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The effect of hospital/physician integration on hospital choice

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ABSTRACT

In this paper, we estimate how hospital ownership of physicians' practices affects their patients' hospital choices. We match data on the hospital admissions of Medicare beneficiaries, including the identity of their physician, with data on the identity of the owner of their physician's practice. We find that a hospital's ownership of a physician dramatically increases the probability that the physician's patients will choose the owning hospital. We also find that patients are more likely to choose a high-cost, low-quality hospital when their physician is owned by that hospital.

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1. Introduction

Over the past decade, hospitals and physicians have become more integrated due to increases in hospitals' ownership of physician practices (Baker et al., 2014). There is considerable debate over how integration has affected agency problems between physicians and their patients. Agency problems arise in this context because patients depend on their physician not only for health services but also for advice about the types of services that they need (Evans, 1974).

Integration is often hypothesized to increase the incentive physicians have to refer patients to the owning hospital (O'Malley et al., 2011). This can occur through the exercise of managerial control under an employment contract or financial rewards such as call pay, directorships, and ancillary service agreements (Burns et al., 2013). Optimists about integration think that this reduces agency problems. According to this reasoning, closer ties between physicians and hospitals improve coordination across care settings and reduce wasteful duplication of effort. Integration also facilitates the sharing of gains from increased efficiency, thereby encouraging greater uptake of integration's opportunities. This is one goal of Accountable Care Organizations, a new form of integration promoted by the Affordable Care Act.

Pessimists think that integration's impact on patient referrals increases agency problems. According to this reasoning, coordination of referrals allows physicians and hospitals to increase their market power, raise prices, and share the gains from doing so. Some pessimists also believe that integration allows hospitals to pay physicians covertly for referrals, which has the potential to allow physicians to profit from recommending care that is cost-ineffective or even medically unnecessary.

For this reason, how integration affects hospital choice is an important empirical issue. Yet, despite this, no previous work has identified how a hospital's ownership of a physician's practice affects her patients' hospital choices, or even whether it affects patients' hospital choices at all.

In this paper, we seek to fill this gap. We use 2009 data on the ownership status of the practices of approximately 400,000 physicians from SK&A (a subsidiary of IMS Health), matched with data on which hospitals own physician practices from the American Hospital Association (AHA). Together, these data identify which hospitals own physicians, and among those that do, the identity of the physicians that they own. We match these data to Medicare beneficiaries' hospital admissions by the National Provider Identifier (NPI) of the patient's physician. We estimate conditional logit models that specify the probability of a patient choosing a particular hospital as a function of characteristics of the hospital (including its size, for profit/nonprofit status, whether it owns physicians, and measures of its cost and quality of care), the physician (owned by some hospital and owned by the hospital of admission), and interactions between the two. The parameters of interest are the effect on hospital choice

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of a physician's ownership status, and the effects of interactions between a physician's ownership status and measures of the hospital's cost and quality of care.

2. Previous literature

Our paper contributes to three literatures: the effects of physicians' financial incentives on agency conflicts between physicians and patients, the effects of hospital–physician integration, and the effects of hospital and patient characteristics on hospital choice. It is most closely related to papers about financial incentives and physician agency such as [Ho and Pakes \(2014\)](#), [Iizuka \(2012\)](#), and [Afendulis and Kessler \(2007\)](#). Using hospital discharge data for managed care enrollees from California in 2003, [Ho and Pakes \(2014\)](#) investigate how insurer capitation rates affect the relationship between hospital characteristics and enrollee hospital choices. They ask whether the observed referrals for enrollees whose physicians face different financial incentives indicate different tradeoffs between price, quality, and convenience. They find that physicians with capitated insurance contracts send their patients to lower-priced, more-distant hospitals, but that there is no effect on health outcomes or quality of care. Using patient-level data on prescriptions from Japan from 2003 to 2005, [Iizuka \(2012\)](#) shows that the choice between generic and branded drugs is influenced by the markups that doctors earn between the two versions. In particular, he finds that physicians who are vertically integrated with a pharmacy prescribe drugs with higher margins more frequently than do physicians who are not, holding other factors constant. Using patient-level data on elderly Medicare beneficiaries with coronary artery disease from 1998, [Afendulis and Kessler \(2007\)](#) compare patients who were diagnosed by a cardiologist who also provides surgical treatment to patients who were diagnosed by a cardiologist who does not. They find that diagnosis by a cardiologist who provides surgical treatment leads to increases in health spending, but not better health outcomes. Although these three papers show that physicians' financial incentives affect the extent of agency problems, none of them examine the effects of hospital/physician integration.

Other papers examine the effects of hospital–physician integration without focusing on the extent of agency problems (e.g., [Cuellar and Gertler, 2006](#); [Ciliberto and Dranove, 2006](#); [Baker et al., 2014](#)). For example, using hospital claims from Truven Analytics for the nonelderly privately insured from 2001 to 2007, [Baker et al. \(2014\)](#) investigate the consequences of hospital/physician integration for hospital prices, the volume of admissions, and spending. They find that increases in the market share of hospitals that own physician practices are associated with higher hospital prices and spending, whereas increases in the market share of hospitals that are contractually integrated with physicians are associated with a small reduction in the volume of admissions.

We build on the modeling strategy used in a long literature investigating the determinants of hospital choice (see [Gaynor and Town, 2012](#) for an excellent review). These papers specify a patient's hospital of admission as a conditional logit function of hospital characteristics and interaction between hospital and patient characteristics. These papers generally find that cost, distance to patients' residence, and measured quality all affect hospital choice in the expected direction ([Beckert et al., 2012](#); [Gaynor and Vogt, 2003](#); [Kessler and McClellan, 2000](#); [Romley and Goldman, 2011](#); [Tay, 2003](#)).

We extend the standard hospital choice model to include the ownership status of the patient's physician, whether the other hospitals that the patient could have chosen (but did not) own physicians, and the interaction between these factors and the hospital's cost, quality, and distance to the patient's residence. In this way, we identify the extent to which hospital ownership of physicians affects choice, and the influence of cost, quality, and distance on choice.

3. Model

We model the utility of patient i living in zip code z from choosing hospital j (Y_{ijz}^*) as a function of the attributes of j : the hospital's size, ownership, and teaching status (W_j); its quality, cost, and distance from patient i (Q_j | C_j | $D_{ijz} = X_{ijz}$); its relationships with physicians, including patient i 's physician (V_{ijz}); and unobserved variation in the attributes of hospitals, which may interact with the characteristics of patient i (ε_{ijz}). For ease of interpretation, we define higher values of X_{ijz} to be unfavorable, i.e., worse quality, higher cost, and longer distance. We do not observe Y_{ijz}^* , but only Y_{ijz} , where

$$Y_{ijz} = \begin{cases} 1 & \text{if } Y_{ijz}^* = \max(Y_{i1z}^*, Y_{i2z}^*, Y_{i3z}^*, \dots, Y_{ijz}^*) \\ 0 & \text{otherwise.} \end{cases}$$

If $Y_{ijz}^* = W_j\alpha + X_{ijz}\beta + V_{ijz}\gamma + \varepsilon_{ijz}$ and ε_{ijz} are independently and identically distributed with a type I extreme value distribution ([McFadden, 1973](#)), then

$$\Pr(Y_{ijz} = 1) = \frac{\exp(W_j\alpha + X_{ijz}\beta + V_{ijz}\gamma)}{\sum_{j \in J} \exp(W_j\alpha + X_{ijz}\beta + V_{ijz}\gamma)} \quad (1)$$

V_{ijz} contains three variables: whether j owns any physicians (V_{ijz}^{00}); whether i 's physician is owned by any hospital interacted with whether j owns any physicians (V_{ijz}^{000}); and whether i 's physician is owned by j (V_{ijz}^{000}). The effect of i 's physician's ownership by any hospital is not identified in the conditional logit model – as are none of the patient characteristics that are constant across hospital choices.

The coefficient of interest in Eq. (1) is the effect of V_{ijz}^{00} on hospital choice. It measures whether a hospital's ownership of a patient's physician affects the probability that the patient will choose the owning hospital, holding constant whether the hospital owns any physicians. Our estimate thus captures the incremental effect of a hospital's ownership of a patient's physician, over and above the general effect of owning physicians. Estimates from this model, however, do not indicate the likely consequences of hospital ownership of physician practices for patient well-being. If hospital ownership of a physician's practice leads the owned physicians to direct their patients to the owning hospital, patients may be better off if the owning hospital is of higher quality or lower cost, or is a better match for the patient's condition or location. Conversely, patients may be worse off if the owning hospital is lower quality, higher cost, or a worse match. To investigate this question further, we estimate an expanded version of Eq. (1) that includes interactions between X_{ijz} and V_{ijz} :

$$\Pr(Y_{ijz} = 1) = \frac{\exp(W_j\alpha + X_{ijz}\beta + V_{ijz}\gamma + (X_{ijz} \times V_{ijz})\delta)}{\sum_{j \in J} \exp(W_j\alpha + X_{ijz}\beta + V_{ijz}\gamma + (X_{ijz} \times V_{ijz})\delta)} \quad (2)$$

The coefficients of interest in this model are the interactions between X_{ijz} and V_{ijz}^{00} . They measure, respectively, whether hospital ownership of a physician practice affects i 's valuation of (i.e., the responsiveness of i 's hospital choice to) quality, cost, and distance. If the coefficients on these interactions are positive, then ownership of a physician leads that physician's patients to choose hospitals that are of lower quality, higher cost, or farther away. We also estimate a fully-interacted model that includes interactions between X_{ijz} and W_j :

$$\Pr(Y_{ijz} = 1) = \frac{\exp(W_j\alpha + X_{ijz}\beta + V_{ijz}\gamma + (X_{ijz} \times V_{ijz})\delta + (X_{ijz} \times W_j)\lambda)}{\sum_{j \in J} \exp(W_j\alpha + X_{ijz}\beta + V_{ijz}\gamma + (X_{ijz} \times V_{ijz})\delta + (X_{ijz} \times W_j)\lambda)} \quad (3)$$

We estimate Eqs. (1)–(3), allowing for arbitrary clustering of ε_{ijz} within 3-digit zip codes. We report coefficients in terms of their average marginal effects on choice probabilities.

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