sides in the *Sutter* contested merger case described in section 3.1.1 above.

3.3   More recent methods

The more recent methods include time-elasticity, willingness to pay, competitor share and structural merger simulation approaches. These methods specifically simulate effects of mergers to determine the price increase which is likely to take place following the merger. However, all four methods discussed in this section can in principle be used in the context of other competition cases, in which geographic markets could be defined as the smallest set of hospitals which, in a simulated merger, would materially increase prices while experiencing relatively few substitutions to other alternatives.

The approaches in this section have been developed over the past decade in response to methodological differences in the existing market definition methodologies, and growing empirical evidence of incorrect conclusions that have arisen from their applications in contested hospital mergers. The new proposed methods use sophisticated econometric techniques that analyse factors that determine hospital choice for individual patients and predict changes in their behaviour after the merger.

MSMs, however, have not yet been thoroughly tested (in relation to verifying the predictions of the models ex post), and where they have been tested this has not been in cases involving hospitals. There is some limited evidence on the performance of MSMs in other industries. For example, Peters (2006) and Weinberg and Hosken (2008) in Ashenfelter et al. (2011) show mixed empirical support for the ability of MSMs to correctly predict direction and, especially, the size of price changes in other industries. Ashenfelter et al. (2011) report that there are currently no ex post studies exploring the performance of MSMs in cases involving hospitals.

3.3.1   Time elasticity

The time-elasticity approach is one of the geographic market definition methods proposed by Capps et al. (2001) to address the excessively large markets that were often produced by simpler methods which ignored heterogeneity of patients and hospitals. This new method was specifically developed to circumvent two other methodological problems—the limited price sensitivity of PMI-funded patients, and difficulties in obtaining accurate measures of prices charged by hospitals.

This approach examines patients' willingness to substitute away from the hospitals of interest by exploring their revealed willingness to travel further to other hospitals with particular

characteristics. Put simply, the time-elasticity approach allows the geographic market to be defined according to how many consumers would switch to competing healthcare providers in response to, typically, a hypothetical 10% increase in travel time to the merging parties. Using a range of theoretical assumptions, the estimated effects of the merger on time-elasticities of patient demand are transformed into equivalent changes in the price–cost margin for the hospitals. These results are then used to assess the full competitive effects of the merger without relying on static consumer behaviour or observed hospital prices.

Since hospital prices are generally immaterial to patients, non-monetary factors such as travel time can function as 'prices'. This method proceeds as follows.[28]

– **Step 1**—Estimate a logit demand function as the probability that patient i chooses hospital j, using the patient and hospital characteristics and factors specific to this patient–hospital pair (eg, travel times).

– **Step 2**—Use parameter estimates from the discrete-choice model to simulate the effect of increasing travel time for each patient to a given hospital by a certain percentage (eg, 5%).

– **Step 3**—Compare the effects of increasing travel times to the merging hospitals individually with the effect of increasing travel times for them jointly. If the time elasticity for the joint increase is much lower, the hospitals are close substitutes and more likely to have market power jointly.

– **Step 4**—Assuming that consumers trade off time for money at a constant rate, price elasticities should be directly proportional to time elasticities. Using the inverse-elasticity pricing rule, this implies that post-merger increases in margins are directly proportional to the reduction in time elasticity between joint and individual simulations in Step 3.

In proposing this new approach, Capps et al. (2001) argue that it has many advantages over the earlier techniques for defining hospital markets. Its main aim is to capture adequately the complexities of patient's hospital choice. By estimating the patient demand model, which explicitly includes a range of patient- and hospital-specific factors, the authors are able to account for patient and hospital heterogeneity and thus minimise the risk of the 'silent majority fallacy'. Furthermore, by explicitly modelling factors that affect patients' hospital choice and willingness to travel, this approach produces results that are in line with the recent empirical evidence that the relevant markets for hospital care may sometimes be very narrow because in urban areas hospitals often exert competitive constraints on each other only over short distances (Capps et al., 2002; Dafny, 2009).

Although the time-elasticity approach, like all other techniques discussed in this section, takes the form of an MSM, it is also suitable for non-merger inquiries. Capps et al. (2002) illustrate that this method can be used to define markets for general market studies by finding the smallest set of hospitals, for which a small increase in patients' travel times to all hospitals in the set would result in relatively few substitutions to outside options.

Not using price data in the analysis is an additional advantage that sets this approach apart from other merger simulation approaches. Scarcity and poor quality of hospital pricing data is a common theme in the empirical literature on PH, and poor price proxies have often been found to undermine the reliability of empirical studies (eg, Farell, Pautler and Vita, 2009; Vogt and Town, 2006). Furthermore, PMI-funded patients are often not sensitive to a hospital's prices or, as in the Netherlands, they do not observe a variation in prices across hospitals (Varkevisser et al., 2008). The time-elasticity model has been developed specifically to address the situations where prices are not directly observable or are not relevant for patients.

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[28] The description of the methodology is adapted from Varkevisser et al. (2008).

The disadvantage of not using price data is that the model cannot allow some patients to be price-sensitive, even in cases where treatments may involve out-of-pocket expenses in practice. In presenting this methodology, Capps et al. (2001) acknowledge that, to avoid distortions, the model needs to be estimated using patients who do not face price differences across hospitals (eg, who have full PMI cover). Consequently, the merger simulation stage of the analysis requires an assumption that their preferences with respect to travel distance are comparable to other patients whose choices may be of interest (eg, self-pay or partially PMI-funded).

Estimating the patient's hospital demand using the observed patient choice data requires further simplifying assumptions. First, this model does not account for the restrictions on patient choice from a limited insurer network, so patients are assumed to be free to switch to whichever hospitals maximise their welfare (Capps et al., 2001). Second, simulating mergers in terms of time elasticities requires assuming that patients trade off travel times and money at a constant rate. Varkevisser et al. (2008) argue that this assumption needs to be validated for each case (by, for example, stated-preference research), but even if it does not hold fully, time elasticities are still broadly indicative of the existence of other available substitutes to the hospital of interest.

Data requirements
The advantages of accounting for patient heterogeneity using discrete-choice models come at a price of needing to use highly granular data on patients' demographic characteristics, diagnoses and treatment choices, as well as data on hospital features and quality. Furthermore, large sample sizes are required due to the complexity of the model. All reported empirical applications of the time-elasticity analysis carried out use large patient pools: over 27,000 hospital admissions for Capps et al. (2001, 2002) and 5,400 for Varkevisser et al. (2010).

Precedent
The time-elasticity approach is the only technique in the class of merger simulation approaches to have a public track record of use in competition investigations for hospital markets. It was used, albeit with some modifications in Phase 2 of the cleared *Hilversum-Gooi-Noord (2005)* merger investigation in the Netherlands (NMa, 2005).

3.3.2 Option demand/willingness-to-pay approach
It has long been recognised that US hospital care has strong features of the option demand market, as patients select their PMI plans while healthy, on the basis of plan features such as premiums and hospital network coverage, but then are largely insensitive to the price of treatment (Gaynor and Town, 2011; Elzinga and Swisher, 2011). The first MSM to reflect these features explicitly was developed by Town and Vistnes (2001), later extended in the option demand approach by Capps et al. (2003).

The Capps et al. (2003) willingness-to-pay model is based on the idea that patients commit to a network of medical providers covered by their insurer at the time they choose their PMI provider, but before they know their medical needs. The value of the network to a consumer is then based on how well they expect the firms in their insurer's networks to meet their needs when they materialise. The standard logit demand framework is estimated to derive the value of each hospital to a consumer, conditional on a specific diagnosis and the consumer's demographic features. This makes it possible to derive the ex ante value of a particular hospital network to all patients, using the probability distribution of diagnoses and the distribution of consumer characteristics. This aggregate ex ante value reveals how much consumers are willing to pay to retain a particular hospital in a network. High willingness to pay suggests higher market power of a hospital over an insurer.

After deriving the willingness to pay for each hospital, Capps et al. regress observed hospital profits on willingness to pay to find a conversion rate between willingness to pay (which is in abstract units) and profits. This willingness-to-pay measure is found to be a highly significant predictor of hospital profits.

The merger effects are simulated by finding the difference in willingness to pay for a merged entity versus the willingness to pay for each hospital independently, since two merged hospitals can increase their market power by coordinating their decision to join an insurance network. This change in willingness to pay is converted to the change in profits, using the parameter from the regression in the step above. Price effects are recovered based on an assumption that quantities supplied remain unchanged. In general market studies, the same results can be used by defining geographic markets as a set of hospitals, which, if merged, are expected to increase prices by more than 5%.

The main rationale behind the development of the willingness-to-pay model, and its frequently emphasised benefit, is its uniqueness among the merger simulation models in explicitly modelling the insurer–hospital bargaining, one of the main competitive dynamics in the US hospital market (eg, Federal Trade Commission and Department of Justice, 2004; Gaynor, Kleiner and Vogt, 2011). Furthermore, it avoids the 'payer problem' posed by Elzinga and Swisher (see above) by modelling patient choice as a two-stage process of committing to an insurer ex ante before choosing a hospital.

The willingness-to-pay approach also shares the advantages of advanced approaches over the more basic market definition techniques. By modelling demand using the interaction between hospital and patient characteristics, this approach can capture heterogeneity and produces flexible substitution patterns across hospitals and, therefore, plausible own- and cross-price elasticities of demand (Capps et al., 2003). Moreover, it succeeds in capturing local market power; comparative simulations of hospital mergers in the San Diego area presented in Capps et al. (2002) show that, like time elasticity and other semi-structural models, the willingness-to-pay approach is able to identify local pockets of market power that can arise in small urban areas even if a large proportion of patients travels outside the area for treatment.

The willingness-to-pay approach has the attractive attribute that it can capture the bargaining dynamics between hospital groups and insurer networks, but this comes at the cost of significant complexity and sensitivity to assumptions. As demonstrated by Vistnes and Town (2001), the outcomes of the option demand models with hospital–insurer bargaining depend on the back-up options the insurer has if one of the hospitals is excluded from the network. The willingness-to-pay approach, specifically, implicitly assumes that in this situation the insurer does not replace the lost hospital with the next best alternative, which may be implausible for many markets where insurer coverage is not universal. Furthermore, the willingness-to-pay model contains a number of complex departures from the standard merger simulation models, which have not yet been validated in courts or in retrospective merger studies.[29] There is also no precedent reported in the literature of the willingness-to-pay method being used in competition investigations.

The literature also raises a number of potential problems related to the model's approach to patient demand. Varkevisser et al. (2008), for example, argue that calculating the ex ante willingness to pay for hospital for each patient implicitly assumes that patients can accurately predict their probability of requiring treatment for all possible diseases, which is highly implausible. Furthermore, the model's authors acknowledge that estimating the patients' demand and thus willingness to pay for hospitals using data on observed choices by PMI-funded patients may bias the results, because many of these patients may already be committed to a restricted hospital choice set. Preliminary investigation, however, does not find strong evidence of this bias (Capps et al., 2003).

Like other MSMs, the willingness-to-pay approach takes into account the heterogeneity of patients and hospitals, and it is therefore able to identify localised hospital markets (Capps et al., 2003). Gaynor, Kleiner and Vogt (2011) note, however, that it can estimate the

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[29] The paucity of empirical evidence on the quality of MSM predictions is discussed in Ashenfelter et al. (2011).

percentage increase in joint prices only after the merger, and cannot be used to isolate asymmetric unilateral effects.

Data requirements
As is standard for merger simulation approaches, the willingness-to-pay demand model requires a patient-level dataset of hospital choices and characteristics which is sufficiently large to also draw conclusions about the demographic distributions in the population. Furthermore, the approach requires data on the network structures of PMI providers in the area of interest and on each hospital's revenues attributable to payments from PMI.

Precedent
No recorded precedent.

3.3.3 Competitor share approach
The competitor share approach is based on the intuition that the ability of hospitals to raise prices following the merger depends on the substitutability between the merging hospitals, which largely depends on the extent of overlaps in the types of patient the merging hospitals treat (Capps et al., 2001; Varkevisser et al., 2008). Similar to other merger simulation approaches, the starting point is a logit discrete choice demand function. Next, however, the mathematical properties of the logit demand function are used to solve for the (implied) price elasticities for each sub-market (ie, insurer–diagnosis pair) as a function of market shares of competitors in the same sub-market. In merger analysis, the model simulates the changes in market shares after the merger and infers the changes in price elasticities (and therefore prices) for each sub-market, and for the merged hospital in aggregate.

Capps et al. (2002) outline the following steps for implementing the competitor share approach in practice:

–   **Step 1**—Define a set of sub-markets (for example, all unique insurer–diagnosis pairs). There may also be patient-specific dimensions, between which the hospital is unable to discriminate, but the distribution of these characteristics in the population for each treatment is likely to be reflected in the overall price.

–   **Step 2**—Estimate a logit (discrete choice) demand model for each sub-market, using prices, patient- and hospital-specific characteristics.

–   **Step 3**—Use the estimated parameters to derive the expression for the hospital's price elasticities as a function of market shares of competitors in the same sub-market.

–   **Step 4**—Compare differences in demand elasticities for the two hospitals jointly with their individual elasticities.

–   **Step 5**—Convert the reduction in price elasticity into price increase (via an increase in margins).

The competitor share approach delivers the benefits of other merger simulation models, by incorporating patient heterogeneity. Using interactions between patient and hospital characteristics allows for flexible patient-substitution patterns across hospitals, since patients will choose to switch to different hospitals depending on their illness or income (Capps et al., 2001). As with other advanced approaches, this allows the competitor share approach to identify local hospital market power effectively (Capps et al., 2001, 2002). Furthermore, Varkevisser et al. (2008) suggest that the competitor share approach can be easily used for non-merger market definition; in more general contexts, markets can be defined, as usual, as a set of hospitals that, if monopolised, could increase prices with relatively few patients substituting to outside alternatives.

The additional advantage that sets the competitor share approach apart from other merger simulation methods is its ability to produce very granular information on competitive

constraints between hospitals. By breaking down hospitals' activity into insurer and diagnosis-based sub-markets, and estimating the competitor share effects for each, this method can be used to identify pockets of market power for specific types of service such as ante natal care (Varkevisser et al., 2008, Capps et al., 2001). This can be particularly useful if, for example, two of the merging hospitals have few overlapping specialisations and therefore do not compete with each other on many product dimensions (which would otherwise mask the potential effects of the genuine overlaps).

One of the main shortcomings of the competitor share approach is that it requires very granular data in light of its complexity. By producing effects of a merger on prices for every diagnosis–insurer pair, for example, in their implementation of this approach, Capps et al. (2002) obtain as many as 1,957 sub-markets using data for five PMI providers. This potentially unwieldy number of results needs to be aggregated further to be tractable, and the final outcomes may be sensitive to the choice of aggregation method. Furthermore, patients are assumed to be sensitive to the variation in prices between the diagnosis–insurer pairs, at least to some extent.

Capps et al. (2001) note two further conceptual difficulties that arise from the approach's assumptions about hospitals' pricing behaviour. First, in simulating the effects of hypothetical mergers, the competitor share approach assumes that hospitals set equal prices after merging. This does not necessarily occur in practice; for example, an ex post study of the effects of two Dutch mergers reports that only one pair of hospitals had implemented standardised pricing (Kemp and Severijnen, 2010). Second, the competitor share approach evaluates hypothetical post-merger competitive constraints using pre-merger prices, in effect omitting the likely dynamic response by competitors after the merger.

In addition to the above issues, the competitor share approach suffers from the same shortcoming as the time-elasticity approach. By assuming that patients' choice set includes all hospitals in estimating the hospital demand model, the approach is potentially vulnerable to bias if, in reality, many patients are constrained by restrictive insurer network coverage.

Data requirements
The highly differentiated results produced by the competitor share model require equally granular data. The approach assumes that hospitals charge PMI providers or their patients different prices for each hospital service, and requires price data for each insurer–treatment pair. In practice, this data may not be available, as in many countries at least part of the remuneration agreements between PMI providers and hospitals is based on a fixed daily charge basis (eg, Varkevisser et al., 2008; Federal Trade Commission and Department of Justice, 2004).[30] Furthermore, this data needs to be obtained on all hospitals in the area of interest, not simply the merging parties.

As with other merger simulation approaches, the competitor share method also requires granular data on individual patients' hospital choices and characteristics. For example, Capps et al. (2001) uses over 27,000 patient episodes to estimate the hospital demand function.

Precedent
No recorded precedent.

3.3.4   Gaynor–Vogt (2003) structural MSM approach
This is a structural model of consumer and hospital behaviour, based on theoretical foundations described in the Berry, Levinsohn and Pakes (2004) model for differentiated product oligopoly. It is the only MSM considered in the literature that attempts to model the

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[30] This is a particularly important point if prices for staying in the hospital (ie, hospital bed, catering, theatre facilities and nursing staff) are disaggregated from the prices charged by the consultants for the procedure.

strategic interaction of the competing hospitals in the market, especially the potential effects of reduced competition among hospitals belonging to the same chain.

The theoretical set-up for the model describes the dynamics of the PH market as Bertrand competition with differentiated products.[31] It models demand at the level of each patient, using the standard multinomial logit discrete choice models based on micro data on individual patients. This demand model allows the prediction of the probability of each hospital being chosen by each consumer, using the set of consumer and hospital characteristics, in interaction with the price of the hospital service. The demand faced by hospital j can be derived by summing the quantities of hospital care demanded by each consumer and the probability of each consumer choosing hospital j. Because prices are endogenous, exogenous wages and predicted quantity (using only geographic distribution and exogenous consumer characteristics) are used as instruments for price, thus enabling the recovery of a_p, the marginal utility of income.

This methodology departs from other merger simulation approaches described above by including a structural supply-side model of oligopolistic competition among hospitals using the Bertrand model of price-setting behaviour. This allows Gaynor and Vogt to recognise and incorporate in the model the fact that hospitals often operate as multi-hospital chains, which has a significant impact on substitution between hospitals within one chain and pricing coordination. Using these demand- and supply-side models, the structural approach allows one to solve explicitly for the own-price and cross-price elasticities faced by each hospital.

Effectively, this structural approach implements a highly sophisticated version of the CL analysis. The amended SSNIP criterion proposed by the authors states that 'for a 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 members' (Gaynor, Kleiner and Vogt, 2011, p. 18). This has the benefit of being consistent with the new US horizontal merger guidelines (2010), which, in defining a market, require a hypothetical monopolist—possibly a chain of hospitals operating in many geographic markets—to impose a SSNIP in at least one location, at least one of which is the location of one of the merging parties.[32] The algorithm used to define the markets using the proposed structural model is as follows.

> **Step 1**—Begin with a hospital of interest for which the market needs to be defined.
>
> **Step 2**—Find the competing hospital that is the closest to the hospital of interest.
>
> **Step 3**—Raise the price of only these hospitals by 5%, and simulate the resulting change in demand.
>
> **Step 4**—If total profits (given diversion to other hospitals in the same chain) increase as a result, this constitutes a market and the SSNIP test stops here. If not, add the next hospital that is closest to the hospital of interest.

All MSMs discussed in this section share an advantage of being grounded in theoretical fundamentals of consumer demand, but in addition to this the Gaynor–Vogt approach is

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[31] The description of the theoretical framework for the model draws on exposition in Gaynor and Vogt (2003) and Gaynor, Kleiner and Vogt (2011).

[32] The article illustrates this criterion through a useful example, quoted here in full: '... consider 4 hospitals, A, B, C and D, and let A and B be members of the same hospital system. Suppose hospitals A and C act as a "hypothetical monopolist" and engage in a coordinated price increase of 5% (holding the terms of sale constant at all other locations), resulting in a decrease in demand at both hospitals and a decrease in profits at the combined hospital entity of A and C. Suppose, however, that B is a sufficiently adequate substitute for care at these hospitals so that the increase in profit as a result of the increase in demand for hospital B's services is greater than the decrease in profits at the combined hospital entity of A and C. Hospitals A and C would be a market under the SSNIP criterion, as the collective profits in the systems of which these hospitals are members has increased. Likewise, if hospital D is a close substitute for the care rendered at A and C while hospital B is not, hospital B would see little or no increase in demand or profits and thus hospitals A and C would not be considered a market according to the SSNIP criterion.' (p. 19).

unique in also having a theoretical underpinning for the supply of hospital services. This feature of the model is important in capturing the fact that hospitals often operate in chains, so a realistic implementation of the SSNIP test needs to allow for potential coordinated price setting and some of the profits diverted from merging hospitals being captured by other hospitals in the chain. Unlike the willingness-to-pay approach, this method also allows for the prediction of different price increases for each of the merging hospitals rather than only the joint effect overall (Gaynor, Kleiner and Vogt, 2011).

The Gaynor–Vogt approach also shares the advantages of other MSMs, such as being sensitive to patient heterogeneity, in particular willingness to travel, allowing for plausible cross-price substitution effects (Gaynor and Vogt, 2003). A comparative empirical study by Gaynor, Kleiner and Vogt (2011) shows that this fully structural approach can identify local hospital market power, in contrast with the simple patient flow-based techniques. Finally, the empirical results from recent studies (eg, Dafny, 2009) imply that the hospital markets are similar in size to those obtained through the structural merger simulation approaches, such as Gaynor and Vogt (2003) or Capps et al. (2003).

Generally, the Gaynor–Vogt approach is not frequently discussed in the reviewed literature, so only a limited range of critical academic assessments of this method is available. Besides the model's complexity, which may be a major obstacle for practical implementations, the main shortcoming of the Gaynor–Vogt approach is its treatment of patients as price-sensitive. The price sensitivity arises from including the total price paid by the insurer to the hospital as an argument in the patient's utility function, which, in turn, drives hospital choices (Gaynor and Town, 2011). Although Gaynor and Vogt (2003) do report some empirical evidence that prices affect patients' hospital choice, the theoretical foundations of the model seem to assume that the effect arises from PMI providers' ability to channel patients to hospitals. This assumption may not hold in healthcare markets where insurer networks are not very selective and their influence over patients' choices is weak.

Data requirements
As usual, estimating the hospital demand function requires data on patient and hospital characteristics and patient discharges. In addition to this standard dataset, the approach also requires data on hospitals' costs, revenues and charges to PMI providers, as well as information about the structures of any hospital chains operating in the area of interest. The data-collection burden of the method is considerable since a robust estimation of supply-side features is likely to require using a large number of hospitals in the study. The original article by Gaynor and Vogt (2003), for example, implements the model using data on 374 hospitals and over 900,000 patients.

Precedent
No recorded precedent.

3.4 Other methods

Oxera encountered a number of other non-standard approaches in the literature which, while not necessarily designed to define markets for competition investigations, can still be used to gain an understanding of hospitals' areas of operation and the competitive constraints they are facing. These approaches are outlined in this section.

3.4.1 GP referral mapping
Cooper et al. (2010), one of the few UK studies, albeit not primarily focused on market definition, constructs another interesting measure of competition in an empirical study based on GP-centred radii. The geographic market is defined as a distance around a GP practice which corresponds to the 95th percentile of distance travelled by a patient from this practice to a hospital. HHI concentration is then measured for every GP-centred area and diagnosis

combination, for which the given hospital is in the choice set, and the results are aggregated into a prevalence-weighted HHI for the whole hospital.[33]

3.4.2 Hospital HHI versus system HHI

This method draws on the disaggregated product market view proposed by Zwanziger et al. (1994). For each hospital, this method calculates an HHI in each postcode from which it draws patients, separately for each major type of care, and aggregates the results into a prevalence-weighted hospital-HHI. Capps and Dranove (2004) extend this approach to estimate the effects of mergers on concentration by calculating the same measure for a system of hospitals taken together (eg, merging parties), and comparing the two HHIs to analyse the increase in market concentration if hospitals act in a coordinated manner. This is used to analyse effects of mergers on concentration, but does not provide clear cut-offs for defining markets (or for assessing competitive impact) specifically.

3.4.3 Physician-based radii

Luft and Maerki (1984), cited in Morrissey et al. (1988), use an alternative approach to market definition, based on physicians', not patients', willingness to travel to carry out treatments in hospitals. They consider, for example, a fixed radius of 15 miles to define the maximum distance a physician would be willing to travel. Morrissey et al. (1988) criticise this approach, on the basis that even if physicians are limited to a particular set of hospitals, the patients' choice set simply consists of hospital–physician pairs, and the distance they are willing to travel to high-quality hospital-physician offerings need not be constrained by the physician-centred radii. As a result, even when physicians are tied to a very local set of hospitals, patient flows may exercise competitive pressures over a wider area.

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[33] The 'HHI' stands for the 'Herfindahl–Hirschman Index'. This index is used to measure the size of a firm relative to the industry or the overall level of concentration in the industry as a whole.

4 Critical assessment of techniques and applicability to the UK

The literature review in section 3 shows that there is a spectrum of techniques available to define the geographic market for PH. The techniques are characterised by different degrees of theoretical soundness, complexity, data requirements and the extent to which they have been tested empirically or have established precedent in court cases. The next step is to consider which of these are suitable for the UK market.

The conclusion that emerges from the literature review is that the more recent techniques are conceptually more appealing than the earlier ones, since they have been developed to account for specific characteristics of the PH market such as heterogeneity of patients and suppliers, lack of price sensitivity of patients, and the fact that competition between hospitals takes place at a network level as well as at an individual hospital level.[34]

However, this theoretical appeal needs to be weighed against the need for extensive and detailed data, on which these techniques tend to rely. Other relevant considerations for whether a technique is suitable for the UK would be the complexity of the technique (ie, whether it allows for the calculations to be carried out with sufficient ease within the given timescale), conceptual suitability of the technique for the UK (ie, whether the underlying assumptions of the model reflect the characteristics of the UK PH system), and existing case practice.

In addition, the theory of harm that is being considered is likely to play an important role in the choice of geographic market definition technique. Some techniques focus purely on market definition, while others have been designed specifically to simulate the effects of a merger. The latter models may therefore be appropriate in mergers, potentially putting less weight on the market definition stage.

This section assesses the available techniques in order to determine which are most applicable for use by the OFT or other parties in defining the geographic market in the UK. The section proceeds as follows. Section 4.1 discusses the key features of the UK PH market, since these determine the criteria for assessing the applicability of the techniques to the UK market. Section 4.2 discusses the criteria against which the techniques are assessed. Sections 4.3 to 4.5 present the assessment of the techniques against the criteria listed in section 4.2. Section 4.6 makes a recommendation resulting from the assessment of the techniques.

4.1 Key features of the UK PH system that affect market definition

To identify which techniques for geographic market definition are suitable for the UK PH market, it is useful to consider some of the key features of how this market works, and how it may be different from markets such as those in the USA and the Netherlands which have received considerable attention in the literature. This section therefore summarises Oxera's understanding of the main steps of the patient journey, and the roles of the main players therein.

In most cases, the patient journey begins when a patient experiences symptoms and seeks advice from a GP.[35] In cases that require specialist knowledge or further investigation, the

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[34] Although the literature review shows that no single method so far has succeeded in capturing all of these market characteristics.

[35] The Opinion Leader (2011).

GP makes an initial diagnosis and formally refers the patient to a specific consultant at a hospital or, in certain cases, simply to any relevant specialist in a selected hospital.

The extent of GP involvement in the selection of private or NHS referral, or in the choice of consultant, varies from case to case, but evidence from patient surveys undertaken by the OFT suggests that GPs have significant influence over the initial choice of the consultant and the hospital.[36] The GP's choice of private hospital PH facility is normally not led by the price of treatment, especially for PMI-funded patients, but is primarily based on the reputation of consultants and facilities, factors that are likely to favour information obtained through local relationships.[37]

If further consultation with the consultant reveals that medical treatment is necessary, the consultant plays an important role in the patient's decision about a PH facility where treatment occurs. Almost half of the consultants in the OFT survey indicated, for example, that they never give a patient a choice between the different private facilities in which they operate, and a majority of consultants responded that over 75% of the treatments they carry out occur in the same private hospital in which they first see the patient.[38]

Following the treatment, the typical patient journey diverges between self-pay and PMI-funded patients. The self-pay patients are billed directly by the hospital for the price of consultant services and the hospital facilities provided during the course of treatment. Due to these out-of-pocket expenses it appears that these uninsured patients are more likely to be price-sensitive in choosing consultants and hospitals, and are more likely to view NHS hospitals as a competitive substitute, trading off the costs of being treated privately against longer waiting times and potentially lower quality. Evidence collected as part of recent merger investigations suggests that approximately 15% of private hospital patients are currently self-pay (Office of Fair Trading, 2010).

For patients with PMI, the next stage of the patient journey involves minimal expenses (other than any policy excess) if the treatment is carried out by an authorised consultant and PH facility, since both the hospital and the consultant settle their costs directly with the PMI according to pre-determined remuneration agreements. PMI-funded patients—amounting to as much as 60% of private patients—are therefore unlikely to be sensitive to treatment prices as long as the providers are within their PMI's network. In fact, the OFT patient survey reveals very limited awareness of costs of treatment among PMI-funded patients.[39] These patients' choices may be more likely to be driven by quality, travel times or recommendations of GPs or consultants. Figure 4.1 summarises Oxera's understanding of the relationships between the main parties in the market for a typical PMI-funded patient's journey.
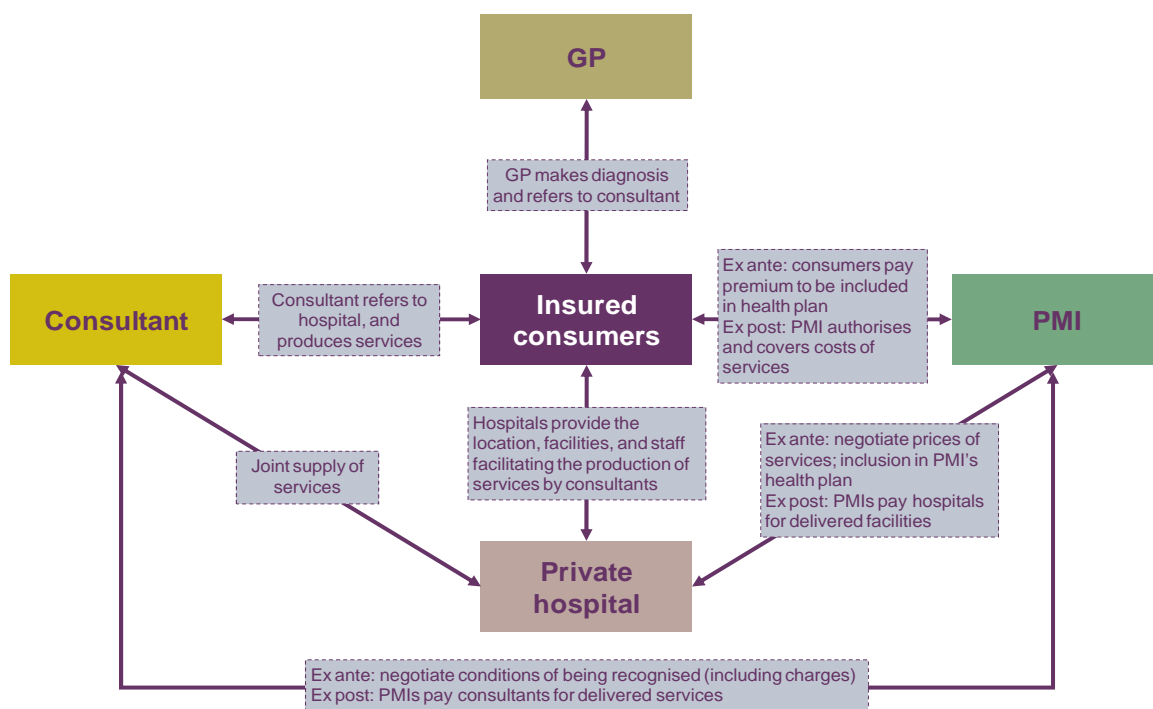
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[36] The Opinion Leader (2011), p. 20 and p. 42. GHK (2011), p. 24.

[37] GHK (2011), p. 22.

[38] GHK (2011), pp. 53–4.

[39] The Opinion Leader (2011), p. 38.

Figure 4.1   Relationships between key players in the PH market

Source: Oxera analysis.

The limited sensitivity of patients to prices due to the widespread use of PMI adds another important feature to competition in the UK PH market—the ex ante price negotiations between hospitals and PMI providers. Evidence submitted in the GHG–Abbey merger investigation (Office of Fair Trading, 2010) shows that there is a small number of large PMI providers (eg, BUPA and AXA) and large nationwide hospital chains (eg, GHG, Spire, Nuffield) that negotiate remuneration agreements centrally, adding a potential national dimension to competition in the UK PH market.

4.1.1   Emerging conclusions on the UK market

The review of the typical patient journey in the UK highlights several features that are important to note in assessing the applicability of market definition techniques to the UK market.

First, there are three types of market participant in addition to the hospital and the patient that have a significant effect on the market: consultants, GPs and PMI providers. Whereas the important roles played in hospital choice by PMI providers and consultants have been noted in the literature on US markets before (eg, Federal Trade Commission and Department of Justice, 2004; Capps et al., 2003), the UK appears to be different in terms of the central role of GPs as gatekeepers and 'traffic controllers' for private care. Their involvement is particularly significant in light of the survey findings that consultants tend to treat private patients in the hospitals where they first see them.

Second, the UK appears to be unique in that the public healthcare sector (NHS) exists alongside the PH market. NHS private patient units (PPUs) and the existence of a free public healthcare service in practice may provide a competitive constraint on private hospitals, at least with respect to self-pay private patients.

The effective separation of the NHS and the individual network of private hospitals significantly restricts the availability of statistical data in the UK for the purposes of undertaking market definition (as PH is outside the data reporting requirements applied to the NHS). The majority of the more recent and more complex market definition methodologies that require highly granular data were developed and applied in the USA and the Netherlands, where private hospitals are the core of the healthcare industry and are subject

to reporting requirements from government organisations. In the UK, however, centralised hospital supervision is largely focused on the NHS; consequently, no analogous central patient discharge databases or standardised financial reporting systems appear to exist for private care. This is therefore likely to significantly limit the choice of the geographic market definition techniques that can currently be applied to the UK market for PH.

Finally, in the UK markets for private care there is significant functional separation (and often separate billing of patients and PMI providers) between the contributions of a consultant and of a private hospital to any given medical treatment. This feature of the market raises a number of issues for product market definition, since the two contributions to treatments significantly differ in terms of the possibilities for supply-side substitutability. In particular, whereas consultant services are generally highly heterogeneous across treatments, many of the core hospital services, such as overnight stay, food and operating theatre facilities, may be the same. The interaction between these two components suggests that more clustered product markets might be appropriate for purely private hospital services insofar as an argument can be made that they are separable from consultants' contributions in practice.

4.2   Criteria for assessing market definition techniques

The OFT may define relevant markets in a variety of contexts, including merger investigations, investigations under the Competition Act 1998 and market studies. Given the differences in the statutory timelines and information-gathering powers arising from different types of investigation, it is unlikely that a single market definition method would be suitable for all circumstances. It is therefore important to determine a set of features that would allow all the available techniques to be compared in a structured way that gives weight to the most important aspects of the case.

The following five criteria are used to assess the suitability of techniques for defining the market for PH in the UK. These criteria have been chosen to allow a balanced assessment of theoretical and practical considerations.

–   **Theoretical underpinning**—any model is necessarily a simplification of reality; however, to obtain reliable results, an appropriate method for defining markets in hospital care needs to be in line with economic theory, internally consistent, and not contradict the established facts about how agents in the relevant market behave in practice.

–   **Data requirements**—the issue of methodological difficulties in defining key variables for many techniques (eg, hospital prices and profits) is a recurring theme in the literature. As discussed in section 4.1, unlike the countries from which more sophisticated hospital market definition techniques originate, the UK does not have a centralised private patient discharge database, and centralised data on private hospital features and finances is similarly hard to access. This makes data availability a key criteria for selecting the appropriate geographic market definition technique for the UK.

–   **Complexity**—the available methods range from simple approximations to methodologies that require significant time and highly specialised resources to evaluate and interpret model performance and results. The models at the more complex end of the spectrum are less likely to be useful for cases with short timescales for the analysis, or where it is a preliminary stage of an investigation.

–   **Conceptual suitability for the UK market**—this criterion tests whether a technique's assumptions are in line with how the UK system operates. For example, techniques that cannot adequately capture the mainly insurance-based model and the GP referral system will be of little value for UK cases.

– **Established case practice**—the experiences of competition authorities, courts and regulators with using a particular technique are important for selecting appropriate methodologies. These 'precedents', combined with ex post studies, also reveal whether predictions of the methods were consistent with observed outcomes.

4.3 Earlier techniques for geographic market definition in PH

This section assesses the earlier techniques for geographic market definition in healthcare markets against the five criteria described above.

4.3.1 Conceptual/theoretical underpinning

The literature review in section 3 highlights that the three earlier techniques—isochrones, CL and EH—have weaker theoretical underpinnings than the more advanced models. The main criticisms of these earlier models are as follows.

– The models rely on arbitrary cut-off points that are not justified by the economic theory and are therefore open to challenge—the applications of catchment area analysis for isochrones generally adopt a threshold of around 80% of patients; the EH test uses a threshold of 10% or 25% for patient inflows and outflows; and the CL test uses an arbitrary cut-off point to define contestable areas and predict switching rates.

– The models appear not to take into account the heterogeneity of hospitals and patients—the same isochrone size is used for different hospitals; and EH and CL's contestable postcode approach assumes that the presence of some travelling patients in area indicates that substitutable external hospitals are available even for the currently 'loyal' patients.

– The models do not address the lack of price sensitivity of patients—while isochrones do not rely on the price changes, CL and EH both assume that patients' flows respond to increases in prices.

There are, however, practical solutions that could address these problems, at least to some extent.

In relation to the arbitrary cut-off point, a practical solution might be to flex the cut-off percentage, for example to between 70% and 90% for the isochrone analysis, to test whether this makes a significant difference to the result. Only where this shows that the result of the analysis is sensitive to the level of the cut-off threshold does the choice of this threshold become problematic. For the CL analysis, the contestable postcode approach appears unsatisfactory, despite its parsimony, since it requires arbitrary cut-offs to define 'contestable' areas and predict switching rates. A more empirically robust approach to calculating estimated loss—for example, using carefully designed conjoint surveys—may avoid many of these criticisms.[40]

If preliminary analysis indicates that the heterogeneity of patients and hospitals is likely to be an issue then a practical solution would be to define the product markets in a more granular fashion. Treatment-specific catchments can then be used in the isochrone analysis to address patient heterogeneity. Similarly, different sizes of isochrones could be used for different hospitals depending on their particular characteristics (such as size, range of treatments offered, and location). This approach is used in the groceries market, where the CC defines geographical markets using different-sized isochrones depending on the size of the store (convenience, mid-sized or one-stop) and its location (urban or rural).[41] Defining the product market more granularly may also alleviate the same problem for the EH test. In fact,

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[40] Conjoint, or stated-preference, surveys ask patients to choose between a range of options multiple times, and alter the parameters of choice in order to estimate elasticities of demand with respect to those characteristics.
[41] Competition Commission (2008).

Varkevisser and Schut (2009) argue that disaggregating the product market may improve EH results, although distortions from other types of patient heterogeneity will still remain.

Another criticism of the EH approach is the backward-looking nature of this test, which might pose a problem in the context of a competition case that is forward-looking in nature. However, the test can be used where the investigation focuses on historical events such as antitrust investigations.

Overall, although the earlier methods may suffer from some conceptual drawbacks (in terms of arbitrary cut-off points and not explicitly taking into account the heterogeneity of patients and hospitals), it appears that the problems associated with the methods can be mitigated or resolved.

4.3.2 Complexity of application
As a general rule, all the 'classical' and 'other' non-formal techniques for market definition are relatively simple to understand and to apply, and appear feasible even in the Phase 1 investigation.

4.3.3 Data requirements
All three methods have moderate data requirements. The kind of data necessary for the isochrone analysis and (in part) CL and EH should be held by merging hospitals, and may therefore be accessible in the context of mergers. In the context of other investigations, the relevant data may be obtained through a survey. In cases where patient contact details are known, specific patients may be targeted. Where the contact details of the patients are unknown, an alternative would be to conduct a nationwide telephone, online or postal survey, targeting PH patients who have recently undergone private treatment.

The data on patient flows to hospitals other than those assumed to constitute a geographical market—as is required in the EH and CL contestable postcode approach—may be more difficult to obtain, since it may require discharge data from third-party hospitals or PMI providers. For CL, an alternative source of information on likely patient diversions could come from approaching patients directly by means of a survey. This may be an expensive exercise, however, because the contact information of specific patients is not available in the UK. A national survey may need to be carried out to obtain the data (with a low expected response rate, since PH patients who have recently undergone treatment would need to be identified). In a limited range of cases it may also be possible to survey patients directly outside hospitals.

4.3.4 Suitability for the UK market
Fixed-radius and isochrone techniques have previously been used in the UK in the context of merger cases. For example, in *GHG/Abbey*, the OFT used an isochrone of 30 minutes around each merging hospital to determine the local areas in which the merging parties were likely to be rivals. That analysis did not identify any reasons why the techniques could not be applied in the UK.

The prevalence of PMI and GP referrals in the UK (leading to a lack of patient response to changes in prices of treatments, and the 'payer problem') can be seen as potential barriers to the application of the CL analysis and EH test to the UK. For the CL analysis, this problem can be overcome by using other dimensions such as quality of service, and waiting times can be hypothetically flexed to gauge the likely reaction of patients in an alternative to a hypothetical price rise. However, flexing dimensions other than price leads to further questions around the appropriate degree of flexing to approximate a 5% price rise, whether the dimension being flexed is actually important to consumers, and whether flexing non-price dimensions is realistic—ie, whether a hospital faced with reduced competition would be expected to flex quality or waiting times, or would simply negotiate a more lucrative deal with PMI providers. In principle, this quality-driven interpretation of patient flows to hospitals may also be applied to EH, albeit with the same methodological issues. Despite these

improvements, none of basic methods can capture the second component of the 'payer problem'—the price competition between hospitals and PMI providers.

4.3.5 Established case practice

As summarised in Table 3.1 in Appendix 3, all of the early techniques (EH, CL and isochrones) have been used in courts for contested mergers. CL and isochrones are also standard techniques that have been used in other industries in a variety of contexts.[42]

4.4 More recent techniques for geographic market definition

This section assesses the more recent techniques for geographic market definition against the five criteria set out in section 4.2.

4.4.1 Theoretical underpinnings

All four MSM models—time elasticity, willingness to pay, the structural MSM model, and competitor share—deliver large theoretical benefits by capturing the underlying characteristics of the PH markets to a greater extent than the earlier techniques. In particular, by reflecting the heterogeneity in sizes of geographic markets for hospitals, these models deliver results consistent with the recent empirical finding that geographic markets in urban areas can be very narrow (eg, Dafny, 2009).

The time-elasticity and willingness-to-pay approaches recognise that patients do not pay for treatment directly, but pay for it through their PMI. The willingness-to-pay approach also has the significant advantage of reflecting the option demand nature of the market in circumstances where PMI providers are able to undertake selective contracting.[43] However, both approaches are sensitive to the underlying assumptions. The results of the time-elasticity approach are fairly sensitive to the assumption about the relationship between time elasticity and price elasticity, which is not well-established. In the willingness-to-pay analysis, it is necessary to define the counterfactual choices that PMI providers would have made in a scenario in which a hospital was dropped from a network, which makes this method difficult to apply in practice and vulnerable to challenge.

The Gaynor–Vogt structural model and the competitor share approach both attempt to model more realistic competitive behaviour between private hospitals. The Gaynor–Vogt structural model recognises that hospitals operate in large chains, which has major implications for coordinated price-setting and for some of the diverted demand being captured by other members of the chain in case of a price increase. The benefits of the competitor share approach are more relevant to merger investigations, as this method is sensitive to the potential differences in market power that a set of hospitals might have over a particular insurer or for a specific treatment.

The disadvantage of both approaches is that they rely on the assumption that patients are price-sensitive to some extent. This is implausible in many contexts where PMI providers are unable to channel patients to hospitals, and difficult to implement in empirical studies due to data constraints.

The GP-centred radii approach, although used in empirical research on the UK hospital market, is not a formal market definition technique and has not been explored in the literature to any great extent. Conceptually, defining markets based on GP-centred radii that capture the overwhelming majority of referrals in the practice does not have clear economic foundations. However, recent survey evidence shows that patients are often not aware of the

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[42] See footnote 10 for examples of the use of isochrones in a variety of retail contexts. For examples of the use of CL, see Niels, Jenkins and Kavanagh (2011), chapter 2.

[43] The extent to which this assumption is an advantage depends on the structure of the market. If the assumption mirrors the actual structure of the market of interest, it can be a significant advantage, although in cases without selective hospital contracting the willingness-to-pay model structure may result in significant distortions.

prices of treatments, and do not have sufficient information about the availability and quality of the treatments available to them.[44] Patients therefore often rely on their GPs when making a choice of hospital. The breakdown of referral patterns by treatment captures indirectly, albeit imperfectly, the heterogeneity of patients' travel preferences across treatments and may alleviate (but not fully resolve) the 'silent majority fallacy' problem for patient flow-based approaches. Furthermore, constructing hospitals' catchment areas practice by practice can directly identify areas where two hospitals of interest are directly competing for patients or GP referrals. Additional empirical evidence on this approach would be desirable in order to explore whether it can provide an alternative to the other four, more complex, techniques.

Overall, all five methods build on the earlier approaches in that they aim to capture specific characteristics of the market for PH such as patient and hospital heterogeneity, the lack of price sensitivity of PMI-funded patients, and the fact that GPs may have a role in a patient's choice of hospital. However, none of these approaches successfully incorporates all of the characteristics of the market.

4.4.2 Complexity of application

In contrast to the earlier methods used to define the geographical market, the four MSM approaches are very complex, requiring substantial data collection, cleaning and analysis, as well as specialist econometric skills to calculate and interpret the results. These approaches define geographic markets by comparing the simulated effects of hypothetical mergers between subsets of hospitals, which can quickly become cumbersome when considering large numbers of hospitals or many hypothesised markets at once. As a result, these methods are likely to be appropriate only in the case of in-depth targeted investigations.

In comparison with the MSM approaches, the GP-centred radii method is more feasible to implement. Calculating referral radii for each GP practice and treatment group and constructing the catchment areas for each hospital require considerable data analysis and aggregation, but this procedure is not theoretically complex.

4.4.3 Data requirement

All the approaches are data-intensive and require substantial amounts of detailed information on individual patients (age, gender, diagnosis, location in relation to the hospital) and hospital characteristics (quality, teaching status). Unlike in the USA and the Netherlands, where this approach has been applied, the UK authorities do not collect this data for patients receiving treatment in private hospitals. The data requirement to estimate the model exceeds the samples that can be achieved using surveys; the time-elasticity analysis used in the NMa investigation of the *Hiversum–Gooi-Noord* (2005) merger used a national database of over 800,000 patients, although academic research has been carried out on samples with as few as 5,400 patients (NMa 2005; Varkevisser et al., 2010). If available, however, data from a large PMI may be sufficient for time-elasticity regressions, and there is precedent of PMI data being used in academic time-elasticity research in the Netherlands (Varkevisser et al., 2010).

In addition to individual patients' data, some of the more recent approaches require data on hospitals and the overall market. For example, the willingness-to-pay approach requires detailed data on insurer network coverage, as well as data on the profitability of all hospitals in the area of interest. Hospital profit data, disaggregated by insurer, is difficult to obtain (especially for third-party hospitals in the affected area). The Gaynor–Vogt structural model requires detailed price, profitability and cost data across a range of hospitals, which is unlikely to be available with sufficient breadth and granularity. The competitor share approach requires highly granular prices on specific treatments set by each hospital for each specific PMI provider. Considering that remuneration agreements between hospitals and PMI providers in the UK appear to be a mix of granular and per-day rates, these prices may not exist. Even if they do, third-party hospitals in the investigated area and PMI providers would have little incentive to disclose them. As a result, this method is unlikely to be feasible.

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[44] The Opinion Leader (2011); GHK (2011).

The GP-centred radii approach requires data on private referrals, which is not centrally collected in the UK. However, given that detailed data is available on NHS referrals, this may be used to infer the distance for private referrals. This would depend on the assumption that the distance to which GPs tend to refer does not differ between private and public referrals. NHS referral data can be used to construct a radius containing an effective choice set for patients in the area (because GPs play a very large role in selecting consultants). This may help to circumvent a lack of availability of patient data.

Overall, all the more recent methods have high informational requirements. For some methods—GP-centred radii and time elasticity—it may be possible to collect the required data, but such an exercise would be expensive and time-consuming, and might require the involvement of third parties with limited incentive to disclose. For other methods, such as the Gaynor–Vogt competitor share approach and, even more so, willingness to pay, the data might not be feasible to collect in the UK.

4.4.4 Suitability for the UK market

In light of the majority of PH patients in the UK being PMI-funded, the time-elasticity and willingness-to-pay approaches, which recognise that patients do not directly pay for their treatments, may be the most appropriate for the UK. The general price-less framework of the time-elasticity model can be very useful if an investigation requires NHS hospitals to be added into a patient's choice set to study the competitive constraint from the public sector. On the other hand, the benefit of the willingness-to-pay approach is that it is the only method to recognise explicitly the PMI provider–hospital bargaining aspect of competition. This aspect is particularly relevant in the UK, where the majority of private patients have PMI. However, it does require insurer networks be to viable even if they do not cover all available hospitals, which is not the case in the Netherlands. The UK appears to satisfy this assumption, but it is not clear whether the practice of restricted insurer networks is sufficiently widespread in the UK to be the main driving force of the competitive dynamics in the market.

For both the Gaynor–Vogt structural model and the competitor share model, the assumption of sensitivity of patients to treatment prices does not appear to be consistent with the fact that the majority of PH patients in the UK are PMI-funded. However, both models also have attractive features in relation to the UK market for PH. For example, the Gaynor–Vogt structural model has the advantage of explicitly modelling the effects on competition of the large hospital chains, which are a significant feature of the UK hospital market (eg, findings in Office of Fair Trading (2010), Competition Commission (2000) and the current OFT market study). The disadvantage of both models is that they require extensive granular input data, which is not centrally collected in the UK.

The benefit of the GP-centred radii method is that it captures the crucial role that GPs play in the choice of consultants and hospitals in the UK.[45] Relying solely on the GP data, however, does not take into account the fact that a consultant can treat a particular patient in any of a number of hospitals where they practise, although recent evidence indicates that the majority of consultants treat patients in the hospital where the first consultation occurs.[46] The GP-centred radii technique may not be as suitable for self-pay patients, some of whom might play a more active role in choosing their hospital and consultant, or might approach consultants directly without referral. However, this approach has not been considered to a great extent in the literature since the UK is unique with regard to the role of the GP in the selection of consultants and hospitals. Given the potential importance of this method for the UK, it would be interesting to examine this analysis in more detail empirically by way of a survey. This would determine whether the method could offer a suitable alternative to the other, more complex methods.

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[45] The Opinion Leader (2011), pp. 20 and 42.

[46] GHK (2011), pp. 53–4.

4.4.5 Established case practice

In general, there is limited precedent for the more recent geographic market definition methods being tested in practice.

On occasion, methods broadly similar to time-elasticity analysis have been used in competition investigations—eg, in the Netherlands (NMa, 2005). Outside hospital markets, MSMs similar to the Gaynor–Vogt approach have been used in some competition investigations (eg, Volvo-Scania),[47] but this does not provide sufficiently robust precedent since the MSMs have been adapted significantly to be suitable for markets.

There is also no established case practice of using GP radii in competition investigations.

4.5 Other techniques to measure aspects of hospital competition

Given the importance of referrals to a specific consultant and the tendency of consultants to treat patients in hospitals where they are first seen for an appointment, and tendency to treat from one main facility, it may be appropriate in the UK to consider geographic market definitions based on consultants' willingness to travel. This can be captured using the physician-based radii approach discussed in section 3, or physician-based isochrones. In either case, a radius of a particular distance or travel time can be constructed around consultants' primary NHS hospitals, to measure their willingness to travel to private hospitals. Using the radii and data on NHS hospital locations, a 'pool' of consultants available to each hospital in the area can be calculated. Moreover, this can identify the extent to which hospitals of interest compete for consultants or, for example, appear to be 'locked out' of providing a particular type of care owing to the unavailability of relevant specialists.

This approach, like most radii, is relatively simple and does not have firm theoretical foundations. Nonetheless, it provides valuable insights into one of the main steps of the UK private patient's journey, and is relatively straightforward to implement in the UK, especially in narrower inquiries. This is because the method requires limited data: the locations of NHS hospitals, lists of consultants in each hospital, and lists of consultants practising in all private hospitals in the area. An estimated willingness-to-travel radius is also needed, which can be estimated by means of a survey. There is also some established precedent from the UK competition investigations for looking at consultants' working patterns, although not specifically in terms of willingness to travel. For example, in the BUPA–CHG investigation, the CC estimated the hospital's 'share' of the consultant market by calculating, for all consultants employed by each hospital, what proportion of their treatment was carried out in the hospital of interest instead of in its competitors in which the same consultants also practised (Competition Commission, 2000).

4.6 Conclusions and recommendations

This section presents a table that allows a simple, high-level comparison of the different techniques and how they perform against the criteria set out in section 4.2. Based on the analysis in sections 4.3–4.5, a number of recommendations are then made.

Overall, the comparative assessment of the techniques reveals that there is a trade-off between theoretical soundness and the feasibility of applying a technique in practice. As can be seen from Table 4.1, there is no single technique that scores highly on every one of the suitability criteria set out in section 4.2. The earlier techniques tend to score less on the theoretical underpinnings but more on ease of application, data requirements, and established case practice. The more recent techniques tend to score more on the theoretical underpinnings but less on the other criteria.

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[47] European Commission (2000).

Table 4.1 Assessment of techniques in the context of the UK PH market[1]

Technique	Theoretical soundness	Not complex	Data available in the UK	Established case practice	Conceptual suitability for the UK
Isochrone	✗	✓✓	✓	✓	✓
GP-radii	✗	✓✓	✓[2]	✗	✓
Consultant isochrone	✗	✓✓	✓	✗	✓
Elzinga–Hogarty	✗	✓	✓/✗[3]	✓✓	✗
Critical loss	✓	✓	✓[4]	✓✓	✓/✗[5]
Time elasticity	✓	✗	✓/✗[3]	✓	✓
Willingness to pay	✓✓	✗✗	✗✗	✗	✓
Competitor share	✓	✗	✗✗	✗	✗
Gaynor–Vogt	✓✓	✗✗	✗✗	✗	✓

Note: [1] The scores for each criterion range from ✓✓ (ideal fit) to ✗✗ (major failings identified). [2] Data on NHS GP referrals is publicly available and could be used as a proxy (if it is established that NHS and private referral patterns are similar); alternatively, direct GP surveys may be an option. [3] In principle, the patient-level data required for the time-elasticity analysis and calculation of patient outflows in EH can be held by PMI providers, although access to it may be restricted in many circumstances. [4] The contested zip code CL approach requires similar data on patient outflows to EH, and is therefore equally difficult to implement; survey-based estimates of actual loss may be more feasible to obtain. [5] The standard CL analysis using 5% price increases is not conceptually suitable in the UK due to the prevalence of price-insensitive insured patients; however, time- or quality-based alternatives may be more applicable.

Based on this critical review of the literature and merger cases, the following conclusions can be drawn.

1) Advanced techniques based on merger simulation are likely to be useful in the UK only in rare cases, where data availability is very good and the competition authority has the resources/capacity and time to undertake advanced analysis.

2) In light of the conceptual appeal of the more complex techniques and the fact that the current level of data does not allow for their application, it may be desirable to put in place measures that encourage the recording and storage of the data required for these more advanced techniques, so that they could be used in competition cases.

3) Earlier techniques are appropriate in many circumstances where the time or budget available for analysis is more limited and where information is unobtainable. If the techniques are applied in the right way, it is possible to avoid, or at least mitigate, the concerns levelled at these techniques in the academic literature.

4) Within the set of earlier techniques, Elzinga–Hogarty and critical loss are likely to be less appropriate than isochrone-type measures based on catchment area analysis. In the case of Elzinga–Hogarty, the lack of a central data source of patient locations and treatment makes its application more difficult in the UK than in some other countries. Therefore, the additional benefit from applying this technique compared with the isochrone-type measures (in terms of increased precision) may be outweighed by the burden of the additional data requirements. In the case of critical loss, the insurance-based model in the UK creates a fundamental hurdle (as patients are not price-sensitive) that is unlikely to be fully overcome. In cases involving PH facilities where there are fewer PMI-funded patients—such as those specialising in elective cosmetic surgery—critical loss would be more appropriate.

5) When applying catchment area (isochrone or fixed-radius) techniques, the issues raised above should be borne in mind. As far as possible, it may be sensible to avoid

assessments that bundle together treatments or groups of patients with systemically different willingness to travel. Assessments should also take into account the potential heterogeneity of PH facilities, so it may be appropriate to apply different-sized isochrones to different types of PH facility.

6) As far as possible, given the significance of the impact of product market definition on geographic market definition, when applying the catchment area techniques, empirical analysis should be undertaken to examine the difference in travel times for patients undergoing different types of treatment included in the product bundle in order to prevent bundling together patients with different willingness to travel.

7) In the specific case of merger analysis, it might often be more appropriate to focus more directly on the likely competitive effects of the transaction rather than on precisely defining the market and calculating market shares. The local nature of competition makes the direct assessment of competitive effects in specific local areas attractive. Assessments that take into account the fact that demand is not symmetric around a PH facility should be used where possible, such as those that use postcode-based patient discharge data to build a topographic picture of demand for a particular PH facility.[48]

8) For Competition Act cases (those involving suspected abuse of dominance or anti-competitive agreements), this direct analysis is less likely to be appropriate. In such cases, it may be necessary for the OFT to form a more precise definition of the relevant market (although in some cases the OFT may be able to apply threshold tests to different candidate markets in order to establish that the relevant legal test is met).

9) In the case of market investigations, a precise market definition is less essential, but the nature of the analysis, which must cover many hundreds of local areas, means that a hospital-by-hospital analysis of local competition is unlikely to be useful or feasible.

10) The literature refers to, but does not explore in detail, some of the less common approaches, such as GP- and consultant-based radii, and only limited empirical evidence is available on these techniques. Given that the more advanced techniques appear to be less appropriate for the UK due to data availability issues, it may be desirable to explore these techniques empirically to determine whether they could provide a suitable alternative to the more complex methods used elsewhere.

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[48] See, for example, Office of Fair Trading (2008), 'Completed acquisition by Spire Healthcare Limited of Classic Hospitals Group Limited', para 20.

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A2 Summary of reviewed literature

Author	Title	Type of article[1]	Techniques discussed	Techniques used	Main relevant findings
Ashenfelter, Hosken, Vita and Weinberg (2011)	Retrospective Analysis of Hospital Mergers	Literature review	EH, critical loss, option demand (willingness to pay)	None	The article gives an overview of recent hospital merger challenges lost by the FTC, citing market definition and not-for-profit hospital defence as the main reasons. It also summarises two retrospective studies of the effects of the consummated mergers, which suggest that the markets defined by the EH test are too broad.
Baker (2001)	Measuring Competition in Health Care Markets	Analytical paper	Geographical boundaries, fixed-radius, EH	None	The study reviews key issues and data sources of hospital competition measurement in the USA for researchers and policy-makers. Data scarcity, careful product and geographic market definitions and regard for endogeneity in econometric studies are identified as the main problems for competition studies.
Blackstone and Fuhr (1992)	An Antitrust Analysis on Non-Profit Hospital Mergers	Analytical paper	None	None	The paper presents four qualitative case studies of contested not-for-profit hospital mergers in the USA, concluding that the relevant geographic market for the mergers depends on the level of care: small local markets for simple hospital care and significantly wider markets for complex operations. It also finds that not-for-profit status, by itself, does not change the effects on competition of hospital mergers.
Canoy and Sauter (2009)	Hospital mergers and the public interest: Recent developments in the Netherlands	Analytical paper	None	None	The paper discusses the experience of hospital mergers in the Netherlands, focusing on issues of market definition, vertical integration and efficiency defence. The authors criticise the competition authorities for failure to define robustly geographic markets in past mergers and welcome development of more robust structural market definition approaches.

Author	Title	Type of article[1]	Techniques discussed	Techniques used	Main relevant findings
Capps and Dranove (2004)	Hospital consolidation and negotiated PPO prices	Ex post merger study	None	Hospital HHI	The paper studies confidential data from hospitals' contracts with preferred provider organisations to identify the effects of recent US hospital mergers on prices. It finds that, in most cases, consolidation enabled hospitals to increase prices.
Capps, Dranove and Satterthwaite (2003)	Competition and Market Power in Option Demand Markets	New technique	Option demand (willingness to pay)	Option demand (willingness to pay)	The authors develop a new willingness-to-pay approach to defining geographic markets for hospital care, where the price-sensitive decision-makers are often insurers, not individual patients. The new measure is then applied to hospitals in the San Diego area, suggesting that in some cases suburbs with as few as two to three hospitals may be a well-defined market.
Capps, Dranove, Greenstein and Satterthwaite (2001)	The silent majority fallacy of the Elzinga–Hogarty criteria: a critique and new approach to analyzing hospital mergers	New technique	EH, competitor share, time elasticity	Competitor share, time elasticity	The paper articulates one of the main theoretical challenges to the EH test: the 'silent majority fallacy'. It proceeds to develop two alternative market definition approaches for contexts when both patients and hospitals are heterogeneous. Merger simulations using the two new approaches show that the silent majority fallacy can lead the EH test to significantly overstate geographic markets.
Capps, Dranove, Greenstein and Satterthwaite (2002)	Antitrust policy and hospital mergers: recommendations for a new approach	Empirical study	Competitor share, time elasticity, option demand (willingness to pay)	Competitor share, time elasticity, option demand (willingness to pay)	The paper provides an overview of the three new methodologies to market definition in mergers—time-elasticity, competitor share and option demand approaches—and illustrates all three by providing simulation results for hypothetical mergers of San Diego hospitals. Simulations using all three approaches produce very similar qualitative predictions and identify local geographic markets in San Diego suburbs.
Connor, Feldman and Dowd (1998)	The Effects of Market Concentration and Horizontal Mergers on Hospital Costs and Prices	Ex post merger study	None	Geographical boundaries	The study investigates the effects of market concentration and hospital mergers on hospital costs and prices. Overall, hospital mergers are found to reduce hospital costs and, in turn, lower prices to customers. There is some evidence that price reductions are smaller in more concentrated markets.

Author	Title	Type of article[1]	Techniques discussed	Techniques used	Main relevant findings
Cooper, Gibbons, Jones and McGuire (2010)	Does hospital competition save lives? Evidence from the English NHS patient choice reforms	Empirical study	Fixed-radius, isochrones, EH, GP-centred radii	GP-centred radii	NHS reforms introduced in 2006 have meant that public hospitals had to compete for patients (largely on the basis of published quality metrics) while the prices were set. The authors use this as a natural experiment to examine the effect of competition on the quality of care in the UK, finding that, in this fixed-price setting, hospital competition appears to improve patient outcomes.
Dafny (2009)	Estimation and Identification of Merger Effects: An Application to Hospital Mergers	Empirical study	Option demand (willingness to pay), fully structural approach	None	The study explores the impact of a hospital's rivals merging on that hospital's price, using rivals' co-location as an instrument. A merger by nearby rivals is found to lead hospitals to increase prices by as much as 40%. The findings suggest that markets for hospital care are very local, far smaller than those typically considered in courts and similar in size to predictions of the new merger simulation models.
Dranove and White (1994)	Recent Theory and Evidence on Competition in Hospital Markets	Literature review	Fixed-radius, EH, hospital HHI	None	The paper reviews the theoretical literature on competition under imperfect information to define the nature of hospital competition and offers empirical evidence on the extent to which hospitals can comply with the predictions of traditional IO literature on competition. Both for-profit and not-for-profit hospitals are considered.
Elzinga and Swisher (2011)	Limits of the Elzinga–Hogarty Test in Hospital Mergers	Analytical paper	EH	None	This paper discusses the main methodological problems in applying the EH test in the hospital merger context, focusing on its failure to reflect heterogeneity and price-insensitivity of hospital patients. It also examines *FTC v. Evanston* (2007), in which the courts concluded that the EH test was not applicable to hospital markets.
Farrell, Pautler and Vita (2009)	Economics at the FTC: Retrospective Merger Analysis with a Focus on Hospitals	Literature review	None	None	The article summarises the findings of three ex post studies that explore the effects of mergers. This research confirms that mergers between not-for-profit hospitals can have anti-competitive effects and shows that geographical markets for hospital care are more localised than suggested by approaches traditionally used in courts.

Author	Title	Type of article[1]	Techniques discussed	Techniques used	Main relevant findings
Gaynor and Vogt (1999)	Antitrust and competition in health care markets	Literature review	Geographical boundaries, fixed-radius, EH, fully structural approach	None	The paper summarises the main issues in the healthcare competition, the related case law and empirical research published up to1999. It highlights how optimality of competition is affected by ways in which healthcare is different from other industries. Based on the identified differences, the authors outline a new structural approach to evaluating the effects of hospital mergers.
Gaynor and Vogt (2003)	Competition among Hospitals	New technique	Fully structural approach	Fully structural approach	The authors propose a fully structural approach to modelling the demand and supply sides of competition between hospitals. This model is developed to explore the effect of ownership type on hospital conduct and to define geographical markets in hospital care more accurately. The new model is also used to simulate mergers among Californian hospitals, identifying some firms whose consolidation creates significant local market power.
Gaynor and Town (2011)	Competition in healthcare markets	Literature review	Fully structural approach, option demand (willingness to pay), hospital HHI	None	The paper reviews empirical and theoretical literature on markets for healthcare services produced between 2000 and 2011. It summarises the main empirical findings on the effects of competition in healthcare services and presents key theoretical models that best describe the option demand nature of US hospital markets.
Gaynor, Kleiner, and Vogt (2011)	A Structural Approach to Market Definition with an Application to the Hospital Industry	Empirical study	EH, critical loss, option demand (willingness to pay), fully structural approach	EH, critical loss, option demand (willingness to pay), fully structural approach	The paper describes the structural approach to hospital market definition developed by Gaynor and Vogt (2003) and compares its predictions to traditional approaches used in courts and to the willingness-to-pay model. Both advanced merger simulation methods are found to deliver very similar market structure predictions. Critical loss analysis and EH, however, are found to significantly overstate the size of geographic markets.

Author	Title	Type of article[1]	Techniques discussed	Techniques used	Main relevant findings
Kemp and Severijnen (2010)	Price effects of Dutch hospital mergers. An ex-post assessment of hip surgery	Ex post merger study	EH, critical loss	None	The study examines the effects of two hospital mergers in the Netherlands on the price of hip surgery and patients' travel patterns. It finds statistically significant price increases after the Ziekenhuis Hilversum–Ziekenhuis Gooi-Noord merger, which was originally delayed by the NMa due to failing the EH test, but cleared upon further investigation. The study also finds that patients may have overstated their willingness to travel in response to price increases in the revealed preference study conducted as part of the merger investigation.
Meghrigian (2003)	Physician product and geographic market definition	Analytical paper	None	None	The paper does not analyse specific market definition techniques. Instead, it argues for a lenient antitrust approach to physicians, because their bargaining position vis-à-vis healthcare insurance providers is said to be very weak.
Morrisey, Sloan and Valvona, J. (1988)	Defining Geographic Markets for Hospital Care	Empirical study	Fixed-radius, geographical boundaries, EH	EH	The authors apply the EH approach to define geographic markets in hospital care. They find that hospital markets for both rural and urban hospitals are much larger and less concentrated than implied in earlier studies. On this basis, the authors conclude that antitrust concerns in hospital mergers are far less likely than conventionally believed.
O'Brien and Wickelgren (2003)	A Critical Analysis of Critical Loss Analysis	Analytical paper	Critical loss	None	The authors use a series of theoretical arguments to criticise the standard applications of the critical loss analysis in courts. The main criticisms relate to the internal inconsistency of accepting large estimated losses for high-margin firms and the failure to consider cross-price elasticities.
Simpson (2001)	Geographic markets in hospital mergers: a case study	Ex post merger study	Critical loss (contestable zip code approach)	Critical loss (contestable zip code approach)	The paper investigates the assumption often made by courts in the critical loss test that patients in 'contestable' zip codes would switch to other hospitals after a price increase. Using the acquisition of Community Hospital in 1990, the author finds that in all but one area that the court would have deemed contestable for the purposes of the critical loss test, the market shares declined very little as a result of price increases after the merger.

Author	Title	Type of article[1]	Techniques discussed	Techniques used	Main relevant findings
Sorensen (2003)	Insurer–hospital bargaining: Negotiated discounts in post-deregulated Connecticut	Empirical study	None	None	The paper finds that the ability of insurance providers to obtain discounts from hospitals depends on their ability to channel patients to other hospitals, and on their size. Seen from another perspective, this ability also influences the scope for hospitals to raise prices. Hospitals can raise prices more easily when insurance providers are not able to channel patients to other hospitals.
Town and Vistnes (2001)	Hospital competition in HMO networks	New technique	Option demand	Option demand	The authors develop an empirical framework that models competition between hospitals and insurers, and examines the effects of insurers' selective networks on hospital prices. The hypothetical merger simulations in the study suggest that mergers between neighbouring and closely substitutable hospitals can lead to significant price increases, even in urban settings where there are many other nearby hospitals.
US Federal Trade Commission and Department of Justice (2004)	Improving Health Care: A Dose of Competition: A Report by the Federal Trade Commission and the Department of Justice	Analytical paper	EH, critical loss, option demand, isochrones	None	The report provides an in-depth overview of the structure of the US health industry and its implications for competition law. The experiences of antitrust authorities in challenging historical mergers, and specifically the major role played by market definition, are discussed in detail.
Varkevisser, Capps and Schut (2008)	Defining hospital markets for antitrust enforcement: new approaches and their applicability to the Netherlands	Analytical paper	EH, critical loss, competitor share, time elasticity, option demand (willingness to pay)	None	Time-elasticity, competitor share and option demand approaches are the main formal market definition techniques that were developed to address theoretical failings of the existing methodology. The applicability of an advanced approach is found to critically depend on the specifics of the market structure: how patients choose hospitals and how hospitals contract with insurers.

Author	Title	Type of article[1]	Techniques discussed	Techniques used	Main relevant findings
Varkevisser and Schut (2009)	Hospital merger control: An international comparison	Analytical paper	EH, critical loss, isochrones	None	The article describes the current practices and legal precedents for private hospital merger control in the USA, Germany and the Netherlands. It also presents case studies of a landmark merger case for each country. The main findings of the international comparison are that geographic market definition is a key vulnerability for merger challenges, and that geographic markets for hospital care are small in practice.
Varkevisser and van der Geest (2006)	Why do patients bypass the nearest hospital? An empirical analysis for orthopaedic care and neurosurgery in the Netherlands	Empirical study	None	None	Many Dutch patients bypass their nearest hospitals. The choice to travel beyond the nearest hospital depends on travel time and hospital quality. Patients are found to have lower aversion to extra travel time for complex treatments. The study concludes that both patient and hospital heterogeneity should be taken into account when assessing hospital substitutability.
Varkevisser, van der Geest, and Schut (2010)	Assessing hospital competition when prices don't matter to patients: the use of time-elasticities	Empirical study	Time elasticity	Time elasticity	The time-elasticity approach is applied to the Dutch hospital markets using a dataset from a large insurer. The paper explores factors that affect hospital choices and simulates the effects of artificial increases in travel times. Overall, all hospitals' time elasticities are found to be high, suggesting the existence of at least one close substitute for each.
Vogt and Town (2006)	How has hospital consolidation affected the price and quality of hospital care?	Literature review	Time elasticity, competitor share and option demand	None	The paper provides a summary of the research on hospital consolidation to assess the likely effects of hospital mergers on healthcare prices, costs and quality. Overall, hospital mergers are found to increase prices by 5% or more, with competitors raising prices as well as the merging parties. The findings regarding mergers' effects on quality and costs are inconclusive.
Zwanziger, Melnick, and Eyre (1994)	Hospitals and antitrust: defining markets, setting standards	New technique	Geographical boundaries, EH, hospital HHI	None	The authors propose a highly disaggregated approach to defining the product market, based on physician specialties. The corresponding geographic markets are defined by constructing a weighted HHI using patient flow data. The article also argues that in the context of selective insurer networks, the markets for hospitals are very local in nature.

Note: [1] The broad types of papers identified in the table are defined as follows: 'literature reviews' primarily provide a broad overview of articles on a particular topic; 'ex post merger studies' investigate effects of actual mergers, primarily using standard econometric techniques; 'empirical studies' include all other quantitative studies on competition in hospital markets; 'new technique' articles introduce and test new market definition techniques; and 'analytical papers' cover all other types of qualitative or theoretical discussions of hospital mergers or broader issues in healthcare markets.

A3   Summary of reviewed cases

Table A3.1   Market definition precedents in hospital mergers and acquisitions[1]

Case	Year	Country	Methods used to define geographic markets		Relevance of market definition to outcome	Merger outcome
			Competition authority	**Hospitals**		
GHG–Abbey[2]	2010	UK	Isochrones	Isochrones	Medium: Market definition was undertaken by the OFT and was not challenged	Cleared by the OFT subject to undertakings
			Patient catchment areas	Patient catchment areas		
Inova[3] *FTC et al v. Inova Health System Foundation et al*	2008	USA	EH	No information	Medium: Market definition was undertaken by the FTC and was not challenged	Hospitals withdrew from the merger after the FTC injunction
Spire–CHG[4]	2008	UK	Isochrones	Patient catchment areas	Medium: Market definition was undertaken by the OFT and was not challenged	Cleared by the OFT
			Patient catchment areas			
GHG–Nuffield[5]	2008	UK	Isochrones	Isochrones	Medium: Market definition was undertaken by the OFT and was not challenged	Cleared by the OFT
Evanston *FTC v. Evanston Northwestern*[3]	2007	USA	Observed post-merger price increases	Patient catchment areas Isochrones	Low: Evidence of substantial lessening of competition after the merger; use of EH explicitly rejected	Ex post merger challenge by FTC upheld by the court
Ziekenhuis Hilversum and Ziekenhuis Gooi-Noord[6]	2005	Netherlands	EH Time-elasticity approach	No information	High: Merger cleared due to inconclusive evidence of the relevant geographic market	Cleared by the NMa after Phase 2 investigation
BUPA–CHG	2000	UK	Geographical borders Isochrones Fixed radii	Geographical borders Isochrones	Medium: Market definition was undertaken by the CC and was not challenged	Prohibited by the CC
Sutter *California v. Sutter Health System*	1999	USA	EH Critical loss	Critical loss	High: Merger cleared due to insufficient evidence of the relevant geographic market	Challenge to the merger overruled in court
Poplar Bluff *FTC v. Tenet Health Care Corp.*	1998	USA	EH	Critical loss	High: FTC found to have failed to identify the relevant geographic market	Challenge to the merger overruled in court

Case	Year	Country	Methods used to define geographic markets		Relevance of market definition to outcome	Merger outcome
Long Island *US v. Long Island Jewish Medical Center*	1997	USA	Insurer testimonies	Patient catchment areas	High: DOJ found to have failed to identify the relevant product and geographic market	Challenge to the merger overruled in court
Grand Rapids *FTC v. Butterworth Health Corp.*	1996	USA	EH	EH	Low: Not-for-profit merger defence	Challenge to the merger overruled in court
Dubuque *United States v. Mercy Health Services*	1995	USA	EH	Critical loss	High: DOJ found to have failed to identify the relevant product and geographic market	Challenge to the merger overruled in court
Joplin *FTC v. Freeman Hospital*	1995	USA	EH	EH	High: FTC found to have failed to identify the relevant geographic market	Challenge to the merger overruled in court
Ukiah *Adventist Health System/West*	1994	USA	EH	EH	High: FTC found to have failed to identify the relevant geographic market	Challenge to the merger overruled in court

Sources: [1] This table is an extended version of US-focused Table 2 in Gaynor, Kleiner and Vogt (2011), which is a source for all data unless stated otherwise. [2] Office of Fair Trading (2010). [3] Elzinga and Swisher (2011). [4] Office of Fair Trading (2008b). [5] Office of Fair Trading (2008a). [6] Varkevisser and Schut (2009). NMa (2005).

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