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# The Industrial Organization of Health-Care Markets[†]

Martin Gaynor, Kate Ho, and Robert J. Town*

*The U.S. health-care sector is large and growing—health-care spending in 2011 amounted to $2.7 trillion and 18 percent of GDP. Approximately half of health-care output is allocated via markets. In this paper, we analyze the industrial organization literature on health-care markets, focusing on the impact of competition on price, quality, and treatment decisions for health-care providers and health insurers. We conclude with a discussion of research opportunities for industrial organization economists, including opportunities created by the U.S. Patient Protection and Affordable Care Act.* (*JEL* J15, J24, J71, J81, K31)

## 1. *Introduction*

The U.S. health-care sector is large and growing—health care spending in 2011 amounted to $2.7 trillion and 18 percent of GDP (Hartman et al. 2013).[1] This makes the U.S. health sector the sixth largest "economy" in the world, just slightly behind France and ahead of Brazil, the United Kingdom, Italy, and Russia.[2] While total spending on health care is large, the industries that constitute the major components of this sector—hospital services, physician services, and health insurance—are each large in their own right. The hospital sector, at $850.6 billion, represents 5.6 percent of U.S. GDP, physician services constitute 3.6 percent, and health insurance is 1 percent.[3] This makes the hospital and physician sectors some of the largest industries in the U.S. economy, larger than construction (3.6 percent of GDP), mining and oil and gas extraction (1.95 percent), agriculture (1.37 percent), computer and electronic products

*Gaynor: Carnegie Mellon University, University of Bristol, and NBER; Ho: Columbia University, NBER, and CEPR; Town: University of Pennsylvania and NBER. We are grateful to editor Janet Currie for support and encouragement and to her and four anonymous referees for helpful comments that substantially improved the paper. This paper was written in large part while Gaynor was at the Federal Trade Commission. The views expressed here are those of the authors and do not necessarily represent those of the Federal Trade Commission or any individual Commissioner.

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[1] We note that health care is also a very substantial part of the economies of all developed economies, not just the United States.

[2] In 2011, U.S. GDP was $15 trillion; China, $7.3 trillion; Japan, $5.9 trillion; Germany, $3.6 trillion; France, $2.8 trillion; Brazil, $2.5 trillion; the United Kingdom, $2.4 trillion; Italy, $2.4 trillion; and Russia, $1.9 trillion. (Source: World Bank, http://databank.worldbank.org/data/views/reports/tableview.aspx).

[3] Health insurance is measured as the "net cost of health insurance," the difference between premiums collected and benefits paid in a calendar year (Hartman et al. 2013).

(1.29 percent), broadcasting and telecommunications (2.5 percent), automobile manufacturing (0.33 percent), or even breweries (0.11 percent).[4]

Obviously, any sector that constitutes nearly one-fifth of the U.S. economy is large enough to warrant extended and focused analysis. However, the significance of the health-care sector is not merely due to its size. The functioning of this sector has tremendous implications for the well-being of the population. A reduction in competitive vigor in health-care markets can result in substantially higher prices and higher medical expenditures. Further, even though consumers are typically heavily insured, the higher expenses associated with higher prices reduce consumer surplus. Employers pass through higher health-care costs dollar for dollar to workers, either by reducing wages or fringe benefits, or even dropping health insurance coverage entirely (see, e.g., Gruber 1994; Bhattacharya and Bundorf 2005; Baicker and Chandra 2006; Emanuel and Fuchs 2008).[5] Perhaps more importantly, the competitive environment affects the quality of care delivered by health-care organizations which, in turn, can have enormous impacts on the quality and length of life.

This paper focuses on the functioning of health-care markets for good reason—markets play a large role in the delivery of health care in many countries, and in the financing of care in the United States, the Netherlands, and Switzerland.[6] Despite its clear importance, the functioning of health-care markets has received relatively little attention in health policy spheres. In addition, markets have come to play an increasing role in the delivery of health care in other countries. In 2006 the English NHS introduced reforms designed to increase choice and competition for hospital care (Farrar et al. 2007). New NHS reforms have been enacted recently which seek to extend the role of markets and competition further (see http://www.kingsfund.org.uk/topics/nhs-reform). The Netherlands relies on private markets for health insurance and has been gradually deregulating markets for health care (Schäfer et al. 2010). Germany, Sweden, and Italy (Lombardy) all have some forms of decentralization designed to introduce markets and competition in health care (Dixon and Poteliakhoff 2012; Vrangbaek et al. 2012; Helderman, Bevan, and France 2012). As a consequence, the performance of markets can have large impacts on the overall performance of the health-care sectors in many countries.

There has been growing interest among economists in recent years in the industrial organization of health care markets. This is due in part to the growing prominence of health-care markets in policy issues, the increasing availability of rich datasets on health care, advances in economics methodology, and institutional changes that have led to a greater role and prominence for markets in health care. In the United States, the Patient Protection and Affordable Care Act (ACA) passed in 2010 has further increased the policy relevance of questions concerning interactions between medical providers and insurers. The U.S. reforms are built on the existing structure of U.S. health-care markets and attempt to leverage competition in some areas (for example between insurers competing on Health Insurance Exchanges), while encouraging certain kinds of consolidation in

[4] Source: Bureau of Economic Analysis, http://www.bea.gov/industry/gdpbyind_data.htm.

[5] Town et al. (2006) find that private insurance rolls declined by approximately 0.3 percentage points or approximately 695,000 lives in 2003 due to the effects of hospital mergers, with the vast majority of those who lost private insurance joining the ranks of the uninsured.

[6] Approximately one-half of health care in the United States is financed via private markets, about two-thirds in Switzerland, and about 85 percent in the Netherlands (Source: OECD Health Data 2012, http://www.oecd.org/health/health-systems/oecdhealthdata2012-frequentlyrequesteddata.htm).

others. In addition, they move towards substantial changes in provider incentives, raising questions about the interaction among market structure, incentives, and outcomes in this market. There are key policy roles for competition authorities, regulators, and policy designers in enabling and facilitating competition in health-care markets.

The paper proceeds as follows. We begin in section 2 by describing some key issues in the industrial organization of health care as a way of structuring our discussion of the literature. That section also mentions some interesting topics that, due to space constraints, we will not discuss. In section 3 we provide some informative descriptive statistics on provider and insurer market structure. We then discuss quality determination in section 4, price and network determination in health-care markets in section 5, health insurance premium setting in section 6, and plan choice in section 7. The economics of physician treatment and referral decisions are presented in section 8. In each of these sections we provide an in-depth review of the existing literature. We note that, in each section, there are promising areas for further research where there is currently little evidence, but where new data sources and empirical methodologies are becoming available. We conclude with a discussion of these research opportunities, focusing in particular on the U.S. health reforms.

## 2. *Key Issues in the Industrial Organization of Health Care*

Recent research on health-care markets has focused on the different ways in which interactions between firms affect variables that directly impact welfare. These variables include provider quality, prices, treatment decisions, and insurer premiums. An additional factor is the match between consumers and providers: are consumers who care about (or need) particular provider characteristics matched to providers with those characteristics? Interfirm interactions include horizontal competition (which may affect, for example, firms' investments in their quality) and also vertical interactions that might determine the prices paid to providers or the choice set of providers made available to particular consumers.

We structure our discussion of this literature around a multistage model of the market. In the first stage, providers (hospitals and physicians) make investments that determine their quality. In addition to being influenced by horizontal competition, these investments may be affected by demand-side factors such as the amount of information on quality that is provided to consumers and the amount of choice they are offered when they need medical care. In the second stage, given their quality levels, providers negotiate with insurers to determine insurers' provider networks and the prices paid to providers. This complex interaction has been analyzed in a growing number of papers; it has substantial implications for consumer welfare and for costs. Third, insurers choose their premiums to maximize their objective functions, taking into account their own characteristics and those of competing insurers. In the fourth stage consumers observe each insurer's provider network and other characteristics, including premiums, and choose their insurers. Finally, when the enrollment process is complete, some consumers get sick and utilize providers either from within their insurers' networks or (incurring a larger out-of-pocket payment) from outside the network.

Each stage of this model has an impact on the equilibrium outcome, and therefore on welfare. Clearly every stage is related to the others: optimal choices in one stage are functions of expectations regarding the rest. The stages are as follows.

1. Quality determination in provider markets

2. Price and network determination in provider markets

3. Premium determination in insurance markets

4. Consumer choice in insurance markets

5. Incentives and provider referral decisions/consumer utilization.

However, very few papers try to address more than one or two stages of the model, in part because of modeling issues (model complexity and the difficulty of identifying a complete model of all the stages), and in part due to lack of data required to estimate a complete model. Most instead focus on one of the stages. In what follows, we review the key papers on each topic and present a framework for thinking about the individual topics and the model as a whole.

In this review we focus on market models of price and quality determination. There are, of course, other important and interesting topics in the industrial organization of health-care markets, notably the economics of asymmetric information in these markets, pharmaceuticals, and medical devices. There have been a number of excellent reviews on asymmetric information in health care (McGuire 2000; Einav, Finkelstein, and Cullen 2010; Dranove 2012; Breyer, Bundorf, and Pauly 2012; Einav and Finkelstein 2011), and of the economics of pharmaceuticals (Scherer 2000; Berndt 2002; Scott Morton, and Kyle 2012). Given space constraints, we focus on the industrial organization of health care and health insurance markets. We explicitly focus on papers that speak directly to one of the five stages of the framework listed above. This is both of quantitative importance, given the size of this sector of the economy, and an area of rapidly growing research. We comment on the potential for incorporating asymmetric information into the IO modeling of health care in section 9.

## 3. *Provider and Insurer Market Structure*

In most developed economies, hospital and physician services comprise a large and growing component of GDP. The share of total expenditures accounted for by hospital and physician services and health insurance has grown substantially over the last thirty years. In 1980, hospitals, physicians, and health insurance[7] accounted for 3.6 percent, 1.7 percent, and 0.34 percent of GDP, respectively (Martin et al. 2011). By 2011, these numbers were 5.5 percent, 3.5 percent, and 1 percent, respectively. The total size of the hospital, physician, and insurance sectors nearly doubled over this twenty-nine year period, from 5.64 percent to 10 percent. The size of these industries and their long-run trends suggest that understanding their structure and performance is not only important for the performance of the health care industry, it is also important for understanding the economy as a whole.

### 3.1 *Hospitals*

While the hospital sector increased its importance in the economy, it simultaneously became more concentrated. In particular, a large hospital merger wave swept through the country during the 1990s, increasing the concentration of many hospital markets.[8] It was during this period that hospital systems, organizations comprised of multiple hospitals, became an important feature in the health-care landscape. This increase in concentration will likely persist and affect market outcomes for the foreseeable future.[9] Figure 1 displays the trends in

[7] Measured as the net cost of health insurance.

[8] There have been over 1,000 mergers in the U.S. hospital industry from 1994 to the present, with activity picking up in recent years (162 in 2010 and 2011).

[9] Because of their high entry- and fixed-cost structures, changes in market structure tend to persist over decades. Chung, Gaynor, and Richards-Shubik (2013) document that the impact of the Hill–Burton Act, which provided

the hospital Herfindahl–Hirschman Index (HHI), the number of within-market hospital mergers and acquisitions, and the percentage of the population enrolled in an HMO from 1990–2006.[10]

The message from figure 1 is that U.S. hospital markets are highly concentrated and have become even more concentrated over time. In 1987, the mean HHI was 2,340 and by 2006 the HHI is was 3,161—an increase of over 900 points.[11] In 1992, the mean hospital concentration levels (2,440) were (barely) below the recently updated federal merger guidelines' (Federal Trade Commission and Department of Justice 2010) cut-off point for classifying a market as "Highly Concentrated" (HHI $\geq$ 2,500), but by 2006, the mean concentration level (3,261) rose to well above this threshold. In 1990, approximately 65 percent of MSAs were classified as highly concentrated. By 2006 more than 77 percent fell into that category. Perhaps just as tellingly, the percentage of MSAs classified as unconcentrated (HHI $<$ 1,800) fell from 23 percent in 1990 to 11 percent in 2006.

Town et al. (2006) note that mergers and acquisitions are the primary reason for the increase in hospital concentration over this period. Figure 2 shows the distribution of concentration across MSAs in 1990 and 2006. Two features are apparent from the figure. First, most MSAs are highly concentrated. Second, points above the 45° line are MSAs that experienced an increase in concentration from 1990 to 2006. The figure illustrates clearly that there has been a large increase in concentration in the vast majority of geographic areas in the United States. By 2006, most health insurers had to negotiate with hospital systems in highly concentrated markets, which likely reduced their bargaining leverage.

An obvious question is what initiated this wave of hospital consolidation. Fuchs (1997) and others point to the rise of managed care as the principal factor driving this massive consolidation. Anecdotal evidence and a cursory glance at figure 1 are consistent with this hypothesis. The idea is that the rise of HMOs introduced aggressive price negotiations between hospitals and health plans, thereby giving hospitals a strong incentive to acquire bargaining power through consolidation. However, the empirical evidence investigating this causal link is mixed (e.g., Chernew 1995; Dranove, Simon, and White 2002; Town et al. 2007b). Park and Town (2014) argue that the expectations over the importance of HMOs drove this merger wave. They find that HMO exit, a measure of the exuberance of expectations regarding the demand for managed care in a location, is correlated with hospital consolidation.

### 3.2 *Physicians*

Physicians practice in a wide variety of organizational settings from single and paired independent practices, to multiphysician, multispecialty groups, to working as part of a large, integrated health system. The horizontal and vertical structures of these physician groups can affect both the process of care and the bargaining leverage of these groups. The complicated nature of these organizational structures makes measuring the market structure for physician services particularly challenging. Nonetheless, cross-sectional data measuring the basic types of organizations to which physicians

capital subsidizes to not-for-profit and public hospitals from 1948–1971, persists to this day.

[10] The HHI is the sum of squared market shares in the market. It is the most commonly used measure of market structure. We present population weighted averages for Metropolitan Statistical Areas (MSAs) based on admissions. We limit the sample of MSA to those with a population less than 3 million in 1990. We do this because it is likely that in MSAs with more than 3 million, there are multiple hospital markets and the HHI of that MSA is likely mismeasured.

[11] It is interesting that over roughly the same period of time, the nursing home industry did not see significant increases in market concentration, even though it was also subject to a number of mergers and acquisitions.

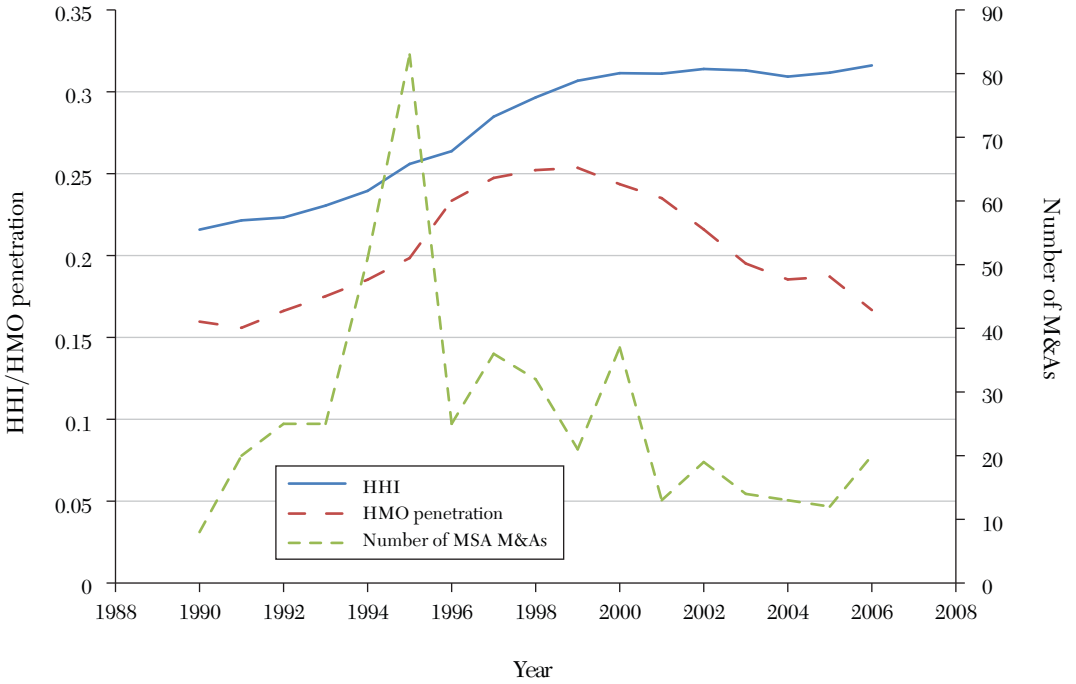


*Figure* 1. Trends in Hospital Concentration, M&A Activity, and HMO Penetration: 1990–2006

belong have been available for some time. Unfortunately, the representativeness and quality of these data varies. It is also unfortunate that, until recently, there were not good measures of the concentration of physician markets. Data collected by SK&A[12] and by IMS Health[13] have recently helped to fill this void. These data represent a large improvement over the alternative, although they are not perfect, and are sold by commercial entities and are thus rather expensive.

Physicians, on average, practice in small groups. According to a recent American Medical Association survey, 60 percent of physicians practice in groups with fewer than five physicians.[14] The same survey also documents that approximately 6 percent of physicians are in large practices (greater than fifty physicians).

The market for physician services is generally unconcentrated, but there is meaningful variation across geography. This is not surprising given the size distribution of physician practices. Dunn and Shapiro (2012) use SK&A data to link physicians to their practice groups. They find that during the 2005 to 2008 time frame, the mean HHI is 1,200 (SD = 1,100) and 1,000 (SD = 1,100) for cardiologists and orthopedists, respectively.[15]

[12] http://www.skainfo.com/database_finder.php?select=Physicians.

[13] http://www.imshealth.com/portal/site/imshealth.

[14] American Medical Association (2009).

[15] Dunn and Shapiro (2012) construct a "Fixed Travel Time HHI" which constructs the HHI accounting for geographic differentiation of physicians.

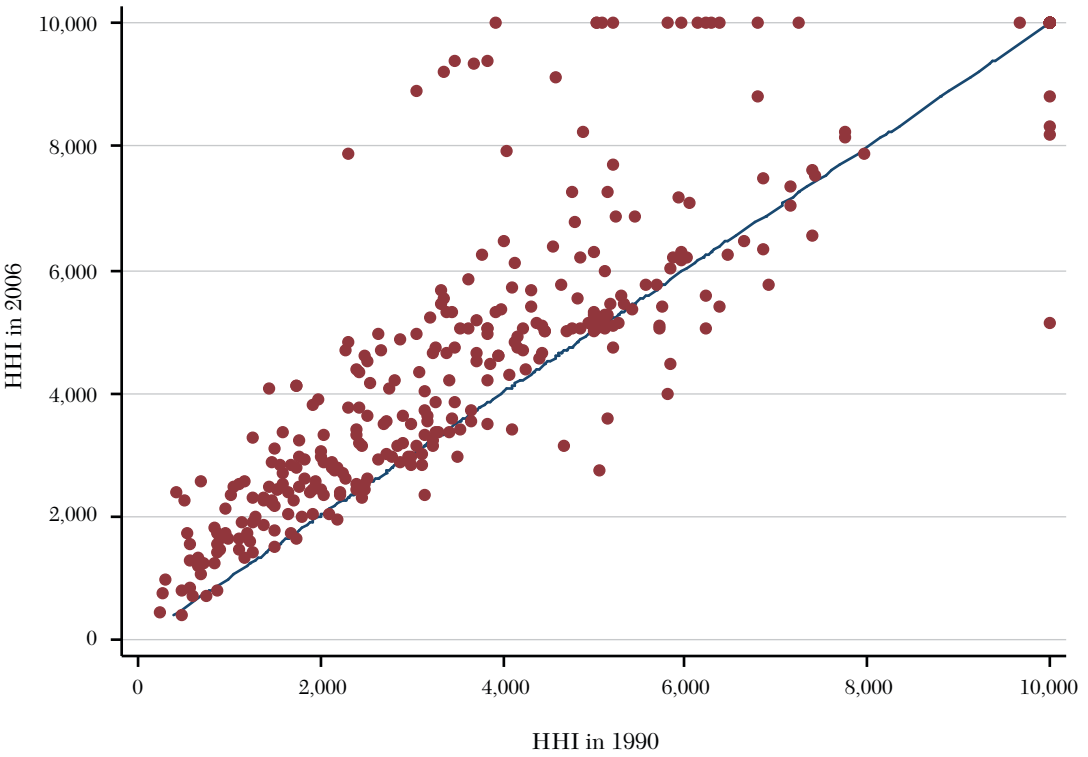


*Figure* 2. Scatterplot of MSA HHI in 1990 and HHI in 2006

10 percent of cardiology and orthopedic patients are treated in markets where the HHI is greater than 2,200. Entry into those specialties is more restricted than general practitioner physicians, and thus the market structure for general practitioners is presumably even less concentrated.

Kleiner, Lyons, and White (2012) construct measures of market share for a number of physician services markets using Medicare data. They find that the median market share (across all markets) for the two largest practices in a market is 33 percent for primary care, 49 percent for orthopedics, 57 percent for radiology, 58 percent for cardiology, and 72 percent for oncology. The median HHI across all areas is 761 for primary care, 1,751 for orthopedics, 2,190 for radiology, 2,370 for cardiology, and 3,606 for oncology. This shows a similar pattern to that found by Dunn and Shapiro (2012)—markets for specialists are fairly to highly concentrated. Kleiner, Lyons, and White (2012) find that primary care physician services markets, by contrast, are quite unconcentrated.

While these measures are quite helpful, they don't get at the complicated structure of organizational and contractual relationships that are prevalent in physician services markets. Understanding and measuring these structures is an important challenge for future research on this market.

### 3.3 *Health Insurers*

In general, health insurance markets in the United States appear to be relatively concentrated and are becoming more concentrated over time. Dafny, Duggan, and Ramanarayanan (2012), using data on the large employer segment of the insurance market, show increasing concentration in health insurance markets. They report that between 1998 and 2006, the mean HHI in their sample increased from 2,286 to 2,984, the median four firm concentration ratio increased from 79 to 90 percent, and the mean number of carriers per market fell from 18.9 to 9.6. They show that 78 percent of the markets they studied had increases in the HHI of 100 points or more from 2002 to 2006, and 53 percent experienced increases of 500 points or more. Dafny (2010) documents an increase in the percentage of markets with fewer than nine insurance carriers in the United States from 1998 to 2005, and a decrease in the percentage of markets with nine or more carriers.

A recent report by the U.S. Government Accountability Office (Government Accountability Office 2009) compiled information on the market structure of the small group health insurance market in the United States. Those markets also appear to be fairly heavily concentrated, and increasing in concentration. Schneider et al. (2008) utilize a unique source of survey data collected by a commercial entity for California to construct HHIs for insurance plans at the county level for 2001. They find an average insurance HHI for California counties of 2,592. They report that 21 percent of counties have HHIs below 1,800,[16] 55 percent had HHIs between 1,800 and 3,600, and 24 percent had HHIs above 3,600. The information from these various data sources seems broadly consistent.

The trend toward increasing concentration in health insurance markets is not limited to the United States. For example, health insurance markets in the Netherlands have also become more concentrated. The mean HHI was not very high in 2005, with a mean HHI of 1,346, but increased by nearly 800 points by 2010 to 2,011. The mean HHI in 2010 is slightly higher than the HHI for an equally divided five-firm market (2,000). While not trivial, this is below the recently revised *Horizontal Merger Guidelines* cutoff for considering a market highly concentrated (HHI = 2,500). What is most notable is the large increase in concentration over the period, which may be a cause for concern.

## 4. *Quality Determination in Provider Markets*

This section corresponds to the first stage in the modeling framework described above. We lay out a framework for analyzing choices that determine quality by health care providers and review key contributions to the literature. While in reality, providers make investments and other choices that determine quality indirectly, for simplicity of exposition we discuss quality as if it is chosen directly by providers. We first treat the case of administered prices, then discuss quality determination with market determined prices, since the theory and empirics are different.

### 4.1 *Administered Prices*

In many situations, prices are set administratively (usually by regulators), rather than being market determined. This is true of entire health systems (e.g., the British National Health Service), or sectors of health systems (e.g., the Medicare program in the United States). In this situation, when competition among firms

[16] The old FTC/DOJ *Horizontal Merger Guidelines* cutoff for considering a market highly concentrated (Federal Trade Commission and Department of Justice 2010).

occurs it will be via nonprice means, which we call quality.[17]

A standard result in models with administered prices is that nonprice (quality) competition gets tougher in the number of firms, so long as the regulated price is set above marginal cost. Firms facing tougher competition will increase their quality in order to attract (and retain) consumers. This result is essentially the same as in models of industries with regulated prices (e.g. airlines, trucking) from a number of years ago (e.g. Douglas and Miller 1974; Schmalensee 1977; Vander Weide and Zalkind 1981).

While this model is not truly specific to health care, adapting it to some institutional specifics of the health-care industry produces essentially the same results (Allen and Gertler 1991; Pope 1989; Gaynor 2006; Gravelle et al. 2012). Allowing firms to have nonprofit objectives or to have some patients who do not exercise choice (e.g., emergency cases) does not alter the results (under appropriate conditions—see Gaynor and Town 2012).

As is well known, the increased quality due to tougher competition can benefit consumers, but in general is not necessarily welfare increasing. In particular, with entry costs, if firms neglect business stealing effects there can be excessive entry. In equilibrium, firms capture less demand than they had anticipated due to business stealing, so the benefits of entry from increased quality are more than offset by the entry costs of the additional firms.

In the case of health care, however, it is likely that quality will be excessive only if it has little effect on health.[18] Quality that substantially improves a patient's chance of survival will be very valuable, and such benefits are likely to outweigh costs. We can do a simple back-of-the-envelope calculation to illustrate this. For example, the typical estimate of the value of one additional year of life (a "life-year") is $100,000. If an increase in quality leads to one additional life-year for every sick person and there are 1,000 sick people in the market, then costs would have to increase by more $100 million for the increase in quality to be inefficient.

In any case, the positive predictions of this model are clear. One may write down a firm's equilibrium quality function as the (implicit) solution to firms' first-order conditions.[19] Suppose firms maximize profits (this assumption can be relaxed to accommodate nonprofit maximizing preferences with no qualitative difference in the results). Let the profits of hospital $j$ be as follows.

$$\pi_j = \bar{p} \cdot q_j - c(q_j, z_j) - F, \tag{1}$$

where $\bar{p}$ is the regulated price, $q_j$ is hospital $j$'s demand, $c()$ is the variable cost function, $z_j$ is $j$'s quality, and $F$ are fixed costs.

Assume that the demand that any firm $j$ faces is separable in its market share, $s_j$, and the level of market demand, $D$. Firm $j$ thus faces a demand of:

$$q_j = s_j(z_j, \mathbf{z}_{-j}) D(\bar{p}, z_j, \mathbf{z}_{-j}), \tag{2}$$

where $s_j$ is firm $j$'s market share and $\mathbf{z}_{-j}$ is a vector of all other firms' qualities.[20] Assume that $j$'s market share is increasing in its own quality, decreasing in the number of firms, and that the responsiveness of market share

[17] Here we mean vertical differentiation.

[18] Of course, it's possible that with asymmetric information, poorly informed patients may choose either supra- or suboptimal quality or similarly, that physician agents will not choose optimally for their patients. The substantial variation in treatment of observationally equivalent patients suggests the presence of such a phenomenon (Chandra and Skinner 2012).

[19] See Gaynor and Town (2012) for the full derivation.

[20] Note that for consumers insulated from the cost of consumption, as in health care, the price they face will be less than the price received by the firm. We ignore this in order to keep this sketch of a model simple. It would not affect the conclusions in any event.

to own quality is also increasing in the number of firms.

The equilibrium quality function that emerges is as follows.

$$z_j^e = z(\overline{p}, c_q, c_z, s_j, D), \tag{3}$$

where $z_j^e$ is firm $j$'s equilibrium quality, $\overline{p}$ is the regulated price, $c_q$ and $c_z$ denote the marginal costs of quantity and quality respectively, $s_j$ is firm $j$'s market share, and $D$ is market demand. The firm's level of quality depends on the level of the regulated price, the marginal cost of quantity, the marginal cost of quality, the level of demand, market share, and (implicitly) the quality elasticities of market share and market demand. Quality is increasing in price, the elasticity of demand with respect to quality, and the firm's total demand. Quality is decreasing in the marginal costs of quantity or quality.

This has implications for econometric specifications for empirical analysis. The equation to be estimated is (3). However, measures of marginal cost, market share, and demand are likely to be endogenous in an econometric equation. One would employ exogenous determinants of these factors, such as cost shifters ($W$), demand shifters ($X_D$), and the number of firms ($N$). A reduced-form econometric specification would thus look something like the following,

$$z_j^e = \mathcal{Z}(\overline{p}, W, X_D, N, \varepsilon), \tag{4}$$

where $\varepsilon$ is a random error term. Note that this looks a lot like a structure–conduct–performance (SCP) model (described below in section 4.3), with quality replacing price as the dependent variable.

### 4.2 *Market-Determined Prices*

We now turn to examining quality determination in an environment where prices are market determined. In general, there are no determinate results in economic theory for the impact of competition on quality in models where firms choose both price and quality—the outcome depends on various factors including the relative elasticities of demand with respect to quality and price for different consumers and the nature of competition between firms (see Gaynor 2006; Gaynor and Vogt 2000). However, some simple insights can be obtained from an amended version of the Dorfman–Steiner condition (Dorfman and Steiner 1954). Dorfman and Steiner's model is nominally about choice of price and advertising, but can also be interpreted as about price and quality (although in a somewhat restrictive way).[21] The Dorfman–Steiner condition is

$$z = \frac{p}{d} \cdot \frac{\varepsilon_z}{\varepsilon_p}, \tag{5}$$

where $z$ is quality, $p$ is price, $d$ is the marginal cost of quality, and $\varepsilon_z$ and $\varepsilon_p$ are the elasticities of demand with respect to quality and price, respectively. This says that quality will increase if the quality elasticity of demand increases or the price elasticity of demand declines, and vice versa. Quality will also increase if price increases relative to the marginal cost of quality, and fall if the opposite happens.

While there are no determinate conclusions from this framework, it does offer some useful guidance for thinking about issues of competition in health care markets. Suppose that the price elasticity of demand facing health care firms increases, for example, due to the entry of alternative providers or consumers facing greater cost sharing. This will

[21] Dorfman and Steiner model a monopolist's behavior. We can consider this an approximation to the behavior of an oligopolistic or monopolistically competitive firm if we think of the demand function as a reduced form demand, e.g., an oligopolist's residual demand curve (see, e.g., Dranove and Satterthwaite 2000).

lead to a fall in prices.[22] Note that if there is no sufficiently countervailing increase in the quality elasticity, then quality will also fall. If the quality elasticity of demand increases (for example, due to an emphasis on medical errors or quality improvement), then quality will increase. If the price elasticity remains unchanged, this will lead to a price increase (since the increase in quality leads to an increased marginal cost of quantity), but price–cost margins will remain unchanged. This framework will prove helpful in making sense of some results from the empirical literature.

While the papers that limit their attention to quality competition are potentially important, including quality investment choices in the full model of competition also implies that the models of bargaining over hospital prices described in section 5.2 should ideally be expanded to allow for hospital choice of quality (see Gaynor and Town 2012 for a full exposition). One could do this by expanding the model to let hospitals choose their qualities in a first stage, then the price bargaining game in section 5.2 ensues, treating qualities as fixed. The other stages in the model, patient choice of health plan and patient choice of hospital, etc., then ensue.

Few, if any, empirical papers have so far attempted to estimate the full multistage model. While it is complex, and simplifying assumptions would be needed for tractability, in our view this is an important next step in analyzing this industry. We return to this issue below. We note here that the effect of competition on quality and on price is indeterminate in general, which is no surprise, given the general results in the literature. However, if we assume that patient choice is not responsive to price (which can be reasonable for hospital care where consumers are largely insulated from prices by the presence of health insurance), then we can derive the result that greater competition will lead hospitals to optimally increase their quality.

In equilibrium, greater competition leading to increased quality can have varying effects on prices. Since there is a positive marginal cost of quality, higher quality will lead to higher prices. However, there can be (increased) price dispersion in the new equilibrium. Suppose that hospitals have different costs of producing quality. In this situation, some hospitals will choose higher quality than others and their relative values to an insurer's network will change. This will lead to some hospitals (those with lower marginal costs of quality) having more bargaining power with insurers and commanding higher prices. Hospitals with higher marginal costs of quality will have lower relative quality and therefore will have less bargaining power and lower relative prices. On the other hand, if all hospitals have identical marginal costs of quality, all hospitals will increase quality by the same amount, and so do not change their relative attractiveness to insurers. In that case, hospitals' bargaining positions have not changed, so in equilibrium there is no effect on the distribution of prices.

### 4.3 *Econometric Studies of Hospital Competition and Quality*

There is a rapidly growing empirical literature on competition and quality in health care. At present, the evidence from this literature is entirely on hospital markets. In what follows we provide a brief overview of this literature. We first review the results from econometric studies of markets with administered prices, and then market determined prices.

The studies reviewed here employ a variety of econometric approaches. The modal approach is an SCP specification. These

[22] The advent of managed care in the 1990s is commonly thought to have increased the price elasticity of demand facing health care firms (hospitals in particular). This should have led to decreased prices, and indeed seems to have done so. See Dranove and Satterthwaite (2000) and Gaynor and Vogt (2000) for reviews of the evidence.

econometric models are derived from a conceptual model that hypothesizes a causal link from market structure to firm conduct and then to industry performance.[23] Most SCP models applied to health care focus on the link between market structure and firm conduct, and omit industry performance. The typical conduct measure in the general industrial organization literature is price or price-cost margin. The typical measure of market structure is the HHI. The equation usually estimated has roughly the following appearance,

$$(6) \qquad p = \beta_0 + \beta_1 q + \beta_2 X_D + \beta_3 W + \beta_4 HHI + \varepsilon,$$

where $p$ is price, $q$ is quantity, $X_D$ represents demand shifters and $W$ captures cost shifters. The SCP studies of quality employ a measure of quality as the dependent variable in this equation, rather than price (and omit quantity). Equation (3) above is very similar to this specification, although the econometric specifications in the literature are mostly ad hoc.

The SCP approach has a number of well-recognized problems when price is the dependent variable (see Bresnahan 1989; Schmalensee 1989, on these issues). These problems also apply when quality is the dependent variable, and there are some additional issues. First, the use of the HHI in a pricing equation can be explicitly derived only from a homogeneous goods Cournot model of conduct.[24] Obviously, an SCP regression with quality as the dependent variable does not derive from this framework. In the case of administered prices, theory does point to an econometric model with a measure of market structure on the right-hand side (see equation (3) or (4)). Even in this case, or even if one thinks of a quality SCP regression as deriving from a broad conceptual framework, as opposed to a specific theoretical model, a number of issues remain. The HHI (or any market structure measure) is likely endogenous. Unmeasured variation in demand and cost factors affect both quality and market structure. For example, a firm with low costs is likely to both have a high market share (leading to a high HHI) and choose high quality. Alternatively, if high fixed cost investments improve quality, then hospitals in high-density markets will have higher quality simply because they spread these costs over more patients.

An additional specification issue arises in regard to SCP studies of markets with administered prices. When price is regulated, price (or the price–cost margin) should appear as an exogenous determinant of the supply of quality (again, see equation (4)). In addition, it is possible that the regulated price may be correlated both with quality and concentration. For example, firms in unconcentrated markets may produce higher quality due to tougher competition. They may also have higher costs due to producing higher quality, and therefore receive higher regulated prices.[25] Therefore, omitting price may lead one to overestimate the effect of concentration on quality. However, to the extent that regulatory authorities try (and succeed) to set prices to compensate firms for their costs, the regulated price may be correlated with the error term in an SCP regression.

While the majority of the studies we review here employ an SCP framework, some employ different approaches. Some studies evaluate the impact of mergers, some

[23] See Schmalensee (1989); Carlton and Perloff (2005).

[24] In that case, the coefficient on the HHI in an SCP regression captures the elasticity of demand, not firm conduct (which is already assumed to be Cournot).

[25] The administered pricing schemes for hospitals in both the U.S. Medicare program and the English NHS make adjustments for geographic differences in hospital costs.

evaluate the impact of regulatory changes (e.g., price deregulation). In addition, there are a small number of studies that take a structural approach: there are some that estimate demand, and some that examine the determinants/impacts of the number of firms. Each of these approaches have their advantages and disadvantages. We discuss these in the context of evaluating the various studies.

#### 4.3.1 *Studies with Administered Prices*

There are a number of studies of the impact of competition on hospital quality under an administered price regime. These derive from the U.S. Medicare program and from the English NHS, which made a transition to administered prices in a reform in 2006. The amount a Medicare beneficiary pays is the same, regardless of where she obtains care. As a consequence, price is not a strategic variable for hospitals serving Medicare patients. Patients in the NHS pay nothing, so price plays no strategic role in that system, either.

Kessler and McClellan (2000) is one of the first studies attempting to make inferences about a causal effect of competition on quality for hospitals. This is a study of the impact of hospital market concentration on (risk-adjusted one-year) mortality from acute myocardial infarction (AMI, i.e., a heart attack) for Medicare patients. Expenditures on these patients are also studied. The study included data on all nonrural Medicare beneficiaries with AMI during selected years from 1985 to 1994. Kessler and McClellan use the SCP framework discussed above, with some modifications. They instrument for the HHI with hospital market shares predicted from a model of patient choice of hospital, where patient choice is largely determined by distance from the hospital.[26] They also employ zip code fixed effects. As a consequence, the effects of hospital market concentration are identified by changes in the predicted HHI.

The results from this study are striking. Kessler and McClellan find that risk-adjusted one-year mortality for Medicare AMI patients is significantly higher in more concentrated markets. In particular, patients in the most concentrated markets had mortality probabilities 1.46 percentage points higher than those in the least concentrated markets (this constitutes a 4.4 percent difference), as of 1991. This is an extremely large difference—it amounts to over 2,000 fewer (statistical) deaths in the least concentrated versus the most concentrated markets. There are significant impacts of concentration on expenditures as well. Prior to 1991, expenditures were higher in less concentrated markets, while the reverse is true as of 1991. Since both mortality and expenditures are lower in less concentrated markets, they conclude that competition improves welfare.

While it is clear that concentration affects hospital quality, the mechanism by which this works is not. It seems unlikely that hospitals strategically choose lower quality in the form of an increased probability of death when they face weaker competition. What may be happening is that hospitals in more concentrated markets exert lower effort than other hospitals. Heart attack patients are very sick and vulnerable, and even relatively small changes in how well their care is managed can have large impacts on their probability of survival, so lower effort in the hospital may have the unintended consequence of higher mortality.

Another question with regard to this application is whether hospitals compete for heart attack patients. Tay (2003) states that one-half of heart attack patients arrive at the

[26] This is one of multiple papers in the literature that essentially uses distance to hospital as an instrument, requiring the assumption that distance (or equivalently consumer choice of home location) is exogenous. We note the caveat that distance to hospital may be correlated with unmeasured patient characteristics, which would generate some bias in the estimates.

hospital via ambulance. Since these patients don't have the ability to choose between hospitals, it's hard to see how hospitals can compete for these patients. However, hospitals in more competitive environments are pressured to be better in order to compete for patients who exercise choice (nonemergency cases). Being better requires investments in organization and management processes that carry with them substantial fixed costs. As a consequence, quality improvements are organization-wide, as opposed to disease specific. These improvements manifest themselves in a very sensitive area—heart attack patient mortality.

Two recent studies (Cooper et al. 2011; Gaynor, Moreno-Serra, and Propper 2013) examine the impact of competition on hospital quality using a reform in the English National Health Service (NHS). The NHS introduced a reform in 2006 intended to promote competition among hospitals. Prices were administratively determined based on patient diagnoses, via a method very similar to that employed by the U.S. Medicare system. Patient choice of hospital was introduced, and hospitals had strong incentives for financial performance. As a consequence, hospitals were to compete solely on nonprice dimensions. These studies combine SCP with the "natural experiment" econometric policy evaluation approach, implemented via difference-in-difference estimation. The differences are before and after the reform and across more and less concentrated markets. Although they differ in the precise methods employed, both Cooper et al. (2011) and Gaynor, Moreno-Serra, and Propper (2013) find that, following the reform, risk-adjusted mortality from AMI fell more at hospitals in less concentrated markets than at hospitals in more concentrated markets.

Gaynor, Moreno-Serra, and Propper (2013) also look at mortality from all causes and mortality from all causes excluding AMI and find the same qualitative results as for AMI, although the estimated effects are smaller in magnitude. They also examine measures of utilization and expenditure and find that length of stay rose in less concentrated markets relative to more concentrated markets after the reform, but there were no impacts on expenditures. Quantitatively, Gaynor, Moreno-Serra, and Propper (2013) find that the reform reduced heart attack mortality by 0.2 percent.[27] Since the reform saved lives without increasing costs, they conclude it was welfare improving.

Some insight into the mechanisms underlying the relationship between market structure and quality is provided by Propper et al. (2010). Propper et al. use data for the English NHS and employ a measure of management quality developed by Bloom and Van Reenen (2007) to examine the impact of market structure on management quality and, ultimately, on hospital quality (AMI mortality, emergency surgery mortality, and other measures). They find that having more close-by competitors has a strong and significant impact on management quality, and hence, on clinical quality of care. Their estimates imply that adding a rival hospital close by increases the measure of management quality by one-third of a standard deviation and thereby reduces heart attack mortality by 10.7 percent. While these results are for the English NHS under specific circumstances, they may provide some insight into these mechanisms more generally.

Gaynor, Propper, and Seiler (2012) estimate a structural model of demand for heart bypass surgery (CABG) in England to

[27] Both the Cooper et al. (2011) and Gaynor, Moreno-Serra, and Propper (2013) estimates of the impact of competition postreform are quantitatively similar. Cooper et al. (2011) calculate that a one standard deviation increase of their measure of competition would lead to a reduction in the heart attack mortality rate of 0.3 percent per year. Gaynor, Moreno-Serra, and Propper (2013)'s estimates imply that a one standard deviation decrease in concentration reduces heart attack mortality by 0.33 percent per year.

evaluate the effect of the NHS reform studied by Cooper et al. (2011) and Gaynor, Moreno-Serra, and Propper (2013). In particular, one part of the reform required referring physicians to give patients five choices of hospitals (previously they'd been required to give none). Gaynor, Propper, and Seiler (2012) use individual data on patient treatment to estimate a multinomial logit model of demand faced by individual hospitals for CABG surgery. Overall, they find that the introduction of choice led to increased responsiveness of demand to hospital quality—the demand elasticity with respect to a hospital's (risk-adjusted) mortality rate is greater after the reform than before. They also find considerable individual heterogeneity in patient responsiveness. More seriously ill patients (as measured by a higher comorbidity count) are more sensitive to the hospital mortality rate than the average patient. With the introduction of the reform, their preference for quality, relative to the average patient, increases even more. Gaynor, Propper, and Seiler (2012) also find some suggestive evidence of a supply response—hospitals that had greater increases in their quality (mortality rate) elasticities due to the reform had larger declines in their mortality rates, implying intensified competition due to the reform.

#### 4.3.2 *Studies with Market-Determined Prices*

We now turn to econometric studies of competition and quality where prices are determined in the market.[28] Here we focus on the studies with the most credible identification strategy in which market structure is changed by either mergers or deregulation of price or entry. The results from settings with market determined prices are decidedly more mixed than the literature that focuses on quality in administered price settings. Also, credible identification of the impact of competition on quality is more challenging. Nevertheless, the evidence indicates that increases in competition improve hospital quality.

There have been a number of recent studies of competition and quality in hospital markets. These all cover time periods from the 1990s or later, when it is generally agreed that price competition had emerged in hospital markets. We first discuss SCP studies, then cover merger studies, then finally move to studies of deregulation.

Propper, Burgess, and Green (2004) use an SCP approach to examine the effect of the effect of hospital competition in the United Kingdom following reforms to the National Health Service in the 1990s (prior to, and different from, the 2006 reform discussed previously). These reforms encouraged payer-driven price competition among hospitals. NHS hospitals competed for contracts from local health authorities (Primary Care Trusts, PCTs) on the basis of price and waiting time (not quality of care). Propper et al. examine the impact of a measure of market structure (roughly, the number of competitors) on mortality over the period 1995–98 and find that mortality increased with the number of competitors. If the effect of this reform was to create competition mainly (or solely) over price, then it may have led to an increased price elasticity. Using the Dorfman–Steiner condition, equation (5), as a guide, we see that without a countervailing increase in the quality elasticity, quality will decline. Whether this is the mechanism driving the result in this paper cannot be determined, although it provides direction for future research.

Ho and Hamilton (2000) and Capps (2005) are two papers that examine the impact of hospital mergers on quality of care. Ho and Hamilton (2000) study 130 hospital mergers of various types over the period 1992–95. The quality measures they employ are inpatient mortality, readmission rates, and the early discharge of newborns. They employ

[28] We omit older studies of the "Medical Arms Race." For a review that includes these studies see Gaynor (2006).

hospital-specific fixed effects to control for time-invariant hospital characteristics that may be related to merger. Capps (2005) uses a set of quality indicators developed by the U.S. Agency for Healthcare Research and Quality[29] to examine the effect of hospital mergers on quality. He compares merging to nonmerging hospitals in New York state during 1995–2000. There are twenty-five merging hospitals, and 246 total. Neither study finds much in the way of significant impacts of hospital mergers on the quality of care.

Romano and Balan (2011) study the impact on quality of care of a consummated merger between two hospitals in the Chicago suburbs (Evanston Northwestern Hospital and Highland Park Hospital). This merger was the subject of an antitrust suit by the Federal Trade Commission and the authors provided evidence on the case. The authors use a difference-in-differences methodology and compare the changes in quality measures at the two merged hospitals before and after the merger to the changes at control hospitals over the same time period. They find no significant impact of the merger on many quality measures, but there is a significant negative impact on some and a few with positive impacts. They conclude that overall, there is no reason to infer that the merger had salutary effects on quality.

Three papers use changes in regulation as a way to learn about the effect of hospital competition on quality. Volpp et al. (2003) study the effect of the deregulation of hospital prices in New Jersey to learn about the impact of the introduction of price competition on hospital quality. In 1992 New Jersey deregulated hospital prices. The neighboring state of New York had no change in its hospital regulatory regime. Volpp et al. (2003) use data on AMI hospital admissions in New Jersey and New York from 1990 to 1996 to learn about the effect of the deregulation. They use a difference-in-difference approach—contrasting the pre- and postregulatory repeal changes in risk-adjusted inpatient AMI mortality in New Jersey with those in New York. They find that mortality in New Jersey increased after price deregulation relative to New York. The prediction from equation (5) is that quality will fall when the price elasticity of demand increases. The biggest impact of the price deregulation in New Jersey very well may have been to increase the price elasticity of demand, and decrease price.[30] Deregulation seems unlikely to have affected the quality elasticity.

A paper by Propper, Burgess, and Gossage (2008) employs a similar approach to Volpp et al. In this paper Propper, Burgess, and Gossage (2008) examine the impacts of competitive reforms in the NHS on mortality for AMI patients. Propper, Burgess, and Gossage (2008) use a different strategy in this paper than in Propper, Burgess, and Green (2004). Here they use the change in regulation in the United Kingdom over the period 1991–99, combined with geographic variation in the number of competitors.[31] As described above, price competition was introduced in 1991 and actively promoted up until 1995. It was downplayed after 1995 and actively discouraged from 1997 onwards. The impact of competition is identified by differences between hospitals facing competitors and those who are not, between the time periods when competition was encouraged versus when it was discouraged.

Propper, Burgess, and Gossage (2008), utilizing reforms in the English NHS, find that competition reduces quality. They find that differences in mortality for hospitals in areas with competitors versus those with no

[29] http://www.qualityindicators.ahrq.gov/.

[30] Unfortunately, Volpp et al. do not have any evidence on the effect of deregulation on prices.

[31] Only variation in the number of competitors is used in Propper, Burgess, and Green (2004).

competitors were higher during the period when competition was promoted (1991–95), than during the period when competition was discouraged (1996–98). The estimated cumulative effect of competition over the entire period is to raise mortality rates by roughly the same amount as the cumulative effect of the secular downward trend in heart attack mortality (presumably due to technological change). This is a large impact. As with Volpp et al. (2003), these results can be interpreted as consistent with economic theory, although that is not directly testable within the framework employed in the paper.

Cutler, Huckman, and Kolstad (2010) is a study that utilizes information on entry (in the CABG market) to make inferences about the impacts of competition. Cutler et al. (2010) use the repeal of entry restricting regulation (hospital certificate of need regulation, CON) in Pennsylvania to examine the effect of entry of hospitals into the CABG surgery market. They hypothesize that overall production is capacity constrained—cardiac surgeons are a scarce input and their supply can't be altered easily. As a consequence, hospital entry won't lead to increased quantities of CABG surgery, but may lead to improved quality. In particular, they hypothesize that it will increase the market shares of high quality surgeons. This hypothesis is confirmed in the empirical analysis. They find that in markets where entrants have 11–20 percent market shares of CABG surgeries, high quality surgeons' market shares increased 2.1 percentage points more than for standard quality surgeons. Overall, they conclude that entry led to increased quality, but that there was no net effect of entry on social welfare. Their estimates of the gains from reduced mortality due to entry are approximately offset by the estimated fixed costs of entry.

The empirical literature on competition and quality in health care markets is, for the most part, fairly recent and has grown very rapidly. This first generation of studies has provided a valuable base of knowledge for further research. As yet, there has been relatively little structural work in this area, and that has been confined to estimating demand. An obvious next step is specifying and estimating complete equilibrium models of quality determination in the market, ideally also including the price-setting stage of the full model. The challenge for researchers will be specifying models that are true to the important institutional facts while being tractable enough for estimation. In addition, the measures of quality have for the most part been confined to patient mortality. While that is undoubtedly significant, it will be important to employ other measures in order to obtain a more complete picture of the impacts of competition on health care quality. Although still in their infancy, as electronic medical records develop and become available for research, more nuanced and complete measures of quality will be possible.[32]

## 5. *Provider Price Negotiations and Network Formation*

The second stage in the model from section 2, following quality choice, is price determination. In this section, we outline a framework for analyzing competitive interactions between providers and payers around provider prices and payer networks in a bilateral bargaining framework. We follow the previous literature by taking hospital quality as given; however, as noted above, an important next step is to incorporate endogenous quality choice into the model. The bargaining framework we discuss was developed to analyze hospital competition, but with some adjustments could be applied to other

[32] Electronic medical records contain information on patient biometrics (e.g., weight, height, blood pressure, test results, etc.) that are not contained in the data now commonly used by researchers: health insurance claims data or hospital discharge databases.

settings in which insurers construct networks of providers, pharmacies or drugs in formularies to serve their enrollees.

There are at least four key distinguishing features of hospital markets that play an important role in affecting negotiations between hospitals and insurers. First, since privately insured patients primarily access hospital care through their health insurance, the set of available hospitals will depend on the health plan's provider network structure. Health insurers often contract with a subset of hospitals in a given location. The effective hospital choice set for a patient when they need to be treated will therefore depend upon their health insurance plan (Ho 2006). Second, patients do not pay directly for the vast majority of their inpatient care. Most of the cost of an inpatient episode is covered under the patient's insurance, hence any price differential between hospitals is only fractionally paid for by the patient.[33] More recently, insurers have begun establishing tiered networks in which patients pay different out-of-pocket expenditures depending on which cost tier the hospital is assigned. Third, the health insurance choice of the patient is generally made prior to the need for inpatient treatment. In this sense, hospitals are an option demand market (see Dranove and Satterthwaite 2000; Capps, Dranove, and Satterthwaite 2003). Fourth, hospitals negotiate with private insurers over inclusion in their provider network and the reimbursement rates from treating the insurer's enrollees. These negotiations also determine how hospital utilization will be monitored and controlled, as well as details of the billing arrangements, and may include discussion over which cost tier the hospital will occupy.

Health insurers, in turn, compete with each other based on premiums (which are a function of the prices they pay hospitals) if the plan is underwriting risk, or the administrative fees if the employer is bearing the risk.[34] Importantly, insurers also compete on the breadth and quality of their provider networks. Employers, through whom most private insurance is acquired, have preferences over hospitals which are an aggregation of their employees' preferences, and select the set of health plans they offer to their workers based on expected costs, benefit structure and provider networks.[35]

A model of insurer–provider price negotiations would ideally also include endogenous network formation. However, because of the complexity of this problem, recent papers fully model only one of these phenomena. We discuss the research on network formation in the following section. We then follow with price negotiation models in section 5.2.

### 5.1 *Insurer–Provider Network Formation*

A small number of papers have focused on understanding the formation of insurers' hospital networks. Ho (2006) uses hand-collected data on the networks of over 500 plans in forty-three U.S. markets to understand the welfare effects of restricted hospital choice. In her data, 17 percent of potential plan–hospital pairs do not have contracts. The proportion varies substantially across markets. She estimates a model of consumer demand for hospitals and uses it to construct a measure of each consumer's expected utility from the hospital network

[33] Some physician contracts with insurers put the patient's physician at risk for the cost of hospital care, inducing a more significant price sensitivity (Ho and Pakes 2014).

[34] Sixty percent of workers with employer sponsored health insurance are covered in partially or completely self-funded plans (Kaiser Family Foundation and Health Research and Educational Trust 2012).

[35] Most large employers are self-insured and thus changes in negotiated prices between providers and health plans are directly passed on to the employer.

offered by each plan in her data.[36] She then uses this expected utility from the network as an input into a discrete choice model of consumer demand for insurers. Ho's estimates indicate that consumers place a significant weight on the attractiveness of the hospital network when choosing their plans. Under the assumption of fixed prices, she predicts that a change from the observed networks to a world where every plan included every hospital in its network would lead to a median equivalent variation of $15.70 per privately insured consumer per year, or a total gain of $1.04 billion for the forty-three markets in her data. She notes that these numbers are small, relative to the premium increases that could result from a move away from the ability of MCOs to use the threat of restricted networks as a bargaining device.

Ho (2009) builds on her previous work and uses it to model the network formation game. The key insight she develops is that, given consumer preferences over MCO characteristics (including the structure of the hospital network), and the realized hospital network, one can estimate the parameters of the hospital profit function. She uses the estimates from Ho (2006) to construct consumer valuations for any hospital network that could be offered by any plan in the large metropolitan areas under analysis. With these measures in hand, together with her insurer demand estimates, she then turns to the network formation game. Her model abstracts away from details of the bargaining game: all hospitals make simultaneous take-it-or-leave-it offers to all plans in the market. Then all plans simultaneously respond. MCOs select the hospital network that maximizes expected profits relative to all possible counterfactual networks. These profits are the revenues the MCO earns, given its hospital network (and a simple premium-setting model), less the payments made to the hospitals in its network.

This simple model suggests the use of an inequality method of moments estimator developed by Ho and coauthors (Pakes et al. 2006) to estimate the determinants of hospital profits. While the underlying econometric theory is nontrivial, the basic idea behind the estimator is straightforward. Given a set of instruments that help address measurement error, the estimator finds the set of parameters that result in the observed hospital network of each insurer producing a higher expected profit than any alternative network, conditional on other insurers' expected choices.[37] Expected insurer profits under both observed and counterfactual sets of networks can be constructed from Ho's model as a function of data, estimated demand model parameters, and hospital profits. This approach enables Ho to estimate the hospital profit function (although not the full bargaining model), despite the fact that her data do not include information on hospital prices. Instead of positing a structural expression for hospital profits, Ho specifies a reduced-form hospital profit function where profits are a function of the number of expected admissions, market and hospital characteristics.

Ho finds that hospitals in systems take a larger fraction of the surplus and also penalize plans that do not contract with all members. Hospitals that are attractive to patients also capture high markups, and hospitals with higher costs per patient receive lower markups than other providers. One limitation of Ho's work is that, because it embeds a reduced form hospital profit function, it is not directly applicable to analyzing the impact of hospital mergers or other changes in market structure.

[36] This is similar to the willingness-to-pay variable developed in Capps, Dranove, and Satterthwaite (2003) which we discuss in detail below.

[37] The parameters are set-identified.

Pakes (2010) furthers the ideas of Ho (2009) and Pakes et al. (2006) by examining the MCO/hospital network formation decision allowing for richer error structures. The idea behind the estimation is the same as in Ho (2009), but Pakes allows for the existence of transfers between hospitals and insurers that are observed by the firms but not by the econometrician. The estimation and simulation results reveal interesting patterns. In the simulations, he computes the full-information Nash equilibrium for the game in which hospitals make take-it-or-leave-it offers to insurers and insurers decide whether to accept or reject the offers. The equilibrium margins for hospitals are decreasing in excess capacity and costs relative to the other hospitals in the market. The hospital's margins are increasing in the insurer's margins.

### 5.2 *A Model of Hospital–Insurer Price Negotiation*

A number of authors have taken the literature on hospital–insurer price negotiations further than Ho (2009). These papers use data on actual hospital prices (not just the realized hospital networks) to estimate models that put more structure on the bargaining game. The result is a fully specified bargaining model that can be used to conduct policy-relevant counterfactual exercises. These are particularly important because the impact of changes in market structure, such as hospital mergers, in the bargaining framework can differ substantially from standard oligopoly models. This is relevant in general to sectors of the economy where prices are determined via negotiation (e.g., cable television, industrial equipment and supplies, much of wholesale purchasing), not just health care. However, in order to focus on the bargaining game, these papers simplify other elements of the model: in particular, they usually condition on the network of the insurer and do not allow consumers to switch insurers in response to a network change. These simplifications have some implications that we return to below.

To illustrate this, we outline below the recent model of (Gowrisankaran, Nevo, and Town 2015) (GNT, hereafter) of hospital–insurer bargaining.[38] This is representative of this approach. We focus on GNT's "MCO (Managed Care Organization) Agency" model as it captures many of the salient features of hospital–insurer negotiation and its structural parameters can be estimated in a straightforward way.[39] The GNT model builds on a longstanding literature on hospital competition by Gal-Or (1997); Town and Vistnes (2001); Capps, Dranove, and Satterthwaite (2003); Gaynor and Vogt (2003); Ho (2009); Haas-Wilson and Garmon (2011); and Lewis and Pflum (2011). The structure of this model is also similar to the bargaining models of Crawford and Yurukoglu (2012) and Grennan (2013), who study cable television distribution and the negotiations between hospital and medical device suppliers over the price of stents, respectively.

GNT model the bargaining process as a simple two-stage game. They make the assumption noted above: that employer/MCO contracts are taken as given.[40] That is, enrollees do not actively select health insurance plans and health plans do not compete downstream with one another. This allows the model to focus on the potentially imperfect contracting of hospitals and MCOs. In the first stage, hospital systems and MCOs negotiate the terms of hospitals' inclusion in

[38] This section draws heavily from (Gowrisankaran, Nevo, and Town 2013) exposition.

[39] GNT also estimate/calibrate another model of MCO/hospital negotiations in which MCO first determine networks and negotiate prices and then compete against one another à la Bertrand. The results from that model broadly align with their MCO Agency model.

[40] We use the term MCO, but this generally denotes any insurer that uses provider networks and negotiates prices with providers. This includes virtually all private health insurers in the United States.

MCOs' networks. In the second stage, each patient receives a health status draw. Some draws do not require inpatient hospital care, while others do. If a patient needs to receive inpatient hospital care, she must pay an exogenously determined coinsurance proportion of the negotiated price for each in-network hospital, with the MCO covering the difference. Coinsurance rates may vary across patients and diseases. The patient selects a hospital in the MCO's network—or an outside alternative—to maximize her utility.

Starting with the second stage of their model, there is a set of hospitals $j = 1, \ldots, J$, and a set of managed care companies $m = 1, \ldots, M$. Each enrollee has health insurance issued by a particular MCO. Let $i = 1, \ldots I_m$ denote the enrollees of MCO $m$. Each MCO $m$ has a subset of the hospitals in its network; denote this subset $N_m$. For each $m$ and each $j \in N_m$, there is a base price $p_{mj}$, which was negotiated in the first stage. Let $\vec{p_m}$ denote the vector of all negotiated base prices for an MCO.

At the start of the second stage, each patient receives a draw on her health status which determines if she has one of a number of health conditions that require inpatient care. Let $f_{mid}$ denote the probability that patient $i$ at MCO $m$ has illness $d = 0, 1, \ldots D$, where $d = 0$ implies no illness. Let $w_d$ be weights denoting the relative intensity of resource use for illness $d$, with $w_0 = 0$. For tractability, GNT assume that the price paid for treatment is $w_d p_{mj}$, the base price multiplied by the disease weight. Therefore, there is only one price to be negotiated, the base price, which can be viewed as a price per unit of $w_d$. This is essentially how most hospitals are reimbursed by Medicare, and many MCOs incorporate this payment structure into their hospital contracts.

Each patient's contract with her MCO specifies a coinsurance rate for each condition, which we denote $c_{mid}$. The coinsurance rate specifies the fraction of the billed price $w_d p_{mj}$ that the patient must pay out of pocket. For each realized illness, $d = 1, \ldots, D$, the patient seeks hospital care at the hospital that gives her the highest utility, including an outside option. The utility that patient $i$ enrolled in health plan $m$ receives from care at hospital $j \in N_m$ is given by

$$(7) \quad u_{mijd} = \beta x_{mijd} - \alpha c_{mid} w_d p_{mj} + e_{mij}.$$

In equation (7), $x_{mijd}$ is a vector of hospital and patient characteristics that may include travel time, hospital indicators, and interactions between hospital and patient characteristics (such as age, sex, hospital ownership type, hospital teaching status, etc.), and $\beta$ is the associated coefficient vector. The out-of-pocket expense to the patient is $c_{mid} w_d p_{mj}$. The parameter $\alpha$ denotes the price sensitivity. The outside choice, denoted as choice 0, is treatment at a hospital located outside the market. Finally, $e_{mij}$ is an i.i.d. error term that is distributed Type I Extreme Value.

Consumers' expected utilities will play an important role in the bargaining game. Let $\delta_{mijd} = \beta x_{mijd} - \alpha c_{mid} w_d p_{mj}, j \in \{0, N_m\}$. Given the assumption on the distribution of error terms, the choice probability for patient $i$ with disease $d$ as a function of prices and network structure is:

$$(8) \quad s_{mijd}(N_m, \vec{p_m}) = \frac{\exp(\delta_{mijd})}{\sum_{k \in 0, N_m} \exp(\delta_{mikd})}.$$

The ex ante consumer surplus, or dollar value of expected utility, as a function of prices and the network of hospitals in the plan, is given by:

$$(9) \quad W_m(N_m, \vec{p_m}) = \frac{1}{\alpha} \sum_{i=1}^{I_m} \sum_{d=1}^{D} f_{mid} \ln\left( \sum_{j \in 0, N_m} \exp(\delta_{mijd}) \right).$$

Capps, Dranove, and Satterthwaite (2003) refer to $W_m(N_m, \vec{p_m}) - W_m(N_m \setminus J_s, \vec{p_m})$, as

the "willingness-to-pay" (WTP) as it represents the utility gain to the enrollees of MCO $m$ from the system $s$.[41]

Another important quantity for the equilibrium is the intensity-weighted expected number of plan $m$ patients who are admitted to hospital $j \in N_m$, given by

$$(10)\quad q_{mj}(N_m, \overrightarrow{p_m}) = \sum_{i=1}^{I_m}\sum_{d=1}^{D} f_{mid} w_d s_{mijd}(N_m, \overrightarrow{p_m}).$$

Since prices are per unit of $w_d$, the intensity-weighted expected number of patients times price will give the expected revenue to the hospital from MCO $m$.

There are $M \times S$ potential contracts between hospitals and MCOs, each specifying the negotiated base prices for one MCO/hospital system pair. The bargaining outcome determines a separate base price for each hospital in the system; the actual price paid to a hospital for treatment of a patient with disease $d$ will be its base price multiplied by the disease weight $w_d$. MCOs and hospitals have complete information about MCO enrollee and hospital attributes, including $x_{mijd}$ and hospital costs.

GNT assume that prices for each contract solve the Nash bargaining solution for that contract conditional on all other prices (Horn and Wolinsky 1988; Collard-Wexler, Gowrisankaran, and Lee 2013). The Nash bargaining solution is the price vector that maximizes the exponentiated product of the values to both parties from agreement (as a function of that price) relative to the values without agreement.

[41] $N_m \setminus J_s$ represents insurer $m$'s network without the hospitals in system $s$ ($\setminus J_s$).

Define the ex ante expected cost to the MCO of a given hospital network and vector of negotiated prices to be $TC_m(N_m, \overrightarrow{p_m})$,

$$(11)\quad TC_m(N_m, \overrightarrow{p_m}) = \sum_{i=1}^{I_m}\sum_{d=1}^{D}(1 - c_{mid}) \times \sum_{j \in 0, N_m} p_{mj} f_{mid} w_d s_{mijd}(N_m, \overrightarrow{p_m}).$$

Then, define the value for the MCO and the employer it represents to be:

$$(12)\quad V_m(N_m, \overrightarrow{p_m}) = \tau W_m(N_m, \overrightarrow{p_m}) - TC_m(N_m, \overrightarrow{p_m}),$$

where $\tau$ is the relative weight on employee welfare. If employer/employee/MCO incentives were perfectly aligned then $\tau = 1$. Assume that $N_m, m = 1, \ldots, M$, are the equilibrium sets of network hospitals. For any system $s$ for which $J_s \subseteq N_m$, the net value that MCO $m$ receives from including system $s$ in its network is $V_m(N_m, \overrightarrow{p_m}) - V_m(N_m \setminus J_s, \overrightarrow{p_m})$.

Hospital systems can be either for-profit or not-for-profit (NFP). Assume that NFP systems maximize some linear combination of profits and the weighted quantity of patients served (Lakdawalla and Philipson 2006). Let $mc_{mj}$ denote the "perceived" marginal cost of hospital $j$ for treating a patient from MCO $m$ with disease weight $w_d = 1$. The costs of treating an illness with weight $w_d$ is $w_d mc_{mj}$. This model of perceived marginal costs implicitly allows for different NFP objective functions: an NFP system that cares about the weighted quantity of patients it serves will equivalently have a "perceived" marginal cost equal to its true marginal cost of production net of this utility amount (Lakdawalla and Philipson 2006; Gaynor and Vogt 2003).

GNT specify that a hospital's marginal cost, which is MCO specific, is:

$$mc_{mj} = \gamma v_{mj} + \varepsilon_{mj}, \tag{13}$$

where $mc_{mj}$ is the marginal cost for an illness with disease weight $w_d = 1$, $v_{mj}$ are a set of cost shifters (e.g., hospital, year, and MCO fixed effects), $\gamma$ are parameters to estimate, and $\varepsilon$ is the component of cost that is not observable to the econometrician. The returns that hospital system $s$ expects to earn from a given set of managed care contracts are then:

$$\pi_s\left(M_s, \{\overrightarrow{p_m}\}_{m\in M_s}, \{N_m\}_{m\in M_s}\right) = \sum_{m\in M_s}\sum_{j\in J_s} q_{mj}(N_m, \overrightarrow{p_m})\left[p_{mj} - mc_{mj}\right], \tag{14}$$

where $M_s$ is the set of MCOs that include system $s$ in their network. From (14), the net value that system $s$ receives from including MCO $m$ in its network is $\sum_{j\in J_s} q_{mj}(N_m, \overrightarrow{p_m}) \times \left[p_{mj} - mc_{mj}\right]$.

Having specified the objective functions, the Nash bargaining problem for MCO $m$ and system $s$, denoted $NB^{m,s}(p_{mj\,j\in J_s}|\overrightarrow{p_{m,\_s}})$, can be specified and is the exponentiated product of the net values from agreement:

$$NB^{m,s}(p_{mj\,j\in J_s}|\overrightarrow{p_{m,\_s}}) = \left(\sum_{j\in J_s} q_{mj}(N_m, \overrightarrow{p_m})\left[p_{mj} - mc_{mj}\right]^{b_{s(m)}}\right) \left(V_m(N_m, \overrightarrow{p_m}) - V_m(N_m \backslash J_s, \overrightarrow{p_m})\right)^{b_{m(s)}}, \tag{15}$$

where $b_{s(m)}$ is the bargaining weight of system $s$ when facing MCO $m$, $b_{m(s)}$ is the bargaining weight of MCO $m$ when facing system $s$, and $\overrightarrow{p_{m,\_s}}$ is the vector of prices for MCO $m$ and hospitals in systems other than $s$. GNT impose the standard normalization, $b_{s(m)} + b_{m(s)} = 1$.

The Nash bargaining solution is the vector of prices $p_{mj\,j\in J_s}$ that maximizes (15). Let $\overrightarrow{p_m^*}$ denote the (Horn and Wolinsky 1988) price vector for MCO $m$. It must satisfy the Nash bargain for each contract, conditioning on the outcomes for each other contract. Thus, $\overrightarrow{p_m^*}$ will satisfy:

$$p_{mj}^* = \max_{p_{mj}} NB^{m,s}(p_{mj}, \overrightarrow{p_{m,\_j}^*}|\overrightarrow{p_{m,\_s}^*}), \tag{16}$$

where $\overrightarrow{p_{\_m,j}^*}$ is the equilibrium price vector for other hospitals in the same system as $j$.

Solving the model by setting the FOCs $\partial \log NB^{m,s}/\partial p_{mj} = 0$ yields the following pricing relationship:

$$\overrightarrow{p} = \overrightarrow{mc} - (\Omega + \Lambda)^{-1}\overrightarrow{q}, \tag{17}$$

where $\overrightarrow{p}$, $\overrightarrow{mc}$, and $\overrightarrow{q}$ denote the price, marginal cost, and adjusted quantity vectors respectively for hospital system $s$ and MCO $m$. $\Omega$ and $\Lambda$ are both $\#(J_s) \times \#(J_s)$ size matrices, with elements $\Omega(j,k) = \dfrac{\partial q_{mk}}{\partial p_{mj}}$ and $\Lambda(j,k) = \dfrac{b_{m(s)}}{b_{s(m)}}\dfrac{A}{B}q_{mk}$ where $A = \dfrac{\partial V_m}{\partial p_{mj}}$ and $B = V_m(N_m, \overrightarrow{p_m}) - V_m(N_m \backslash J_s, \overrightarrow{p_m})$.

Equation (17), which characterizes the equilibrium prices, would have a form identical to standard pricing games were it not for the inclusion of $\Lambda$. The case where $\Lambda = 0$, and hence there is differentiated products Bertrand pricing with individual prices for each MCO, is where hospitals have all the bargaining weight, $b_{m(s)} = 0, \forall s$.

Importantly, (17) shows that, as with Bertrand competition models, GNT can back out implied marginal costs for the bargaining model as a linear function of prices, quantities, and derivatives, given MCO and patient incentives.

5.2.1 *Implications of the GNT model*

In general, the comparative statics of the GNT model are complicated and depend on many factors including, for example, the coinsurance rates and the degree of asymmetry between hospitals. This subsection provides theoretical intuition for some of the forces at work. First, the use of coinsurance rates has potentially important implications. As long as coinsurance rates are strictly between zero and one, prices affect patient choice and MCOs use this fact to steer patients towards cheaper hospitals. This will influence equilibrium pricing: for example the MCO may be willing to have a higher relative price for the high-cost hospital because this will steer patients to the low-cost hospital.

The model also has direct implications for the impact of bargaining on prices. Note from equation (17) that price–cost margins from the model have an identical formula to those that would arise if hospitals set prices to patients, and patients chose hospitals using the choice model, but with $\Omega + \Lambda$ replacing $\Omega$. Since $\Omega$ is the matrix of actual price sensitivities, GNT define the *effective price sensitivity* to be $\Omega + \Lambda$. GNT show that for the special case of a single-hospital system, this effect of bargaining on price sensitivity leads to lower prices relative to differentiated products Bertrand competition with a given coinsurance rate. With asymmetric hospitals and multihospital systems, the incentives are more complicated. There may be cases where MCO bargaining may not uniformly lower prices, notably if cost differences across hospitals are large and hence it is important to steer patients to low-cost hospitals. However, generally MCO bargaining lowers prices relative to differentiated products Bertrand competition. This implies there is a beneficial effect of selective contracting. Insurers that have the threat of excluding a hospital from their networks have the ability to bargain and reduce prices for consumers. A number of states have passed laws that require insurers to contract with all interested providers ("Any Willing Provider" laws).[42] Laws such as these reduce insurers' bargaining power, allowing providers to raise prices.[43]

Consider now the impact of mergers on prices. Similarly to Bertrand competition, negotiated prices also result in upward pricing pressure from mergers. For example, as two separate hospitals merge, by raising the price of one of the hospitals some consumers are diverted to the other hospital. Premerger, these were considered lost profits, postmerger these are captured. This creates an incentive to raise prices relative to the premerger prices. However, the impact of a merger in a bargaining model will be different than under Bertrand competition. To see this, note that with Bertrand competition, a merger only changes the cross-price effects. With bargaining, the effective own-price elasticity can also change. However, the cross-price terms change differently, and potentially less, than with Bertrand competition. Since these effects can be of opposite sign, the net effect of the merger relative to the Bertrand prediction is ambiguous.

It is worth noting that GNT's simplifying assumption that insurers do not compete for enrollees is needed to generate their simple characterization of the bargaining outcome. If enrollees could switch insurers in response

[42] Interestingly, recent legislation has been introduced in Pennsylvania that would require integrated providers to contract with any willing insurer. The intent of these "Any Willing Insurer" (AWI) laws appears to be to reduce the possibility of foreclosure. To the best of our knowledge, no state has enacted an AWI law.

[43] See Vita (2001); Durrance (2009); and Klick and Wright (2013), who provide evidence showing that any willing provider laws lead to increased per capita health and pharmaceutical spending. Pinkovskiy (2013) finds that state regulation of managed care generally, including any willing provider laws, increased health care spending's share of U.S. GDP by nearly 2 percentage points, and accounts for much of the growth in health care spending over the period 1995–2005.

to a network change, the Nash bargaining problem in equation (15) would contain an additional term representing the system's outside option or threat point: its incremental profits from other insurers when it was removed from MCO *m* which came from enrollees switching plans to access it. This increase in hospital threat points would have implications for both prices and the price effects of hospital mergers. Ho and Lee (2013) develop a method that allows them to investigate these issues empirically; their results are discussed below.

### 5.3 *Empirical Evidence on the Impact of Hospital Competition on Prices*

#### 5.3.1 *Reduced-Form Estimates*

Most of the analysis of the impact of hospital competition has relied on reduced-form specifications following the SCP paradigm in the industrial organization literature. In this approach, researchers construct measures of market concentration, usually some form of the HHI, and regress it on the variable of interest (e.g. prices), controlling for observable confounding variables (see equation (6)). Reduced-form approaches allow researchers to be somewhat agnostic about the underlying theoretical model and thereby let the data speak directly to the relationships between the variables of interest.[44] While the broader industrial organization literature has largely moved away from employing reduced form approaches, it nevertheless remains a popular research approach in the health economics and health services research literatures.

Accurately measuring prices is the principal challenge in estimating models of hospital price competition. MCO–hospital contracts are complicated and have different prices and different payment structures for different services. Three types of contracts are prevalent: DRG-based, per diem, and percent of charges. Hospital contracts often contain combinations of these three types of contracts. For example, a hospital/insurer contract might have a DRG structure for general medical/surgical services and "carve-out" obstetrics using a per diem formulation. These contracts give hospitals different incentives for resource use. Anecdotally, bargaining leverage appears to play a significant role in the determination of the contract form, with hospitals preferring contracts with lower powered incentives and insurers preferring higher powered contracts.

There is little work that considers the role of competition in determining insurer–hospital contract structure.[45] In their analysis of insurer contracts for transplant services, Bajari et al. (2011) find that the majority of hospital contracts rely on a nonlinear, percent of charges structure. Because of the complexity of insurer–hospital contracts, in most circumstances, actual administrative claims data used to adjudicate payments between hospitals and insurers will provide the best measure of price. Constructing price using administrative claims requires adjusting for differential severity and types of services. Until very recently, administrative claims data from payers and hospitals were not widely available.[46] Without the ability

[44] See Gaynor and Vogt (2000) and Dranove and Satterthwaite (2000) for summaries of early portions of this literature.

[45] Town et al. (2011) examines the degree of physician risk bearing in their contracts with health insurers. They find that physicians facing less competition are more likely to have fee-for-service contracts.

[46] Very recently some health insurance claims databases have become available that contain actual prices paid to hospitals. The Health Care Cost Institute http://www.healthcostinstitute.org has the universe of claims from four large private insurers with complete data on transaction prices, FAIR Health http://www.fairhealth.org maintains a database of health insurance claims for which a portion has information on transaction prices, and Truven Health Analytics http://www.truvenhealth.com maintains the MarketScan database of health insurance claims from a group of large employers, with complete data on transaction prices.

to access transaction level data, researchers resorted to constructing prices using state-mandated hospital financial reports. This meant constructing price measures applying average hospital-wide discounts to insurers to charges (list prices) (see, e.g., Gaynor and Vogt 2003).

However, there are some exceptions. Capps and Dranove (2004); Tenn (2011); Haas-Wilson and Garmon (2011); Thompson (2011); Ginsburg (2010); and Gowrisankaran, Nevo, and Town (2015) all use insurer claims data to construct risk-adjusted prices.[47] More recently, several states have initiated programs to post measures of hospital prices on the web. For example, Massachusetts issues detailed reports on provider prices broken down by insurer and type of product (e.g., http://www.mass.gov/ago/docs/healthcare/2011-hcctd-full.pdf).

Recently, Gaynor and Town (2012) surveyed the hospital price concentration literature published between 2000 and 2011. Of the eight papers included in their literature review, all but one of the papers found a positive relationship between hospital concentration and price. This relationship is a function of the structure of the health plan market. During the rise of MCOs in the 1990s this relationship strengthened, and the growth in the correlation appears to wane during the managed care backlash of the early 2000s. The correlation is stronger in markets with high MCO penetration or in areas with a large number of managed care organizations. The relationship between price and measures of market structure also holds in other countries. Halbersma et al. (2011) find hospital prices are positively correlated with hospital concentration and negatively correlated with insurer concentration after the introduction of market-based health-care reforms in the Netherlands in 2004.[48]

#### 5.3.2 *Estimates of the Impact of Consummated Hospital Mergers on Price*

The second popular approach to the analysis of the impact of hospital mergers is to study the impact of consummated mergers. The appeal of studying consummated mergers is obvious. The variation in market structure is driven by the phenomena of primary policy interest. Understanding the outcomes of past hospital mergers speaks directly to the role of competition and the impact of consolidation on hospital prices. The predominant empirical strategy is difference-in-difference estimation, where the merging hospitals (or sometimes their close rivals) are the treatment group and researchers locate other hospitals to use as controls.

Despite its clear appeal, there are nontrivial impediments to implementing the merger case study approach. Principal among these challenges is defining a sensible set of control group hospitals. Hospital inflation has been significant and persistent—the producer price index for hospitals increased on average 3.8 percent per year over the last decade. Thus, simply examining pre/post hospital prices may lead to misleading inferences regarding the underlying change in the competitive environment induced by the merger. In addition, a merger may change the quality or the set of services provided by the merging hospitals, which may also affect inference. The set of control hospitals should have cost and demand shocks that mimic what would have happened to the merging hospitals under the counterfactual that the merger did not take place.

[47] The Federal Trade Commission, following a string of unsuccessful attempts to block hospital mergers in the 1990s, undertook a large retrospective effort to study the impact of consolidation in the hospital industry on prices. Tenn (2011), Haas-Wilson and Garmon (2011), and Thompson (2011) are papers that resulted from that effort.

[48] Moriya, Vogt, and Gaynor (2010); Melnick, Shen, and Wu (2011) also find the same patterns for U.S. markets.

In their study of the impact of the Evanston Northwestern Healthcare and Highland Park Hospital merger and the St. Therese Medical Center and Victory Memorial Hospital, Haas-Wilson and Garmon (2011) used the nonfederal general acute-care hospitals in the Chicago Primary Metropolitan Statistical Area that were not involved in mergers over the relevant time period. Hospital mergers will almost surely affect the price of close rivals. A hospital merger that leads to increased bargaining power will also spill over and increase the prices of competing hospitals that are not party to the merger. Using a set of control group hospitals that are geographically proximate to the merging hospital will control for local demand and cost shocks, but risks inducing a downward bias in the estimated impact due to the spillover effect. Using hospitals that are not proximate as a control group reduces the bias from spillovers, but increases the likelihood that demand and costs shocks will not be adequately controlled.

Gaynor and Town (2012) provide a detailed review of the hospital merger literature. Of the nine studies they identified, all but one find that prices increased (or increased faster relative to trend) for hospitals that consolidated relative to the control group hospitals.[49] The estimated increase in price is often quite large. For example, Tenn (2011) finds that the prices at Sutter hospital increased between 28 and 44 percent after its merger with Alta-Bates hospital, relative to the control group.[50] The finding that horizontal hospital mergers in concentrated markets lead to price increases implies that if there are merger specific efficiencies, they are not large enough to overcome the impact of the increase in market power.

The pattern that mergers between competing hospitals in concentrated markets often leads to significant price increases also holds in international settings. While most non-U.S. OECD countries rely on administered prices, the health reforms implemented in 2004 in the Netherlands allow insurers and hospitals to negotiate over prices. Two hospital mergers between competing hospitals were consummated just prior to the reforms. Kemp and Severijnen (2010) estimate the impacts of the mergers on the price of hip surgery and find that the hospitals involved in the most controversial merger experienced a significant increase in price, relative to the control hospitals.

The concern regarding the use of a difference-in-difference approach to identify merger effects is that the merger is, in fact, endogenous. Unobservables (to the econometrician) that affect the returns to merger and the prices that would have occurred absent the merger may be present and bias the estimated coefficients. For example, a hospital facing declining demand might be more likely to merge.[51] The estimating merger effect in this example would be biased towards zero. Dafny (2009) addresses the endogeneity issue by constructing an indicator of whether hospitals are colocated (located within 0.3 miles of one another) as an instrument in an instrumental variable approach. The logic is that if distance is predictive of mergers (which it should be, as the gains from merger are a function of the

[49] The one study that did not find a price increase at merging hospitals, Spang, Bazzoli, and Arnould (2001), is the oldest paper in the review, uses relatively poor measures of price and costs, and the study design is not well-suited to identify hospital merger effects.

[50] Since the price increase at Alta-Bates was comparable to the control group, this suggests that the hospital system used their bargaining leverage after the merger only for higher rates at Sutter hospital.

[51] The are other possible sources of bias. For example, a hospital that is a poor negotiator with MCOs may be more likely to be acquired or the hospital may change its postmerger characteristics (e.g. quality), which may affect is postmerger price. See Gowrisankaran (2011) and Leonard and Olley (2011) regarding the potential biases of difference-in-difference estimates of merger price effects.

distance between hospitals), but is uncorrelated with these unobservables that determine the postmerger price effects, then it should correct for the selection into merger.[52] She then examines the impact of a hospital's rivals merging on that hospital's price using this IV strategy and finds that OLS analyses lead to lower estimated merger effects relative to IV, consistent with the idea that hospitals select into merger.

Finally, while the literature clearly shows that mergers between rivals in concentrated settings are likely to increase prices for insurers, it is unclear how those increased prices affect consumers. Town et al. (2006) examine how changes in hospital market structure affect rates of uninsurance. If increases in hospital prices are not passed on to consumers, then there should be little association between hospital mergers and insurance take-up. They find that, in fact, hospital mergers lead to declines in the rates of insurance and the more competitive the insurance market (measured by the number of HMOs), the larger the impact of hospital mergers. There is little work on the equity and access consequences of provider consolidation. Town et al. (2007a) find that the declines in health insurance take-up caused by hospital consolidation were most pronounced for low-income and minority populations. Simpson (2003) finds that despite a large increase in prices, postmerger patients did not switch to alternative hospitals.

In sum, the message from this literature is clear. Consistent with the GNT model outlined above, mergers between rival hospitals are likely to raise the price of inpatient care and these effects are larger in concentrated markets. The estimated magnitudes are heterogeneous and differ across market settings, hospitals, and insurers.

#### 5.3.3 *Results from Structural Approaches*

There are two strands of this literature that we term structural and semistructural. Semistructural estimation approaches have a foundation in economic theory and rely on a specific economic model to guide the construction of variables (e.g., WTP) and guide hypotheses to be tested. However, these approaches are not purely structural in that some or all of the estimated parameters do not map into model primitives.

Town and Vistnes (2001) and Capps, Dranove, and Satterthwaite (2003) take semistructural approaches to estimating the relationship between bargaining leverage and price. In both of these papers, a measure of the health plan enrollees' willingness-to-pay (WTP) for a hospital is constructed and regressed upon hospital profits. In the notation of the model presented above, WTP is given by: $WTP_{J_s} = W_m(N_m, \overrightarrow{p_m}) - W_m(N_m \setminus J_s \overrightarrow{p_m})$.[53]

While these empirical implementations are not fully structural, the approach does map into a specific version of the GNT model. In the GNT model, if the copayment rate is zero and the bargaining weights are equal between the MCO and the hospital, then price is determined by:

$$(18) \quad \sum_{k \in J_s} q_{mk}\left[p_{mk} - mc_{mk}\right] = \frac{b_{s(m)}}{b_{m(s)}}\left[V_m(N_m, \overrightarrow{p_m}) - V_m(N_m \setminus J_s, \overrightarrow{p_m})\right].$$

[52] As noted by a referee, while the instrument is clever, there is some reason to be concerned about its validity. The instrument needs to be correlated with the likelihood of merger, but uncorrelated with unobservables that drive postmerger change in price. The latter condition may be difficult to satisfy in this setting.

[53] CDS are the first to use the WTP terminology in this context.

While in the CDS framework, profits are given by:

$$(19)\quad \sum_{k\in J_s} q_{mk}\left[p_{mk} - mc_{mk}\right] = \frac{b_{s(m)}}{b_{m(s)}}\left[W_m(N_m, \overrightarrow{p_m}) - W_m(N_m \setminus J_s, \overrightarrow{p_m})\right],$$

The Capps, Dranove, and Satterthwaite (2003) formula is equivalent to (18) if hospitals obtained a lump-sum payment for treating patients, with the MCO then paying all the marginal costs of their treatment. In practice, WTP measures are regressed on profits or price (in which case, WTP is normalized by $q_{mk}$) and marginal cost controls are added to the regression. The parameter on WTP captures the relative bargaining weights.

CDS estimate the relationship between WTP and hospital profits based on a specification analogous to (19). Using data from San Diego, they calculate WTP as described above and regress it against hospital profits. WTP and hospital profits are highly correlated. A one-unit increase in WTP increases hospital profits by $2,233. Lewis and Pflum (2011) build upon the CDS framework. They estimate a hospital cost function and specify a simple bargaining model and find that WTP is correlated with market power. They also find that systems operating in multiple markets have higher bargaining power, indicating that focusing only on local markets in evaluating the potential effect of a merger may be insufficient. A hospital's physician arrangements and other characteristics can also have a significant effect on its bargaining power.

Town and Vistnes (2001) acquired data on negotiated price between two MCOs and hospitals in Southern California to estimate the relationship between WTP and price. They find that hospitals with higher bargaining power (as measured by these two counterfactuals) negotiate higher prices. They also run merger counterfactuals, and their results indicate that mergers between neighboring hospitals can lead to significant increases in hospital prices, even in an urban environment with many other competing hospitals.

Gowrisankaran, Nevo, and Town (2013) estimate the parameters of the model outlined in section 5.2 using data from Northern Virginia. They center their analysis on a proposed merger between the large 1,800-bed Inova hospital system and Prince William Hospital, a 170-bed facility in Manassas, VA. In their structural work, Gowrisankaran et al. estimate the marginal cost and bargaining parameters using (17) in a generalized method of moments procedure to recover bargaining and cost parameters. Their model allows for the possibility that patients may face nontrivial out-of-pocket cost differentials between hospitals, which affects hospital choice and in turn affects equilibrium prices.

GNT find that patients pay an average of 2–3 percent of the hospital bill out of their own pockets. The own-price elasticity for systems is relatively low, ranging from 0.07 to 0.15. Without any health insurance, own-price elasticities would range from 3.13 to 6.57. Mean estimated Lerner indices, based on the bargaining model, range from 0.21 to 0.68 across hospital systems. From the inverse elasticity rule, these Lerner indices are equivalent to those implied by Bertrand pricing with own-price elasticities of 4.84 and 1.48, respectively. This implies that bargaining incentives make MCOs act more elastically than individual patients, but less elastically than patients without insurance.

With the structural parameters in hand, GNT then use the FOC from the bargaining problem to examine the equilibrium implications of several different counterfactuals. They find that Inova's acquisition of Prince William Hospital would lead to a significant price increase—the equivalent of

a 30 percent price increase at Prince William Hospital. They also examine the role of coinsurance rates in affecting the bargaining equilibrium. They find that a tenfold increase in the coinsurance rate leads to a 16 percent decrease in the equilibrium hospital prices.

Gaynor and Vogt (2003) take a different approach to structurally estimating the impact of hospital mergers. They adapt the structural models of Berry, Levinsohn, and Pakes (1995), who developed an estimation framework for differentiated products consumer goods, to the hospital industry. Their approach can be mapped into the GNT model by assuming the coinsurance rate, $\alpha$ equals 1, and the MCO's bargaining weight is zero.[54] Gaynor and Vogt use data from hospital discharge and financial data from California. They estimate the average elasticity of demand faced by a hospital to be –4.85 and find that hospitals are highly spatially differentiated—cross-price elasticities fall sharply with the distance between two hospitals. They then go on to simulate the impact of a hospital merger in San Luis Obispo, California, and predict that hospital prices would increase by up to 53 percent, with no significant difference in merger effects if the merging hospitals are NFP or FP.

Ho and Lee (2013) work with a bargaining model similar to GNT, but allow for health insurer competition; that is, they allow enrollees to switch plans in response to a network change. They note that insurer competition may have at least two offsetting effects on hospital prices. First, it may lead to lower premiums, placing downward pressure on prices because there is less surplus to be divided between insurers and providers. There is also a bargaining effect: by increasing consumers' ability to switch insurers in response to a network change, insurer competition may allow hospitals to "play" insurers off one another, giving them leverage to negotiate higher rates.

The authors derive an equation for price under the assumptions of a zero coinsurance rate and that premiums do not respond to a small change in hospital prices (although they may respond to a hospital being dropped from a network). They work with transaction price data for a large group of patients in California. Similar to GNT, price is expressed as a function of how (i) an insurer's premiums, demand, and payments to other hospitals, and (ii) hospital costs and reimbursements from other insurers change when a hospital is dropped from an insurer's network. They estimate a model of consumer demand for hospitals and use it to predict as many terms in the price equation as possible. They then use other variables to proxy for the terms that are not directly measurable with their data. A consumer WTP measure proxies for hospital attractiveness to patients (an input into insurer premium and demand changes). The impact of insurer competition is identified using a measure of the presence of Kaiser Permanente, a large vertically integrated health insurer, in the hospital's market. Specifically the authors use the share of each hospital's patients who live within three miles of a Kaiser Permanente hospital. Their intuition is that, if a hospital's patients live close to a Kaiser hospital, this should increase the attractiveness of Kaiser health insurance to those patients and reduce the threat points of other insurers in price negotiations with the hospital. They choose Kaiser Permanente for this analysis because, as a vertically integrated insurer that owns a network of providers and rarely refers patients outside its network, it affects the bargaining process between a non-Kaiser hospital and another insurer only through competition for enrollees at the insurer level. A different insurance carrier, which competed with the

[54] Gaynor and Vogt (2003) prove the conditions under which insurers choosing hospitals (and consumers choosing insurers) is equivalent to consumers choosing hospitals directly.

other insurer and also sent patients to the hospital, would impact the hospital–insurer bargaining process through multiple routes.

The authors allow for heterogeneous effects of insurer competition on prices across hospitals. They find that the impact is negative for most hospitals, but that attractive hospitals can benefit from insurer competition. For the top decile of hospitals by WTP, increasing the proportion of patients with local access to a Kaiser hospital by just 10 percent increases the negotiated price per admission by approximately 2 percent of the average price in their data. The implication is that more insurance market competition leads to higher hospital prices for attractive hospitals. However, since the estimation framework cannot be extended to predict impacts on insurance premiums, the welfare effects are unclear.[55]

The structural analysis of buyer–seller networks is a young and quickly evolving literature. While this literature is relatively new, the underlying policy implications of these papers is similar to the other strands of the literature. Hospitals (particularly those in systems) can acquire and exercise market power. The availability of high-quality data sets combined with recent theoretic and econometric advances point to this line of work leading to important findings in the near future.

### 5.3.4 *Not-for-Profit Firm Behavior*

The hospital sector is characterized by the fact that there is a mixture of firms with different ownership types. Not-for-profits are the most common, but there are substantial numbers of for-profit hospitals and public hospitals. Interesting questions arise in this context about differences in behavior between for-profit and not-for-profit firms (and publics), and the impact of the mixture of different types of firms in a market on firm conduct.[56] The role of not-for-profit hospitals in merger analysis was pushed to the fore with the decision in Butterworth/Blodgett hospital merger in which the court ruled that a merger between competing not-for-profits was not anticompetitive because the merged hospitals were unlikely to exercise their newly acquired market power.[57] The court heavily relied on the work of Lynk (1995) who argued that not-for-profit hospitals do not leverage their market power to increase prices. His findings were later overturned by Dranove and Ludwick (1999).

Several studies discussed above (e.g., Capps, Dranove, and Satterthwaite 2003; Gaynor and Vogt 2003) examine the issue of not-for-profit/for-profit differences in competitive conduct. There is little support for the notion that not-for-profit hospitals price differently than their for-profit counterparts. A recent study by Capps, Carlton, and David (2010) examines whether not-for-profit hospitals are more likely than for-profit hospitals to offer more charity care or unprofitable services in response to an increase in market power. The implication is that if there were such a difference, not-for-profits would be spending their profits from market power on socially beneficial activities. Capps et al. examine seven years of data on California hospitals and find no evidence of any such differences—not-for-profits do not engage in any more socially beneficial activities than do for-profits when they possess market power.

[55] A number of reduced-form papers find that hospital prices are lower where insurance markets are more concentrated (Halbersma et al. 2011; Moriya, Vogt, and Gaynor 2010; Melnick, Shen, and Wu 2011). Separately, Dafny, Duggan, and Ramanarayanan (2012) find that insurance premiums grow faster in more concentrated insurance markets, and Trish and Herring (2012) find that insurance premiums are higher where insurance markets are more concentrated.

[56] A classic review of the difference between not-for-profits and for-profit organizations can by found in Sloan (2000).

[57] *In the matter of Butterworth Health Corporation and Blodgett Memorial Medical Center*, (Docket No. 9283)

More evidence for the lack of a difference between not-for-profits and for-profit hospitals is found in Duggan (2000). He uses an increase in government reimbursements for treating indigent patients to test for differences in behavior between for-profit, not-for-profit, and public hospitals. He finds that both for-profit and not-for-profit hospitals responded strongly to the financial incentives in the policy. Both types of private hospitals treated the most profitable indigent patients and avoided unprofitable ones. Public hospitals' behavior did not change. In addition, both for-profit and not-for-profit hospitals used the revenues from the indigent care program to increase financial assets, as opposed to improve medical care for the poor. Duggan (2002) finds that not-for-profit hospitals located in areas with many for-profit hospitals were substantially more responsive to the changed financial incentives than not-for-profit hospitals located in areas with few for-profits.

### 6. *Insurer Premium Setting*

The next stage in the model outlined in section 2 concerns premium setting by insurers. Less work has been done in this area than on hospitals. The U.S. health insurance market is complex, with employers providing the majority of private coverage to their employees as a pre-tax fringe benefit. Each employer offers only a subset of the plans available in the market to its employees. Insurers therefore compete on two levels: first to be included in the menu of plans offered by employers, and then to attract employees away from the other offered plans. Employers may be self-insured, contracting with insurers only to administer their plans (including assembling the provider network and negotiating provider prices), they may purchase actual insurance, or they may offer a combination of self-insured and fully-insured plans. Some employers bargain directly with insurers over premiums and other coverage details; others hire benefits consulting firms to do this work for them. Given the complexities of this market, detailed datasets are needed to analyze it fully. Such data are not, at present, publicly available. Just a few authors have been able to access enough data to study the impacts of competition on insurer premiums and other characteristics, or to model other aspects of this market.

Dafny (2010) is one of the first of a new set of studies on insurance market competition. Dafny uses data from a benefits consulting firm on the plans purchased and premiums paid by a large number (776) of large employers over the period 1998–2005. While these data are not necessarily complete by market or nationally representative, they do represent the most complete and extensive data set with prices and quantities for the insurance market. Dafny's empirical approach is motivated by a model of the premium negotiations between insurers and employers. She examines the effect of shocks to employer profitability on changes in the insurance premiums they pay. The idea is that if insurers possess no market power, then the premiums they charge will not vary with employer profitability. Only if insurers have market power will they be able to price discriminate based on employer profitability. Dafny finds strong evidence that premiums increase with the buyer's profitability. She also finds that this effect decreases in magnitude with the number of insurers in the market, consistent with insurer market power falling with the number of firms. This provides the first piece of compelling evidence on competition in insurer markets—although of course it is possible that other factors could be driving the results. Dafny considers the alternative hypothesis that employers who experience positive profit shocks may share some of the rents with employees through increased coverage, leading to increased medical expenses and thereby increasing premiums without affecting insurer markups. The

fact that the effect is larger in markets with fewer insurers suggests this is not the primary mechanism. Dafny also includes a control for plan generosity that does not alter the results.

Dafny, Duggan, and Ramanarayanan (2012) use the same dataset as Dafny (2010), but examine how the growth rate of an employer's health insurance premiums is affected by health insurance market concentration (HHI). They address the potential endogeneity of the HHI measure by instrumenting for observed HHI with changes in local market concentration due to a large merger in 1999 between two national health insurers: Aetna and Prudential Healthcare. Using this instrumental variables approach, they find a significant impact of the predicted change in HHI due to the merger on the change in premiums. The cumulative effect of insurer market consolidation on premiums is approximately 7 percent. They also find evidence that the merger reduced physician earnings growth on average by 3 percent, while nurses' earnings rose slightly (by six-tenths of 1 percent). This is consistent with plan concentration leading to downard pressure on physician earnings and to substitution of nurses for physicians.

Dranove, Gron, and Mazzeo (2003a) also find evidence that more insurers in a market are associated with lower prices. They use a modification to the methodology of Bresnahan and Reiss (1990) that was devised by Mazzeo (2002). The idea is to use a cross-section of data on the numbers of insurance firms operating in different sizes and types of markets to identify threshold ratios (the ratio of the population necessary to support $n + 1$ firms to the population needed to support $n$ firms for different values of $n$ ), and to use these ratios to infer changes in firm profit margins as new insurers enter the market. The original methodology makes the assumption that firms are homogeneous, but Mazzeo (2002) adapts it to allow for heterogeneity across firms. Dranove et al. analyze data from 1997 and distinguish between HMOs that are national and those that are not; they hypothesize that local HMOs may not compete strongly with national HMOs because national employers may strongly prefer to buy from national HMOs and local employers from local HMOs. They allow for the possibility of any combination of any number of firms (up to five of each type). The parameter estimates indicate that the profits of local HMOs are virtually unaffected by the number of national HMOs and vice versa. However, the presence of a second same-type HMO reduces profits by approximately one-half, while the effects of subsequent same-type firms on profits are negative but declining in magnitude. These results indicate that there is fairly substantial competition within HMO markets but also substantial product differentiation. They suggest that there is virtually no competition between local and national HMOs.

The papers cited so far indicate fairly consistent evidence that insurer competition in the U.S. private insurance market affects prices. Several studies suggest that in other markets, where individual consumers rather than large employers make purchasing decisions, insurer competition has less impact. Frank and Lamiraud (2009) consider health insurance markets in Switzerland, where all residents are required to have health insurance. The government defines a standardized benefit for the required coverage, adjusts the payments insurers receive to compensate them for risk, and provides public information on prices. Individual consumers then pick their plans. The authors document a high degree of price dispersion in Swiss health insurance markets, with little evidence of reductions over time, even though the number of health plans per market rose over the time period studied.

They speculate that the large number of choices may lead to decision overload on the

part of consumers. They use survey data on individuals and publicly reported information on health insurance plans to estimate a model of health plan switching and find evidence that switching is significantly more common in areas with fewer plans, and that those who switched paid significantly less than those staying with the same plan.

While the institutions in the Swiss individual health insurance market are, of course, quite different from those in the U.S. large employer market, this suggests that individual decision making is more likely to be affected by transactions costs or irrationality than is that by large corporations. Similar patterns with regard to price dispersion in markets where choices are made by individual consumers have been documented in the U.S. market for Medigap insurance (Maestas, Schroeder, and Goldman 2009) and the Netherlands health insurance market (Bolhaar, Lindeboom, and van der Klaauw 2010).

Two additional papers model the Medigap and Medicare + Choice/Medicare Advantage markets.[58] They are consistent with insurer markets being quite concentrated, leading to fairly high prices. Starc (2014) models the Medigap market. She documents that the national four-firm concentration ratio is 83 percent (compared to 44 percent for private passenger automobile insurance and 34 percent for life insurance) and two firms (United Health, 46 percent, and Mutual of Omaha, 24 percent) account for almost all of that. Starc documents substantial price dispersion for Medigap policies even though plans are standardized (Maestas, Schroeder, and Goldman 2009, document the same finding) and a positive relationship between premiums and market concentration. A 1 percent increase in the two-firm concentration ratio is associated with a 0.26 percent increase in premiums.

Starc then estimates a structural model of insurance demand, claims, and seller costs (variable, fixed, and sunk) using data from the National Association of Insurance Commissioners (NAIC) and the Medicare Current Beneficiary Survery for 2006–2008. She estimates the average price elasticity of demand to be −1.12. This is a very low elasticity for firm demand, especially given the standardization of the products sold in this market. The small number may be due to aggregation (the NAIC data are at the level of the state and the true geographic market is likely much smaller than that); it may also be caused by weak instruments. Starc's interpretation is that the low elasticity is caused by strong brand loyalty. The estimated claims function indicates a positive relationship between premiums and claims: sicker consumers sort into more expensive plans from trusted (brand-name) insurers. This is indicative of the presence of adverse selection.

Starc also recovers estimates of cost parameters. She recovers variable costs using the usual pricing equation and assumption about conduct, but also accounting for the issue that health insurers are subject to minimum loss ratio regulations by the federal government. Sixty-five percent of premiums collected are required to be paid out to enrollees as reimbursements for covered services. Estimates of bounds on fixed and sunk costs are recovered using a revealed preference approach; the magnitudes are reasonable, but the standard errors on the estimates are very large. Finally, Starc takes her estimates and proceeds to welfare analysis. She calculates the impact of setting premiums equal to average cost. This leads to a large reduction in prices: equilibrium prices fall by 17 percent. The results emphasize the substantial market power exercised in this market.

[58] Medicare's private insurance program, whereby beneficiaries can opt out of traditional Medicare and enroll in a private plan, has been referred to by several names over its history including Medicare + Choice and is currently called Medicare Advantage. Medigap refers to private insurance purchased by Medicare beneficiaries to cover Medicare's "gaps" in coverage—cost-sharing or uncovered services.

Lustig (2010) examines the market for Medicare + Choice plans in 2000–2003. These are private managed-care plans that Medicare beneficiaries may choose as an alternative to traditional Medicare (the current version of this program is called Medicare Advantage). Lustig recovers preferences from demand estimation and then estimates plans' cost functions. He uses the estimates to investigate the welfare loss due to insurer market power, relative to that due to adverse selection. He finds that generosity preferences have a significant impact on plans' fixed costs, but not on the marginal cost of plan generosity. Further, consumers' health risk has no significant impact on insurers' costs. These results suggest that adverse selection may not be an important issue in the Medicare + Choice market. Lustig then simulates welfare changes when adverse selection is eliminated in markets with increasing numbers of insurers. He finds that the gains to eliminating adverse selection (as a percent of the total welfare difference between the observed and the socially optimal outcome) increase monotonically in the number of insurance firms. That is, when there are few firms in the market, most of the welfare loss is due to the exercise of market power, rather than to adverse selection.

An earlier paper by Town and Liu (2003) focuses on estimating the welfare associated with Medicare + Choice and the impact of competition on welfare; it does not allow for adverse selection. The authors find strong evidence of competitive effects consistent with Lustig. Consumer surplus increases in the number of plans in the county and most of the increase in welfare is due to increased premium competition. Comparing monopoly markets to markets with four firms, they find that 81 percent of the difference in welfare is due to increased premium competition.

Overall, the literature on health insurer competition indicates that while the U.S. insurer market is fairly concentrated, implying high premiums, increases in competition do generate premium reductions in cases where large employers make plan choices. In other markets, where consumers instead of firms choose plans, this result does not always seem to hold. We note that this finding is relevant for the Health Insurance Exchanges to be introduced under the ACA health reforms; we return to this issue below.

## 7. *Models of Health Plan Choice*

Moving to the next stage in the overarching model in section 2, once insurers have set their premiums, consumers observe each health plan's characteristics (including provider networks) and choose their plans. The welfare outcome depends not just on insurer characteristics, but also on consumers' ability to choose the plan that best matches their preferences (and medical needs). In this section, we review recent papers that investigate the frictions and issues that arise in consumer choice of health plans.

We note above that the U.S. commercial insurance market often involves employers choosing a menu of plans and employees choosing from within that menu. The first question we consider is the extent to which employers act as perfect agents for consumers in choosing their menus: that is, the extent to which consumers would benefit from being offered a larger choice set of plans. The literature here is quite limited. Dafny, Ho, and Varela (2013) and Dafny, Ho, and Varela (2010) use the same dataset employed in Dafny (2010) to consider this question. Their approach has three steps. First, they estimate a discrete choice multinomial logit model of employee demand for health plans, conditioning on the set of plans offered by the relevant employer in the relevant geographic market and year. The parameters from this model reflect the values placed by employees on individual plan characteristics. Second, they estimate an hedonic model of

premiums that permits them to predict the premiums a given employee would face for each plan offered in her local market (implicitly assuming continuing group-based pricing due to their underlying data). Third, they use the demand estimates, together with the predicted premiums, to predict employee choices of plans and their expected utility when offered additional plans that exist in the relevant market and year. Dafny et al. explicitly address a well-known problem with the logit choice model: that the logit error term has unbounded support, implying that the gain to consumers from increasing the size of the choice set will be biased upwards. Their preferred simulations hold fixed the number of choices offered to each consumer and predict the welfare gains from substituting consumers' most-preferred plans for those actually offered by their employers. This change in plan menus (assuming continued group-based pricing) is predicted to generate a benefit to consumers equivalent to 13 percent of combined employer and employee contributions. The authors conclude that, while moving away from employer-based insurance would likely generate premium increases due to reduced risk pooling and higher administrative costs, the offsetting benefit to consumers from increased choice would be substantial. The estimates indicate that employers are quite far from being perfect agents for their employees.

These results suggest that moving away from an employer-based system towards a system where consumers have more flexible choice should be welfare improving (with the caveat that premiums would likely increase as a result, and this price increase was not factored into the welfare analyses). However, the analysis assumes that the data reflect optimal decision making on the part of consumers. The authors implicitly assume that there are no informational asymmetries and that consumers are able to predict the probability that they will fall ill with different diagnoses in the following year, and understand the coverage and services offered by each plan for each diagnosis, so that their chosen plan offers the highest expected utility of all the plans offered to them.[59] We now review several recent papers that investigate these assumptions.

As noted above, there is a sizeable literature considering the impact of asymmetric information on health plan choice and welfare (see for example Einav and Finkelstein 2011 and Einav et al. 2013). Rather than providing an additional review of this literature, we focus on papers that investigate other frictions affecting consumer demand in this setting. Handel (2013) fits into this category. The author estimates demand using data on insurance choices within a single large firm. The data contain a major change to insurance provision that can be used to identify consumer inertia—including switching costs—separately from persistent preference heterogeneity. The firm changed its menu of five health plan offerings during the six-year period captured by his data, forced employees to leave the plans they had been enrolled in, and required them to actively choose a plan from the new menu with no default options. In subsequent years, the plan options remained the same, although prices changed over time, and consumers had their previous choice as a default option.

Handel therefore observes both unambiguously active choices—in the year when the menu changed—and choices in a more usual passive environment. He notes that, in cases where premiums changed over time so that particular consumers' default options were unambiguously dominated by other plans, the majority of such consumers did not switch plans. He also documents that the choices of incoming cohorts of new employees at the

[59] If this assumption is incorrect, it may help explain why unregulated employers often offer limited choice sets. However, this could also be due to high contracting costs.

firm reflect current prices and characteristics, while prior cohorts of employees make different choices that reflect past plan characteristics. Both findings are evidence of inertia on the part of consumers.

He then estimates a structural demand model that uses this variation in the data to identify consumer inertia separately from risk preferences and ex ante health risk. Inertia is modeled as the implied dollar cost of choice persistence and its estimated magnitude is large: it causes the average employee to forego $2,032 per year, with a population standard deviation of $446. This is a strikingly large effect compared to the average family's annual spending of $4,500.

In a second step, Handel specifies a simple insurer pricing model that fits his application closely: the (self-insured) firm sets a premium equal to the average cost of the prior period plus a fixed per-covered dependent administrative cost. He then applies the estimates to a counterfactual that reduces inertia: for example, this could potentially occur through targeted information provision or simplified insurance plan benefit descriptions. He finds that, holding prices fixed, reduced inertia leads to improved choices by consumers and therefore increased consumer surplus. However, if premiums are allowed to adjust in response to consumer sorting, then a policy that reduces inertia by three-quarters improves consumer choices, but also exacerbates adverse selection, leading to a 7.7 percent reduction in welfare. In this counterfactual, consumers who are healthy but also value comprehensive insurance can no longer reasonably purchase it because of the high premiums caused by sorting of sicker patients into higher-coverage plans. The welfare loss from adverse selection is therefore much greater in a market with fewer frictions, an interesting result that suggests an explanation for other papers' findings (e.g., Lustig 2010) that adverse selection is not a major problem in some health insurance markets.

One question raised by Handel (2013) is what causes this substantial consumer inertia, and what policy changes could (or should) be made to address it. Handel suggests that it could stem partly from tangible switching or search costs (although these are limited in his setting because all plans offer the same provider networks and cover the same medical services) and also from inattention and other psychological costs. Handel's main finding is that inertia can mitigate the welfare loss from adverse selection; however, it is also likely to reduce the welfare gain from improved matching of consumers to plans when choice sets expand. It could also reduce the premium reductions generated from insurer competition.

Additional evidence of consumer choice behavior that is not fully rational comes from Medicare Part D. This program, which was established in 2006, provides pharmaceutical benefits to seniors. While traditional Medicare Parts A and B are organized as a single-payer system, Part D benefits are provided by private health insurers that receive a subsidy from the government, as well as payments from their enrollees. A large number of plans are offered in each geographic region: the median market contained forty-eight plans by November 2006. The introduction of Part D quickly elicited a substantial amount of research evaluating consumer choices in that program.

Kling et al. (2012) documents a field experiment that provided consumers with information about the relative costs of each of the available plans in 2007, computed using their 2006 claims. The information was already available for free to consumers who used an online tool or called a Medicare help line. However, providing the information directly to consumers rather than them having to actively access it has an impact. They find that individuals who receive this information are more likely to switch plans and more likely to have lower costs: average costs

decline by about $100 per year in the intervention group relative to the control group.

Abaluck and Gruber (2011) is another important early paper that analyzes 2005–06 claims data from Wolters Kluwer, a firm that transfers information between plans. The claims are taken from a subset of pharmacies representing 31 percent of all prescription drug claims in the United States. The authors predict the out-of-pocket price each enrollee would have paid in every other plan in the choice set by binning enrollees into deciles of drug expenditure, days' supply of branded drugs, and days' supply of generics and taking averages (and variances) within each bin. These other-plan out-of-pocket prices are used as an input to a multinomial logit demand model. The estimated coefficient on premium is much more negative than that on expected out-of-pocket costs (more than five times as large, in some specifications).

The authors interpret this finding as evidence that consumers irrationally place more weight on premiums than on the total cost of enrolling in a particular plan. Consumers also exhibit strong preferences about observed characteristics such as donut-hole coverage and size of the deductible, even conditional on out-of-pocket risk. Of course it is possible that the results are caused by consumers taking account of factors that are not included in the model when making their choices—perhaps well-known, trusted brands offer donut-hole coverage, for example. However, it seems likely that (perhaps in addition to such factors) consumers made substantial mistakes in choosing their Part D plan in the first year of the program.

Heiss et al. (2012) conduct a similar exercise using administrative data from CMS from 2006–08. The authors compare the observed plan choices in the data to those under various counterfactual scenarios including perfect foresight (the consumer chooses her plan to minimize costs using exact actual consumption in the subsequent year), static beliefs (she chooses the plan that minimizes expected out-of-pocket expenses given drugs purchased in the current year), and a minimum premium rule. The observed choices lead to higher spending on average than any of these three decision rules. Their analysis suggests that less than 10 percent of individuals enroll in plans that are ex post optimal with respect to total out-of-pocket payments. Relative to the static beliefs benchmark, individuals lose on average about $300 per year. The authors conclude that unless a large number of consumers value something other than costs, they must be choosing suboptimally.

Finally Ketcham et al. (2012) demonstrate that enrollees make mistakes, but that they also switch plans and experience better outcomes after switching. The authors use panel data from insurance plans offered by the prescription benefit manager CVS/Caremark in 2006 and 2007. Like the previous papers, they document substantial overspending by enrollees relative to the lowest-cost plan. However they also show that enrollees with the largest errors in 2006 are most likely to switch plans at the end of the year. Enrollees who switch, and those with the highest out-of-pocket spending in 2006, are the most likely to reduce their out-of-pocket spending in 2007. These results are interesting and potentially important, indicating that the mistakes made by seniors in the first year of Part D might not extend to future years of the program. The results indicate that overspending by as little as $25 per month ($300 per year) in 2006 resulted in a 49 percentage point increase in an individual's probability of switching in 2007.

### 8. *Physician Treatment and Referral Decisions*

In the final stage of the overall framework we employ, some consumers get sick and utilize providers. The consumer chooses her

primary care physician from the network offered by the plan; that physician refers the patient to the hospital if further care is needed. The referral decision is likely to be made with some input from the patient, either because the physician incorporates the patient's opinions in his decision or because the patient chooses a physician with admitting privileges at her preferred hospital. Of course, the hospital chosen affects both the consumer's utility and also the cost of care. There is a growing literature that considers the impact of physician incentives on these referral choices.[60]

Early papers consider HMO gatekeeping. HMOs are managed care organizations that have restricted provider networks and also often give physicians cost-control incentives. The early papers focus on the ability of HMOs to reduce costs. This literature has been reviewed by Glied (2000). The summary suggests that HMOs have lower inpatient admissions and costs than other insurers. However, the early study results are often difficult to interpret because, for example, physicians and patients who prefer a low treatment intensity may select into HMOs. More recent papers address these issues. Cutler, McClellan, and Newhouse (2000) compare the treatment of heart disease in HMOs and traditional insurance plans and find that HMOs have 30–40 percent lower expenditures. Virtually all the difference comes from lower unit prices rather than differences in actual treatments, suggesting either that HMOs are able to negotiate lower prices than other insurers within a hospital or that they tend to refer patients to cheaper hospitals.

Gaynor, Rebitzer, and Taylor (2004) look in more detail at how HMOs achieve cost savings. They analyze physician responses to group-based financial incentive contracts within a single HMO. In the years of their data, this HMO contracted directly with independent physicians or group practices. Doctors were grouped by the HMO into "panels" that comprised between three and thirty physicians. Each physician was given a global budget for all his patients and was free to allocate spending as he wished. He received substantial performance payments (bonuses of 10 to 20 percent of total fees) only if his panel's expenditures for the year were lower than a prespecified budget. Gaynor et al. write down a model of moral hazard in teams that predicts that expenditure per patient will be higher in larger panels (where individual physicians generally have relatively low shares of the panel's patients and therefore face weak incentives) than in smaller panels.

They use data from the HMO to analyze the correlation between spending on utilization and the intensity of incentives, identified using variation in the physician's share of his panel's patients and the number of physicians in a panel. They begin with physician-level analysis, including specialty fixed effects, and find a negative significant relationship between expenditure per patient and the physician's share of his panel's patients. A panel data analysis adds a broader set of controls and generates consistent results: panels with more physicians have higher expenditures per patient. An increase in panel size from ten to twelve physicians is associated with an increase in expenditures of $6.58 (or 7.3 percent of the sample mean) per month. An additional analysis indicates that cost reductions are focused on outpatient rather than inpatient spending.

Overall, this paper indicates that physician groups that contracted with this particular

[60] There is also a growing literature on other aspects of physician behavior: for example, Dranove, Gron, and Mazzeo (2003) consider the implications of provider responses to the introduction of quality "report cards." Kolstad (2013) uses the introduction of report cards for cardiac surgery to investigate whether surgeons respond only to financial incentives or also incorporate nonfinancial incentives in their objective functions. However, the details of this literature are outside the scope of this paper.

HMO responded to the financial incentives introduced by the insurer, but a moral hazard in teams problem led the response to be negatively correlated with the size of the physician panel. The designers of the HMO's incentive system apparently understood the problem, but hoped that peer pressure between physicians would overcome the dilution of incentives that occurs in group settings; this turned out not to be the case. An additional question, left for future research, is the impact of cost-control incentives on the quality of care provided.

Ho and Pakes (2014) analyze patient referrals in California. They investigate the response of physicians' hospital referrals to the cost-control incentives generated by capitation contracts and also consider the trade-offs made between price, quality, and patient convenience. Commercial health insurers in California often pay large physician groups through global capitation contracts where the physician group is paid a fixed amount per patient to cover all costs of treating the patient (including hospital inpatient costs). An alternative is professional services capitation; this usually includes a "shared risk" arrangement under which the physician group receives a share of savings made relative to some preagreed benchmark, including hospital costs. Ho and Pakes analyze hospital referral choices for patients enrolled in six California health insurers that use these capitation contracts, rather than fee-for-service contracts, to different extents. They consider birth episodes.

The paper estimates a utility equation for each insurer that summarizes the preferences implied by observed hospital referrals. Two estimation issues need to be addressed. First, the price variable contains measurement error, which may bias the estimates. Second, the price for a patient with a particular severity is likely to be correlated with the unobserved hospital quality for that severity. The utility equation therefore needs to include hospital fixed effects that vary freely with severity of diagnosis.

Ho and Pakes develop an estimation procedure based on revealed preference. They assume that the hospital chosen for each patient generates greater expected utility than any of the other hospitals in her choice set. The utility equation for each insurer is assumed to be additively separable in price, distance and a set of severity-specific hospital "quality" fixed effects. The authors identify pairs of patients who have the same severity and are members of the same insurer, but who chose different hospitals. By defining the alternative of each patient as the chosen hospital of the other and summing the two patients' inequalities, they difference out the severity-hospital quality terms from the utility equation. By averaging the resulting inequalities over patients and hospitals they eliminate the effects of errors in price measurement. The result is a relatively straightforward estimator of bounds on the price coefficient. The estimates indicate that the price coefficients are much more negative than those estimated in a more standard multinomial logit analysis (which does not address either of the estimation problems). They are significantly more negative the higher the capitation rate of insurer payments.

Finally, the authors use the price coefficients to back out bounds on the hospital-severity specific quality terms in the utility equation. They add some structure that allows them to represent preferences as a linear function of price, quality, and distance that differs across insurers only in the coefficients of these variables. Econometric tests indicate that very little is lost in terms of fit by adding this structure. As a result, they can examine how the trade-offs between price, quality and distance vary with capitation rates.

Their findings indicate that, though the price coefficient varies directly with the

capitation rate, so does the quality coefficient. The ratio between the two differs extremely little across the insurers in the data. That is, while the trade-off between distance and price differs substantially across insurers, the trade-off between price and quality does not. Highly capitated more price-sensitive plans tend to send their patients longer distances to obtain similar-quality service at a lower price (but do not trade off costs against quality differently). Consistent with this, severity-adjusted outcomes also do not differ significantly across plans.

A few very recent papers evaluate initiatives that implement cost-control incentives like those planned for Accountable Care Organizations. Accountable Care Organizations are part of the Patient Protection and Affordable Care Act (2010). They are intended to provide incentives for providers of various types (e.g., physicians, hospitals, post-acute care facilities) to come together to coordinate care for Medicare beneficiaries.[61] The notion is that by coordinating their activities, these organizations can provide better quality care at lower cost.

For example, the Alternative Quality Contract (AQC) was adopted by Blue Cross Blue Shield of Massachusetts in 2009. It introduced physician incentives similar to those created by the global capitation contracts in California. Physician groups entered into five-year global budget contracts under which they received a budget per enrolled patient and were accountable for costs of all services provided to those patients, including inpatient care. Song et al. (2011) use a propensity-weighted difference-in-difference approach and find that, in the first year, this initiative was associated with reduced growth in spending on outpatient services and improved quality of care. Most of the savings came from referring patients to lower-priced providers.

Colla et al. (2012) study the Physician Group Practice Demonstration (PGPD), an early program launched by the Centers for Medicare and Medicaid Services to test the ACO model. Under the PGPD, ten participating physician groups were eligible for up to 80 percent of any savings they generated (after crossing a 2 percent savings threshold) if they were also able to demonstrate improvement on thirty-two quality measures, largely process measures of the adequacy of preventive care and chronic disease management. The study uses a difference-in-difference approach, comparing preintervention and postintervention trends in spending of PGPD participants to local control groups (Medicare beneficiaries from the same regions who received care largely from non-PGPD physicians). The results indicate very modest average annual savings per beneficiary (an average of $114 per person per year). There were no significant savings for individuals eligible only for Medicare (the bulk of Medicare beneficiaries), but annual savings were significant for patients eligible for both Medicare and Medicaid-vulnerable populations who consume a disproportionate share of Medicare and Medicaid spending. Substantial savings achieved by some participating institutions were offset by a lack of saving at others.

The Pioneer ACO Model is a program established by Medicare to allow health care organizations and providers that are already experienced in coordinating care for patients across care settings to move rapidly to become an ACO.[62] The results from the initial year of this program were somewhat mixed. Costs for the Medicare beneficiaries in the Pioneer ACOs grew by one-half of a

[61] For more information on ACOs see http://innovation.cms.gov/initiatives/aco/, http://www.kaiserhealthnews.org/stories/2011/january/13/aco-accountable-care-organization-faq.aspx.

[62] http://innovation.cms.gov/initiatives/Pioneer-ACO-Model/.

percentage point less than did costs for similar beneficiaries with conventional Medicare benefits, and there was improvement on some quality metrics.[63] Frech et al. (2013), however, report that only thirteen of the thirty-two participating organizations achieved savings, while nine left the Pioneer program, two left the Medicare ACO program entirely, and seven became regular Medicare ACOs.

Overall, the evidence on the impact of these ACO-type physician incentives on costs is fairly mixed. The largest effects seem to have been from physicians responding to cost-control incentives by choosing lower-priced outpatient units or hospitals for their patients. (One reason for the small impact of the PGPD on costs may be that Medicare prices are essentially fixed across providers.) Ho and Pakes (2014) suggests that the spending reduction from the move to lower-cost providers may come at the cost of a reduction in patient convenience, but perhaps not a reduction in quality of care or outcomes.

## 9. *Conclusion: Research Opportunities, Policy Impacts*

### 9.1 *Research Opportunities for Industrial Organization Economists*

Health care is an area rich in research possibilities for industrial organization economists. As we hope this review demonstrates, there has been a great deal of progress in understanding health care markets, but there is also a great deal that remains to be learned. Hospital markets have been the most active area of inquiry, in large part because of the availability of data. The recent availability of some new administrative claims databases will make much more research possible on all kinds of health care providers, but physicians in particular. Advances in computing capabilities make it feasible to store and compute models with "Big Data." Data on health insurance markets remain problematic, but this may change as the ACA gets implemented. Hopefully, data from the various health insurance exchanges set up under the ACA will be available. Data on private health insurance markets may also become more broadly available, perhaps due to regulatory requirements of the ACA, or perhaps due to a more general trend of "liberating" data. More extensive and detailed modeling of physician services markets, insurance network formation, and insurance markets should become possible as more and better data become available.

Obviously, more research is called for in the areas we reviewed. One obvious extension is moving beyond the econometric models that have been estimated and trying to incorporate more stages of the model described in section 2. Trying to identify and estimate a complex multistage model is very challenging, but the health care industry is a good place to attempt such a task. The institutions are a good fit, but just as importantly, as rich detailed data become available on multiple segments of the market (e.g., hospitals and insurers), empirical modeling will be facilitated.

The area of vertical relations is well suited to investigation in health care markets. This is a very unsettled area in industrial organization, with a paucity of empirical evidence. While there has been a great deal of horizontal consolidation in healthcare markets, vertical relations are also evolving rapidly. Various forms of restraints and integration between physicians, hospitals, and insurers are being developed, which provides opportunities for industrial organization economists to learn about the impacts of these arrangements.

We noted that research in the industrial organization of health care has moved beyond

[63] http://www.cms.gov/Newsroom/MediaReleaseDatabase/Press-Releases/2013-Press-Releases-Items/2013-07-16.html.

the early emphasis on the role of asymmetric information in health care markets. New, detailed datasets may allow new research that incorporates information asymmetries into the full model we have outlined here. For example, detailed administrative claims databases contain information on the identity of the physician who referred a patient for a procedure and the doctor who performed the procedure, as well as which procedure or service the patient obtained. There are commonly many patients referred or treated by the same physician in these large (billions of records) databases. As a consequence, it should be possible to specify and estimate models that recover patient and physician preferences, and therefore learn more about the role of asymmetric information via physician agency. If, in addition, information is available about provider contracts and financial incentives, (e.g., as in Gaynor, Rebitzer, and Taylor 2004; Ho and Pakes 2014), that can provide another important source of identifying information.

Last, in most of the research we've reviewed, patients' actual choice sets were not known. Researchers used a variety of more-or-less ad hoc approaches to deal with this. Obtaining information on insurers' actual networks can be surprisingly difficult, although clearly obtaining this information and coupling it with data on choices is ideal. Another possibility is to use econometric approaches to identify consumers' likely choice sets. This has been labeled the consideration set approach (Sovinsky Goeree 2008). Although it hasn't been widely employed in IO, and to our knowledge not at all in health care applications, this approach may have some real promise in health care IO research.

### 9.2 *Data*

As we mentioned previously, there are some promising new datasets for the hospital and physician industries. These datasets provide detailed information on where patients were treated, what treatments they received, what diagnoses patients had, and the prices that providers were paid. While this represents a tremendous improvement, these (health insurance claims) data don't generally contain information on the specifics of a patient's insurance benefits or the provider network. Claims data do not include potentially important health information, such as body height and weight, or test results (e.g., blood glucose or heart stress tests). Electronic health records (EHR) contain such information (and more). As they become more widely used, EHR data will likely become available. Merging those with claims data should allow for better controls for patient health status, which is critical to making accurate inferences about price and quality. The health insurance industry unfortunately has no good publicly available source of data for industrial organization economists. As we mentioned above, it's possible that the implementation of the ACA will help to rectify this situation. Last, there are no systematic data on provider contracts and organizational arrangements. Again, perhaps the implementation of the ACA, particularly with regard to ACOs, will spur data collection and dissemination.

### 9.3 *Potential Effects of Health Reform*

The primary objectives of the ACA are to expand health insurance coverage and provide incentives for health-care providers to reduce costs. Changes in market structure introduced to support these objectives could affect quality, prices, and costs through numerous mechanisms, several of which are suggested by the findings in the literature reviewed above. For example, Health Insurance Exchanges (HIEs) are being established to provide a forum where consumers who do not have access to large- or small-group health insurance through their employers can access health insurance

with low search costs. In addition, they are intended to play a role in risk pooling and to facilitate competition between health insurers with the goal of generating reduced prices and increased coverage.

Papers on health insurer choice such as Dafny, Ho, and Varela (2013) indicate that rational consumers would incur a substantial welfare gain from the expanded choice sets offered by HIEs. However, any frictions in the decision-making process, caused by switching costs or other types of inertia (Handel 2013), could limit the increase in consumer welfare. Frank and Lamiraud (2009) suggest that this could also feed through to premiums: consumer inertia could undermine the market mechanism and reduce the price (and quality) effects of insurer competition. Ho and Lee (2013) point out a possible downside of increased competition that could come with HIEs: intensified competition between insurers may give attractive hospitals increased leverage in the price-bargaining process and lead to hospital price increases. Further research would be useful to investigate the relative importance of these effects and give guidance to policymakers as health reform moves beyond its initial rollout phase.

The reforms also establish Accountable Care Organizations (ACOs), whose objective is to generate incentives for groups of health care providers, who together offer services to a large number of Medicare or privately-insured patients, to reduce costs and improve the quality of care. The structure of the ACOs that have emerged to date varies: for example, some include a member hospital while others comprise multispecialty physician groups that contract with hospitals outside the organization. Payment mechanisms also vary. In general, the payer (Medicare or the private insurer) commits to allowing the ACO to share in cost savings made relative to some preagreed target, but ACOs do not always bear risk as under a global capitation contract. Such details are likely to have important effects on the overall impact of ACOs. For example, the question of whether ACOs should include member hospitals is potentially important. Vertically integrated organizations that include hospitals could potentially generate improved coordination of care, reduced hospital admission rates, and improved outcomes, perhaps resulting in substantial cost reductions in the long term.

However, this type of ACO would likely imply a reduction in horizontal competition between physician groups (depending on the specifics of the market, for example, if a small number of hospitals within a market formed integrated organizations with a larger number of physician practices) and potentially affect the vertically integrated organization's bargaining position with MCOs. This could lead to price increases in the physician group market and/or across a broader array of health care services. It could also imply the loss of some savings that would otherwise be generated when physicians were given incentives to reduce costs.

Ho and Pakes (2014) and Song et al. (2011) provide evidence that physicians respond to cost-control incentives by referring their patients to lower-cost secondary providers, perhaps without a negative impact on quality. If hospitals were not members of ACOs and referring physicians moved patients towards lower-priced hospitals, this could both directly reduce costs and also give very high-priced hospitals a new incentive to lower their prices relative to the pre-ACO equilibrium. We note, however, that competition between hospitals to join a vertically integrated ACO could potentially yield similar benefits. As mentioned previously, however, early results from the Medicare Pioneer ACO demonstration are less conclusive regarding the impact of ACOs. As yet, the data available to study the impact of vertically integrated ACOs on quality and coordination of care are very sparse. Physician

groups, too, are an important piece of the picture but have been under-studied, again largely due to a lack of data. There will be opportunities for important research in these areas as the necessary data become available. This will allow for opportunities to make important contributions to the research literature, and to have an impact on important policy problems.

### 9.4 *Policy Impacts*

In an applied area such as the industrial organization of health care, research can have a real impact on policy. The ACA provides opportunities both for new research and for affecting policy. While we have highlighted the ACA, we also want to be clear that there are broad, important questions and issues on the functioning of health care markets that research in the industrial organization of health care can address that are not specifically linked to the ACA. Research evidence is very much relevant to policymakers concerned with the functioning of existing health care markets, as well as designing new markets, such as the health insurance exchanges.

Evidence of this is provided by the fact that research on the industrial organization of health care has had a noticeable impact on antitrust. Research results are of great interest to the antitrust enforcement agencies and the antitrust community more broadly. The research results we reported in section 5.3 have shifted the evidence base in hospital merger cases (Dranove and Sfekas 2009). Prior to the appearance of this research in the literature and its diffusion into antitrust, the U.S. antitrust agencies had lost all but one of the hospital merger cases they brought in the 1990s, even though these mergers were very likely harmful to competition. This trend has been reversed in recent years, undoubtedly due in part to the evidence introduced by the research literature. This includes the previously mentioned hospital retrospective studies undertaken by the FTC itself (Tenn 2011; Haas-Wilson and Garmon 2011; Thompson 2011). In addition, the enforcement agencies adopted new methods developed in the research literature and changed their approach to hospital mergers (Dranove and Sfekas 2009). The current approach to hospital mergers at the Federal Trade Commission is described by Farrell et al. (2011). This approach involves the use of a bargaining model for both a theoretical and empirical framework, analogous to the approach described in section 5.2.[64]

The functioning of health care markets has become a topic of intense interest to policymakers (e.g., Baicker and Levy 2013; Berenson, Ginsburg, and Kemper 2010; Berenson et al. 2012; Cutler and Morton 2013). As research moves forward invigorated by new methods, data, and researchers, we can expect to see substantial real-world impacts of the new evidence generated by economic research.

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[64] Another example of the impact of research on policy is the adoption of the Logit Competition Index (LOCI, Akosa Antwi, Gaynor, and Vogt 2013) by the Netherlands Healthcare Authority as part of their process of assessing competition in health care markets.

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