

Does the Entry of an Ambulatory Surgical Center Affect Hospital Surgical Output and Hospital Profit?

JOB MARKET PAPER

(Draft – Do Not Quote)

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Abstract

This paper examines if the entry of Ambulatory Surgical Centers (ASCs) into a hospital's market impacts either the number of surgeries that hospital performs or its profit margins. I obtain annual data on hospitals from the American Hospital Association survey and the Centers for Medicare & Medicaid Services (CMS) Medicare Cost Report. I collect information on ASC characteristics from the CMS Provider of Services file. I use a fixed effects panel data model to measure if ASC entry impacts the hospital. I find a 1.71% decline in a hospital's outpatient surgeries and no significant change in inpatient surgeries when an ASC enters a hospital market. However, ASC entry does not seem to be associated with any substantial changes in hospital profit margins for either a hospital's outpatient or inpatient department. Therefore, even if ASCs engage in cream-skimming by treating a hospital's most profitable patients, ASC entry on average does not seem to cause a hospital financial harm.

Key Words. Ambulatory Surgical Center, Hospital Competition, Physician Ownership, Hospital Profit

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Many economists have examined how hospitals compete amongst themselves along price and non-price dimensions [(Zwanziger and Mooney 2005), (Abraham, Gaynor, Vogt 2005)]. However, when defining hospital markets, economists have generally assumed only hospitals produce healthcare services such as outpatient surgery and diagnostic imaging. The literature has ignored how Ambulatory Surgical Centers (ASCs) also produce those services and therefore alter the competitive environment of hospital markets. This paper examines how the entry of ASCs influences hospital output and profit. These two outcome variables are important to examine because ASC entrants could harm the financial health of a hospital by reducing its market share of valuable healthcare services. Hospital administrators often complain ASCs cherry pick the best patients in their market, leaving the hospital to treat sicker or poor patients who may be unable to pay for the hospital's services. An administrator of a Des Peres hospital in St. Louis, MO claimed that in 2005 only 31% of the hospital's revenue came from outpatient services, which tend to be profitable for hospitals (Feldstein 2006). However 5 years earlier, 52% of the hospital's revenue came from outpatient services. The administrator cited a nearby ASC that specialized in orthopedic surgery as a primary reason for the decline. Administrators contend when they are forced to treat relatively unhealthy or poor patients, they are unable to subsidize less profitable components of the hospital such as uncompensated care. They argue that they subsidize that kind of care with profits from the lucrative patients that ASCs tend to specialize in treating. The American Hospital Association claims hospital profit margins have declined because of surgery centers (Higgins 2005). In a study prepared for the AHA, the authors presented four case studies of how physician owned specialty hospitals (which are similar to ASCs) affect general hospitals (McManis Consulting 2005). The authors found hospitals in Wichita and Oklahoma City that shut down community medical education programs

because they could no longer be subsidized by the hospital's profit since they faced competition from nearby physician owned hospitals. The authors also stated in two of their case studies, hospitals were considering cutbacks in other subsidized services for low-income populations. Anecdotal stories like those are common. However, no previous research has analyzed a nation wide sample of hospitals to determine if these stories are the exception or are the rule. This research will shed light on this topic. If hospitals do lose a meaningful number of patients following the entry of an ASC, I expect hospitals may also have reduced profit margins and decrease their provision of unprofitable services like uncompensated care. Ultimately, while I do find that ASC entry negatively influences a hospital's provision of outpatient surgery, it seems ASC entry has almost no impact on a hospital's profit margins. This may be because a hospital's outpatient department offers many services beyond outpatient surgery. A hospital which suffers a reduction in outpatient surgery could increase volume on those other services and still remain profitable. Further, I only measure outpatient margins associated with Medicare patients. It is possible that ASC entry has an impact on the outpatient margins of other types of patients. However, hospital administrators concerns that ASCs are a detriment to the viability of their hospital seem exaggerated.

Background

ASCs differ from hospitals in a number of ways. ASCs are small healthcare facilities that predominately offer outpatient surgeries and certain high-tech diagnostic tests (such as MRI scans). By specializing in only a few tasks, ASCs likely provide these services at a lower cost than a hospital.² As shown in table 1 (MedPAC 2005), ASCs are typically for-profit facilities

² Hospitals also face more regulation, have more staff, and treat sicker patients than ASC's. These factors increase the overall cost of each healthcare service provided by a hospital.

located in urban areas. One peculiar feature of ASCs is that the physicians who treat patients at an ASC may also be partial owners of that facility. Since a physician acts as an agent for his patients, a physician-owner chooses to treat his patients at a hospital or the ASC. Amongst their patients, these physicians could cherry pick by treating high revenue-low cost patients at the facilities they own and treat low revenue-high cost patients at a hospital.³ Hospitals commonly complain that ASCs cherry pick the most profitable patients from their market (Abelson 2004). Kelly (2003) states that because ASCs have “physician investors, they have an unfair edge in referrals from physicians with a financial interest.” Another key feature of ASCs is their prevalence and safety. Outpatient surgeries are increasingly performed at ASCs. A survey by Oregon’s Health Policy and Research (2004) division found in 2003, Oregon ASCs performed 38% of all outpatient surgeries in that state. ASCs tend to perform low-risk surgeries that do not pose post-surgical complications. The Indiana State Department of Health (2003) found that in 2003, only 1 out of 444,368 (.225 per 100,000) surgeries performed in ASCs resulted in death. Further, only 1,941 (4.37 per 1,000) of those patients experienced complications requiring treatment for surgical infections or admission into a hospital. Fleisher, Pasternak, Herbert, and Anderson (2004) studied deaths and readmissions of Medicare beneficiaries following outpatient surgery at hospitals. 9 out of 360,780 (2.49 per 100,000) surgical procedures resulted in death. The rate of admission into a hospital following surgery was 21 per 1,000 procedures. The higher mortality and readmission rates for the hospital can be explained to some extent by their sample since the authors only examined Medicare patients. The statistics for Indiana used all patients, regardless of insurance status. Regardless of if the surgery occurs in a hospital or ASC, outpatient surgery rarely results in an unfavorable outcome.

³ Physician owners may do this to respond to financial incentives. They are residual claimants to any profit that their ASC earns, but are usually not residual claimants to hospital profit.

Literature Review

Few authors have examined the interactions between ASCs and hospitals. Preliminary research indicates that hospitals which compete against a newly constructed ASC could potentially lose significant revenue, which may reduce a hospital's profitability. Older and unhealthier patients (who are more costly to treat) are more likely to be treated at a hospital than at an ASC (Wynn et al. 2004). ASCs not only treat healthier patients than hospitals, but also may greatly reduce the number of outpatient surgeries nearby hospitals perform. Lynk and Longley (2002) present two case studies involving ASCs entering rural hospital markets. In both cases, after an ASC opened in a hospital's market, the hospital performed dramatically less outpatient surgery. This paper extends Lynk and Longley's work by measuring the relationship between a hospital's provision of outpatient surgery and the entry of ASCs into its market for a nationwide sample of urban hospitals.

Although competition between ASCs and hospitals has not been deeply explored in the literature, competition between hospitals has. Abraham, Gaynor, and Vogt (2005) identified how the number of hospitals in a healthcare market alters the competitive environment. The authors found that a healthcare market needs few hospitals for the competitive outcome to occur. Slightly more similar to this study, Zwanziger and Mooney (2005) found that following the enactment of a law encouraging price competition, hospitals in more competitive markets experienced slower growth in revenues and expenses compared to hospitals in less competitive markets.

Other authors have examined the impact specialty hospitals, similar to ASCs, have on general hospitals. Specialty hospitals share related characteristics with ASCs, such as physician ownership and the provision of specialized services. Therefore, the effects specialty hospitals

have on general hospitals, to some degree, may mirror the effects ASCs have on general hospitals. However, ASCs exhibit greater levels of physician ownership and provision in specialized services compared to specialty hospitals, meaning the effects of ASCs on general hospitals may be exacerbated compared with specialty hospitals. Several physicians typically own a single specialty hospitals each with a small stake in ownership relative to an ASC owner. The incentive to cherry pick could be much stronger at an ASC because physicians have a larger share of ownership compared to physicians at specialty hospitals. Also, specialty hospitals are larger than ASCs and have the ability to perform a wider range of services than an ASC, reducing specialization. Further, researching interactions between ASCs and general hospitals seems more fruitful than research between general hospitals and specialty hospitals due to the greater number of ASCs. Table 1 shows there were over 3,800 ASCs in 2003. Guteman (2006) states recent federal reports indicate only 67 physician owned specialty hospitals existed in 2003.

Barro, Huckman, and Kessler (2006) use a difference-in-differences estimator to examine changes in inpatient expenditures, the provision of intensive services, and mortality in those healthcare markets which experienced entry by a cardiac specialty hospital compared to those healthcare markets which did not experience entry. They find markets with specialty hospitals have patients with lower expenditures for cardiac care without significant changes in mortality. However, they also found the specialty hospitals treated healthier patients than the general hospitals. After a specialty hospital enters, existing hospitals might be burdened by sicker more costly patients. Researchers have found specialty hospitals tend to treat healthier patients than community hospitals (Greenwald et al. 2006). My paper adds to the literature by providing an analysis of how ASC entry into a hospital's market influences its provision of surgery and its

profitability. Although other authors have recently started to look at these issues as they pertain to the entry of specialty hospitals, no previous papers have examined ASCs in this manner.

DATA AND METHODS

Data and Study Sample

This paper primarily utilizes three data sources. I use the Centers for Medicare & Medicaid Services (CMS) Provider of Services (POS) file for information on every ASC in the U.S. certified to treat Medicare patients. I use the following information from the POS: entry date, geographic location, and services offered.⁴ I use the end of year POS from 1999 through 2001 and the second quarter POS from 2002 through 2004.⁵ I also analyze ASC entry in the year 1994 through 1998 by examining the 1999 POS. Since the POS reports the date an ASC started treating patients, I can determine if an ASC entered a market in 1994 through 1998 by looking at the 1999 POS.⁶ Next, I use the 1997 through 2004 American Hospital Association (AHA) annual survey for information on: geographic location, ownership, teaching status, facility size, services offered, staffing arrangements, number of outpatient surgeries performed, and number of inpatient surgeries performed. Additionally, the AHA survey includes the latitude and longitude of most of the hospitals in the sample. I determine the latitude and longitude of the ASCs and any hospitals with missing information by using geocoding software and their street address.⁷ I then utilize the “great circle” distance formula to determine the distance between each ASC and hospital.

⁴ I examine services offered to exclude any ASCs that focus exclusively on cosmetic surgery.

⁵ CMS was not able to provide the end of year POS for the years 2002 through 2004.

⁶ However, if an ASC entered in 1997 or before and then exited in 1998 or before, I would have no record of that ASC. This should not be a substantial problem since table 1 shows only a small number of ASC's exit each year.

⁷ Geocoding software was found at www.ezlocate.com.

Finally, I use the CMS Medicare cost report to obtain annual financial data for most U.S. hospitals. I only include hospitals reporting an entire year's worth of data. This data includes the costs and charges hospitals incur from treating patients in both the hospital's inpatient and outpatient department. I use the cost report to calculate the profit of a hospital's inpatient department (using all patients) and outpatient department (using only Medicare patients).⁸

As previously mentioned, I compute the distance between every healthcare facility in my sample. Merely knowing the distance between an ASC and a hospital is not sufficient to determine if the two facilities are in the same market. The ASC and hospital must compete for the same patients in order to be in the same market. No research has measured from what distances ASCs admit their patients. Thus, there is no existing guidance on how to define these markets. However, many authors have produced papers on how to define the market from which hospitals admit their patients. I assume the common market definitions in that literature are a good approximation of ASC markets.⁹

The easiest way to define hospital markets is with geopolitical boundaries, such as counties or Metropolitan Statistical Areas (MSAs). If a hospital and ASC are located in the same MSA [county], they are in the same MSA [county] hospital market. These definitions may create markets that are too small, too large or may inaccurately describe the market of hospitals located near a border. Researchers have also defined market boundaries using a fixed radius. For this method, researchers assign the same fixed radius to all hospitals in their sample. The radius around each hospital represents the hospital market. This definition also provides an inaccurate description of the market size since different hospitals have different market sizes. Gresenz, Rogowski, and Escarce (2004) accounted for that problem by constructing a variable-

⁸ Details on how variables were constructed from the cost report are located in Appendix A.

⁹ Garnick et al. (1987) present more detailed explanations of many of the market definitions mentioned in this paper.

radius measure for hospital markets. The authors calculate the actual radii from which hospitals in nine states admit 75% of their patients and also the radii from which those hospitals admit 90% of their patients. They then calculated predicted radii for the remaining hospitals in the 1997 AHA survey.¹⁰

Since a researcher can choose from several market definitions to perform an analysis, the market definition a researcher picks might drive the results. Wong, Zhan, and Mutter (2005) explored this topic and used two different measurements of competition and seven different market definitions to test how competition influenced a hospital's total operating expenses. For each market definition, as the hospital's Herfindahl Hirschman Index increased costs decreased and as the number of hospitals increased costs increased, implying their results did not depend on market definition. However, I still use multiple market definitions as robustness checks. The markets I use in my analysis include: County, MSA, Fixed Radius of 15 Miles, Variable Radius (75% of a hospital's patient admissions), and Variable Radius (90% of a hospital's patient admissions).

Some problems arise with those market definitions. Gresenz, Rogowski, and Escarce (2004) only constructed the variable radius of a hospital market for those hospitals that completed the 1997 AHA survey. Therefore, I cannot use hospitals that entered after 1997 because I do not know their market radius. This should not pose a problem since looking at the outcomes of established hospitals will provide clearer results. New hospitals may have unique circumstances, unassociated with ASC entry, that influence outcomes and would cause noise in the analysis. Another problem is that Gresenz, Rogowski, and Escarce did not construct the variable radius for every hospital that completed the 1997 AHA survey. They primarily focused

¹⁰ For the hospitals in my sample, the average 90% variable radius measure is 23.96 miles. The average 75% variable radius measure is 11.71 miles.

on non-government non-for profit hospitals and nonfederal public hospitals (county and city hospitals, but not state hospitals). It has some, but not all, investor-owned (for-profit) hospitals and a couple of federal hospitals. Although certain hospitals are not included in the analysis using the variable radius market definitions, they are included in the robustness checks using the alternative market definitions.

Empirical Analyses

This paper uses a fixed effects (FE) panel data estimator that examines the change in certain hospital outcomes from 1997 through 2004. The FE method measures the change in the dependent variable caused by ASC entry, controlling for unobserved variables that do not change over time. Equation (1) shows the specific FE model that I use for my analysis.

$$(1) \quad Y_{it} = \mathbf{b}_0 + \mathbf{b}_1 LAST_{it-1} + \mathbf{b}_2 LAST_{it-1}^2 + \mathbf{b}_3 LAST_{it-2} + \mathbf{b}_4 LAST_{it-2}^2 + \mathbf{b}_5 LAST_{it-3} + \mathbf{b}_6 LAST_{it-3}^2 + \mathbf{f}(Controls_{it}) + \mathbf{a}_i + \mathbf{w}_t + \mathbf{e}_{it}$$

In the above model, subscript i refers to a particular hospital. Subscript t refers to a particular year. The dependent variables I examine are hospital surgical output and hospital profit margin. My variable of interest, $LAST$, refers to the number of ASCs entering the market of hospital i during year $t-1$, year $t-2$, or year $t-3$. I include a quadratic of $LAST$ because the simultaneous entry of multiple ASCs into a hospital market might have an effect that changes with each additional entrant. I include several lags of $LAST$ because the effect of entry could change over time. In the first year of an ASC entrants, it may be difficult for an ASC to attract

patients and therefore have an effect on a hospital. After being established for a second or third year, an ASC entrant's effect on a hospital may be larger.

Additionally, in the model α_i represents a hospital fixed effect. w_t represents a year fixed effect. The FE estimator is unbiased if there are no unobserved variables that change over time that are also correlated with the error term during any time period. That is, the error term must be strictly exogenous. I attempt to satisfy that assumption by controlling for several demand side and supply side variables which could be correlated with the error term and change over time.

In the model, I include several variables that describe the demographics of a hospital's market. Certain markets may have characteristics associated with its population that could entice ASCs to enter or could influence any of the dependent variables I analyze. Using the Area Resource Files (produced by Quality Resource Systems, Inc.) I control for the quadratic of the number of people over the age of 65 in the county where a hospital is located. Also from the Area Resource Files, I control for the quadratic of the total number of people in the county where a hospital is located. Areas with larger populations, particularly larger elderly populations should support more healthcare facilities as well as require more surgeries. I use the annual Local Area Unemployment Statistics from the Bureau of Labor Statistics to control for the following characteristics of the county where a hospital is located: the unemployment rate, the percentage of people living in poverty, and the log of the median income. I use the Small Area Health Insurance estimates from the U.S. Census Bureau to control for the percentage of people without health insurance in the county where a hospital is located.¹¹ Again, income and the

¹¹ The Small Area Health Insurance estimates only includes information from the years 2000 and 2001. Therefore, for the years 1997 through 1999 I use the 2000 estimates. For the years 2002 through 2004 I use the 2001 estimates. My final results do not change if I exclude this variable from the model.

ability to pay for healthcare should influence both the entry of healthcare facilities into a market as well as the number of surgeries those facilities perform.

I control for a number of variables in the AHA annual survey that describe the characteristics of each hospital in my sample. Since hospitals in more competitive markets may be less profitable, I control for the magnitude of hospital competition with the total number of hospitals in the market as well as the hospital's Herfindahl Hirschman Index (HHI) using the number of hospital admissions at all hospitals in the hospital's market.¹² Since hospital size influences the number of surgeries a hospital performs, I control for the number of operating rooms, full time physicians, and include a dummy variable for whether a hospital has at least 100 beds. Additionally, I control for if a hospital is a non-profit, for-profit, or a public hospital. I control for whether a hospital has at least 20 residents, and therefore could be considered a teaching hospital. I also control for whether the hospital has an additional facility (besides the main hospital) where it provides outpatient surgery.

I use these controls because ASCs may be more likely to enter into a profitable market or a market that provides a large number of outpatient surgeries, potentially biasing my results. However, if these variables do not completely control for those problems my results would be biased toward finding no effect if hospitals that face competition from ASCs perform fewer outpatient surgeries and suffer a reduction in profit. Therefore, even if the FE estimator and my controls cannot fully account for differences amongst markets, any potential biases as described above would not cause me to report that ASCs have a stronger impact on hospitals than in reality.

¹² The HHI for each hospital is the sum of the squared market shares of admissions for all of the hospitals in a hospital's market.

Using the above model, I examine four dependent variables. I first examine the number of outpatient surgeries a hospital performs in a particular year as found in the AHA survey. If the results of the two case studies Lynk and Longley (2002) presented hold true for a large sample of urban hospitals, ASC entry should have a negative effect on this variable. I then analyze the number of inpatient surgeries a hospital performs in a particular year as found in the AHA survey. ASC entry likely has no effect on this variable since ASCs do not perform inpatient surgery, a result that would also mimic Lynk and Longley (2002). However its possible the effect of ASC entry on inpatient surgery could be ambiguous. Hospitals that lose outpatient surgeries to an ASC may somehow use excess capacity in their outpatient department to treat more inpatients, causing a hospital's provision of inpatient surgery to increase. Likewise, an entering ASC may treat some patients on an outpatient basis who previously would have been treated on an inpatient basis at a hospital, causing a hospital's provision of inpatient surgery to decline. The next two dependent variables I examine relate to the profit margins of a hospital. I use both the profit margin of the hospital's outpatient department (for only Medicare patients) and inpatient department (for all patients) as found in the Medicare cost reports. I predict ASC entry has a negative impact on the profit margins of the outpatient department and has no impact on the profit margins of the inpatient department. Two factors lead me to predict declines in a hospital outpatient department's margins following ASC entry: (1) the hospital will likely perform fewer outpatient surgeries following the opening of an ASC, and (2) hospital administrators claim ASCs cherry pick the most profitable patients in their market. However, it is unclear how the profit margins of a hospital's inpatient department would be affected, since the impact of opening an ASC on a hospital's provision of inpatient surgery could be ambiguous.

I measure outpatient profit margins using a hospital's operating margin as shown in equation (2).¹³

$$(2) \quad \text{Outpatient Margin} = \frac{\text{Medicare Outpatient Charges} - \text{Medicare Outpatient Costs}}{\text{Medicare Outpatient Charges}}$$

To accurately determine profit, the formula should use Medicare outpatient revenues (the amount Medicare pays the hospital for providing outpatient services) instead of charges (the amount a hospital bills Medicare for providing outpatient services). However, the cost report does not include outpatient revenue. Since charges can exceed revenue, my estimation of Medicare outpatient margins may be too high. Since I'm interested in the change in a hospital's margins after ASC entry, overestimating the margin is not a significant problem if a hospital's charges are proportional to revenues by the same constant from year to year. If hospitals with ASC entrants reduce their charges compared to hospitals with no entrants, I may estimate ASC entry has an artificially negative effect on hospital profits. However, after CMS introduced the outpatient prospective payment system in August of 2000, payment rates for outpatient surgeries were established, likely preventing a hospital from reporting charges that greatly differed from a hospital's revenue and reducing the likelihood of that problem.

I also test whether an ASC entrant in a hospital's market impacts the hospital's inpatient margin using equation (3).¹⁴ The Medicare cost report provides slightly better financial

¹³ Information on how to calculate Medicare outpatient charges and costs were obtained from Pink et al. (2006). See Appendix A for specific variable definitions.

¹⁴ Established definitions of inpatient costs or charges could not be found. To construct these variables, I carefully examined the Medicare cost report and used variables that corresponded to the outpatient definitions. See Appendix A for specific variable definitions.

information for a hospital's inpatient department, because it details a hospital's total inpatient revenues (not just charges) for all patients.

$$(3) \quad \text{Inpatient Margin} = \frac{\text{Hospital Inpatient Revenue} - \text{Hospital Inpatient Costs}}{\text{Hospital Inpatient Revenue}}$$

With the FE model I previously discussed, I assume the effect of ASC entry on a hospital's outcome variables behaves in a quadratic fashion. However, the effect of ASC entry on a hospital's outcome variables may be discontinuous and dependent on the number of pre-existing ASCs in a hospital's market. For example, in a market with a large number of ASCs, a new ASC may treat patients who previously were treated at other existing ASCs as well as a hospital. This could reduce the effect an ASC has on a hospital when compared to an ASC that enters a market with fewer ASCs. If an ASC did enter a market with a relatively small number of ASCs, a large proportion of the patients the ASC would treat may come from the hospital. Equation (4) shows the approach I use to measure this relationship.

$$(4) \quad Y_{it} = \mathbf{b}_0 + \mathbf{b}_1 \text{NUMASC}6_{it} + \mathbf{b}_2 \text{NUMASC}9_{it} + \mathbf{b}_3 \text{NUMASC}12_{it} + \mathbf{b}_4 \text{NUMASC}13_{it} \\ + \mathbf{b}_5 \text{LAST}_{it-1} + \mathbf{b}_6 \text{LAST}_{it-2} + \mathbf{b}_7 \text{LAST}_{it-3} + \mathbf{b}_8 (\text{LAST}_{it-1} * \text{NUMASC}6_{it}) \\ + \mathbf{b}_9 (\text{LAST}_{it-1} * \text{NUMASC}9_{it}) + \mathbf{b}_{10} (\text{LAST}_{it-1} * \text{NUMASC}12_{it}) + \mathbf{b}_{11} (\text{LAST}_{it-1} * \text{NUMASC}13_{it}) \\ + \mathbf{b}_{12} (\text{LAST}_{it-2} * \text{NUMASC}6_{it}) + \mathbf{b}_{13} (\text{LAST}_{it-2} * \text{NUMASC}9_{it}) + \mathbf{b}_{14} (\text{LAST}_{it-2} * \text{NUMASC}12_{it}) \\ + \mathbf{b}_{15} (\text{LAST}_{it-2} * \text{NUMASC}13_{it}) + \mathbf{b}_{16} (\text{LAST}_{it-3} * \text{NUMASC}6_{it}) + \mathbf{b}_{17} (\text{LAST}_{it-3} * \text{NUMASC}9_{it}) \\ + \mathbf{b}_{18} (\text{LAST}_{it-3} * \text{NUMASC}12_{it}) + \mathbf{b}_{19} (\text{LAST}_{it-3} * \text{NUMASC}13_{it}) + \mathbf{f}(\text{Controls}_{it}) + \mathbf{a}_i + \mathbf{w}_t + \mathbf{e}_{it}$$

In order to measure this effect, equation (4) is an alternative model where I include these additional dummy variables: $\text{NUMASC}6_{it}$ (Market has between 4 and 6 ASCs), $\text{NUMASC}9_{it}$ (Market has between 7 and 9 ASCs), $\text{NUMASC}12_{it}$ (Market has between 10 and 12 ASCs), and

$NUMASC13_{it}$ (Market has 13 or more ASCs). I again use the variable $LAST$ to describe the number of ASCs entering the market of hospital i in year $t-1$, $t-2$, and $t-3$. I then interact each of the dummy variables with each of the entry variables. If the coefficients on the interaction terms are significantly different than zero, the effect of an ASC entering a hospital's market depends on the number of ASCs in the market.

RESULTS

I report the full results for each dependent variable using the market type variable radius of 75% of a hospital's patient admissions. However, results (in terms of sign, magnitude, and statistical significance) are similar for the other market definitions mentioned previously. Standard errors are robust to heteroskedasticity and corrected for clustering at the MSA level. In my analysis, I only include general or surgical hospitals located in a MSA. Also, a hospital must classify itself as a private non-profit, private for-profit, or public hospital. To ensure that only I examine hospitals that perform outpatient surgery and have reported reasonable financial data, I only include hospitals that perform at least 20 outpatient surgeries in each year. I also only include hospitals reporting an operating margin for their outpatient department between -1 and 1. For the outpatient surgery sample, these restrictions provide 13,642 observations that represent 2,269 hospitals.

Table 2 provides summary statistics for the variables I use in the analysis.¹⁵ Table 3 examines how ASC entry influences a hospital's provision of both outpatient and inpatient surgery. Table 4 reports the effect of ASC entry on the operating margin of a hospital's

¹⁵ For each of the dependent variables that I analyze, I use a slightly different sample of observations. Values for certain dependent variables are missing for a small number of hospitals in my sample. The sample statistics shown in table 2 reflect the observations that were used in the regression analyzing the number of outpatient surgeries performed at a hospital.

outpatient as well as inpatient department. Table 5 examines the effect of ASC entry in differently sized markets.

As shown in table 3, ASC entry has a noticeable influence on the number of outpatient surgeries a hospital performs while having no effect on the number of inpatient surgeries a hospital performs. For ASCs entering in year t , each additional entrant is associated with a decline in outpatient surgery of 1.3% that is significant at only the 10% level. The summary statistics in table 2 report that on average a hospital market has 0.437 ASCs (Standard Deviation: 1.02) enter in year $t-2$ and 0.414 ASCs (Standard Deviation: 1.00) enter in year $t-3$. Therefore, if one ASC entered in year $t-2$, there would be an associated decline in outpatient surgery of 1.87%. If one ASC entered in year $t-3$, there would be an associated decline in outpatient surgery of 1.71%. The decline in outpatient surgery in year $t-1$, $t-2$, or $t-3$ are not significantly different from each other at any reasonable level of significance, implying time since entry does not influence an ASC's effect on a hospital.

The estimates for this model seem reasonable since the average hospital in my sample performs 5,614 outpatient surgeries in a year. On average (using the decline of 1.71% found for entry in year $t-3$), an ASC entering a hospital's market is associated with a reduction of 96 surgeries at that hospital. Each market has an average of 6.6 ASCs, implying the reduction in surgery caused by ASCs over time could exceed 10%. Although I do not have information regarding the volume of surgeries each ASC in my sample provides, I have limited information on the amount of surgery provided by ASCs in Indiana from the Indiana State Department of Health. In 2002, ASCs in Indiana performed an average of 3,494 surgeries. Also in 2002, according to sample of data I use in my regressions, an ASC on average was located in 7 hospital markets. According to my model, a new ASC entering into 7 different hospital markets would

have caused a 1.71% decline in hospital outpatient surgery in each of the hospital markets it entered. On average, amongst all the hospitals in an ASC's market, an entering ASC was associated with a total reduction of 674 surgeries. Again, this seems reasonable since it is only 19.3% of the average amount of surgeries an ASC in Indiana provides. The remainder of the surgeries ASCs perform likely come from patients who previously would have been treated in a physician's office or would be a new surgery that would not have been provided prior to the entrance of the ASC.

As expected, ASC entry has no influence on the amount of inpatient surgeries a hospital performs. These results confirm the two case studies Lynk and Longley (2002) presented are not anomalies. For a large sample of urban hospitals, ASC entry seems to have a negative effect on outpatient surgery while having little influence on inpatient surgery.

Table 4 shows ASC entry is not associated with a significant change in either a hospital's Medicare outpatient margin or a hospital's inpatient margin. It may not be surprising ASC entry has no measurable impact on the Medicare outpatient margin since ASCs only perform outpatient surgery, but hospitals provide other outpatient services besides outpatient surgery. Loss of margins due to a decline in outpatient surgery could be recovered from other lines of service. Further, hospitals treat patients besides those covered by Medicare.¹⁶ If I could measure the outpatient margin associated with treating these patients I may find the entry of an ASC causes a change in a hospital's margin. Additionally, ASC entry may cause a hospital's total profit to decline due to reduced volume, but margins could still remain roughly the same. This offers some proof that ASCs do not cherry pick the most profitable patients from a hospital's market.

¹⁶ Oregon's Health Policy and Research (2004) division found that in Oregon a third of hospitals charges for hospital outpatient surgery were billed to Medicare. The remaining charges were billed to other payors.

Table 5 examines whether an ASC entering a hospital market that already contains several ASCs has a different effect on that hospital compared to if the hospital market had fewer ASCs. If, when ASCs enter a market, they do not solely induce demand but instead take some surgeries away from existing providers, an ASC entering a market with several other ASCs may have less of an impact on a hospital because the new ASC takes patients away from other ASCs as well as the hospital. In the table, there are three sets of variables. The first set of variables describes how many ASCs entered market i in year $t-1$, $t-2$, and $t-3$. The second set of variables are binary and identify if in year t and market i there are between 4 and 6 ASCs, between 7 and 9 ASCs, between 10 and 12 ASCs, or 13 or more ASCs. Finally, I interact each of the binary variables with each of the entry variables. The coefficient on the interaction terms describe if there is a difference in the effect of entry into a market represented by one of the dummy variables compared to the effect of entry into a market with between 0 and 3 ASCs. This table shows an ASC entering a market with between 0 and 3 ASCs in year $t-1$ is associated with a 2.57% decline in hospital outpatient surgery. If the entry occurs in year $t-2$, entry is associated with a 5.47% decline in hospital outpatient surgery. If the entry occurred in year $t-3$, entry is associated with a 4.13% decline in hospital outpatient surgery. The difference between entry in year $t-2$ and year $t-1$ is significantly different from 0 at the 5% level. This, unlike table 3, shows that initially ASC entrants may not influence hospital output, but over time their effects become larger. The difference in entry between all other combinations of years is not significantly different from 0 at any reasonable level of significance. Also, unlike table 3, the effects of entry when examining these markets with few ASCs are much larger than when the number of ASCs is not considered.

To determine if the entry of an ASC in either $t-1$, $t-2$, or $t-3$ into a market with 4 or more ASCs is associated with a change in the level of a hospital's outpatient surgery, I test whether the sum of the coefficient on the entry variable and the coefficient on the interaction between the entry variable and market size variable is statistically different from 0. Table 5 shows that ASCs entering a market with 4 or more ASCs during year $t-1$ are not associated with a change in the level of outpatient surgery a hospital provides. That is, I do not find that these interaction terms plus the entry term differs from zero at any reasonable level of significance. I do find that if an ASC enters a market with between 4 and 6 ASCs in year $t-2$, the new ASC entrant is associated with a decline in outpatient surgery of 2.84%, a smaller change compared to an ASC entering a market with no more than 3 ASCs. This decline is significant at the 5% level. There is a similar decline in outpatient surgery for an ASC entering a market with between 4 and 6 ASCs in year $t-3$. In that case, an ASC entrant is associated with a decline in outpatient surgery of 1.75%. However this decline is only significant at the 15% level. For entry into market that have 7 or more ASCs in either year $t-2$ or year $t-3$, I find that the entry is not associated with any statistically significant change in outpatient surgery. An additional ASC in any sized market does not seem to influence inpatient surgery.

CONCLUSION

It seems ASC entry into a hospital's market has only some effect on a hospital amongst the outcomes measured in this paper. As mentioned previously, ASCs and hospitals vie for outpatient surgery patients, and it seems ASC entry reduces a hospital's provision of outpatient surgery. Further, ASC entry only impacts outpatient surgery in those markets with 6 or fewer ASCs. Despite this, ASC entry does not seem to impact hospital profit margins. This could

occur because hospitals provide other services in their outpatient department besides outpatient surgery. Therefore, a hospital's profit margins may not change following the entrance of an ASC because the hospital's other outpatient services take up the slack of the lost outpatient surgeries. A potential problem in the analysis is I only measure outpatient margins for Medicare patients, ignoring outpatient surgical revenue from other payors. It is possible ASC entry would have a stronger or weaker influence on outpatient margins when all patients are analyzed, providing an additional explanation for why I do not find that ASC entry influences margins. Further, since I measure profit margins, a hospital's total profit could change without a change in its profit margin.

Another potential flaw in this study is I treat all ASCs as identical. In reality ASCs come in different sizes. Larger ASCs may have more of an impact on hospitals than smaller ASCs. My results show an average effect over the sizes of all the different ASCs in my sample. Despite these shortcomings, the paper does provide one important finding. Since ASC entry impacts a hospital's provision of outpatient surgery, more research should examine how ASC presence influences the behavior of hospitals. Hospitals have devoted many resources to limiting the competition they face from specialized healthcare providers like ASCs and specialty hospitals.¹⁷ The fact that hospitals devote resources to stave off competition from ASCs shows the importance of ASCs. If hospitals continue to hinder the construction of new ASCs, patients may lose out on a low cost alternative location to receive outpatient surgery. However, it is unclear whether society would benefit from more or less competition in the healthcare market. Increased competition may provide lower prices to consumers. However, even though I was not able to show it here, increased competition may limit a hospital's ability to provide unprofitable services

¹⁷ Hospitals have sought exclusive contracts with health insurance providers in order to prevent ASC's from treating certain patients. Also in the past several years, hospital groups successfully lobbied for an 18 month moratorium on the construction of new specialty hospitals in order to perform research on whether they were beneficial.

such as healthcare for the poor or uninsured. In the upcoming years, it will be possible to determine if the entry of ASCs causes hospitals to reduce uncompensated care because in 2003 the Medicare cost report started to ask hospitals questions regarding the level of uncompensated care they provide.

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Table 1**Characteristics of Ambulatory Surgical Centers in the U.S. (1997-2004)**

	1997	1998	1999	2000	2001	2002	2003	2004
Number of facilities entering the market	237	228	162	295	446	309	365	315
Number of facilities that have exited or merged	40	46	20	53	103	83	75	66
Total facilities	2462	2644	2786	3028	3371	3597	3887	4136
Percentage of ASCs that are for profit	93	94	94	94	94	95	95	96
Percentage of ASCs that are nonprofit	6	6	6	6	5	5	5	4
Percentage of ASCs that are in urban areas	90	89	89	88	88	87	87	87
Percentage of ASCs that are freestanding	99	99	99	99	99	99	99	99
Percentage of ASCs that are hospital owned and operated	1	1	1	1	1	1	1	1

Source: MedPAC analysis of provider of services file from CMS

Table 2 - Summary Statistics

	Mean	Std. Dev.
Number of Outpatient Surgeries	5,613.952	5,228.321
Number of Inpatient Surgeries	3,625.233	3,543.788
Medicare Outpatient Margin	0.622	0.146
Medicare Inpatient Margin	0.053	10.535
Number of ASC entrants in year <i>t-1</i>	0.470	1.044
Number of ASC entrants in year <i>t-2</i>	0.437	1.025
Number of ASC entrants in year <i>t-3</i>	0.414	1.001
Number of ASCs in Hospital's Market	6.645	11.479
Herfindahl Hirschman Index	0.464	0.332
Total Population Over 65 (100,000) [County]	1.136	1.855
Hospital Wage Index	1.008	0.147
Real Estate Price Index	138.922	29.402
Percentage without Health Insurance [County]	13.800	4.410
Unemployment Rate [County]	4.938	1.836
Percentage living in Poverty [County]	12.018	4.597
Log of Median Income [County]	10.651	0.216
Full Time Physicians and Dentists	21.768	85.236
Provides Outpatient Surgery	0.981	0.137
Separate location for Outpatient Surgery	0.373	0.484
Number of Operating Rooms	10.765	8.930
Number of Hospitals	9.226	13.545
Small Hospital	0.173	0.378
Private Hospital	0.151	0.358
Public Hospital	0.135	0.342
Teaching Hospital	0.200	0.400
Total Population (100,000) [County]	10.185	18.192

Table 3
Fixed Effects Estimates of ASC Entry on Hospital Surgical Output

	Log of Outpatient Surgery	Log of Inpatient Surgery
	-0.0131	-0.0007
Number of ASCs entering in year $t-1$	[0.0068]+	[0.0056]
	0.0002	0.0009
Number of ASCs entering in year $t-1^2$	[0.0017]	[0.0015]
	-0.021	0.0001
Number of ASCs entering in year $t-2$	[0.0071]**	[0.0073]
	0.0024	0.0007
Number of ASCs entering in year $t-2^2$	[0.0014]+	[0.0011]
	-0.0201	0.0064
Number of ASCs entering in year $t-3$	[0.0062]**	[0.0053]
	0.0031	-0.0034
Number of ASCs entering in year $t-3^2$	[0.0008]**	[0.0028]
Herfindahl Hirschman Index	-0.0253	0.0294
	[0.0666]	[0.0797]
Population over 65 (100,000) [County]	0.3027	-0.1074
	[0.2609]	[0.2576]
Population over 65 squared (100,000) [County]	-0.0265	0.0177
	[0.0253]	[0.0166]
Full Time Physicians and Dentists	0	0.0001
	[0.0001]	[0.0000]*
Hospital has separate location to provide outpatient surgery	-0.0072	0.0033
	[0.0132]	[0.0092]
Number of Operating Rooms at Hospital	0.0155	0.0113
	[0.0017]**	[0.0017]**
Number of Hospitals in Market	-0.0054	0.0038
	[0.0047]	[0.0034]
Small Hospital	-0.0612	-0.1051
	[0.0326]+	[0.0389]**
Private Hospital	0.0386	-0.0036
	[0.0435]	[0.0563]
Public Hospital	-0.0386	-0.002
	[0.0465]	[0.0709]
Teaching Hospital	0.0445	0.0304
	[0.0251]+	[0.0221]
Total Population (100,000) [County]	-0.0164	0.0417
	[0.0231]	[0.0264]
Total Population Squared (100,000) [County]	0.0002	-0.0003
	[0.0003]	[0.0002]+
Constant	4.5059	3.495
	[2.2667]*	[1.9048]+
Observations	13642	13616
R-squared	0.062	0.022

Standard errors in brackets are robust and clustered at the MSA level

Percentage uninsured, unemployment rate, percentage living in poverty, log of median income, and year dummies were included in the model, but the results are not shown here.

+ significant at 10%; * significant at 5%; ** significant at 1%

Table 4
Fixed Effects Estimates of ASC Entry on Hospital margins

	Medicare Outpatient Margin	Medicare Inpatient Margin
Number of ASCs entering in year $t-1$	-0.0007 [0.0022]	0.2276 [0.2281]
Number of ASCs entering in year $t-1^2$	0.0003 [0.0003]	-0.032 [0.0333]
Number of ASCs entering in year $t-2$	0.0014 [0.0029]	-0.0193 [0.0265]
Number of ASCs entering in year $t-2^2$	-0.0001 [0.0005]	0.0017 [0.0027]
Number of ASCs entering in year $t-3$	-0.0014 [0.0022]	-0.2391 [0.2394]
Number of ASCs entering in year $t-3^2$	0.0014 [0.0006]*	0.0295 [0.0289]
Herfindahl Hirschman Index	-0.0054 [0.0156]	0.0662 [0.1326]
Population over 65 (100,000) [County]	0.0634 [0.0708]	2.2032 [2.0557]
Population over 65 squared (100,000) [County]	-0.0031 [0.0061]	-0.1815 [0.1807]
Full Time Physicians and Dentists	0 [0.0000]	0.0001 [0.0001]
Hospital has separate location to provide outpatient surgery	-0.0011 [0.0022]	0.0087 [0.0116]
Number of Operating Rooms at Hospital	0.0002 [0.0003]	-0.0013 [0.0026]
Number of Hospitals in Market	-0.0018 [0.0008]*	0.0058 [0.0084]
Small Hospital	-0.0111 [0.0053]*	-0.0207 [0.0236]
Private Hospital	0.0348 [0.0085]**	-0.0448 [0.0871]
Public Hospital	-0.0114 [0.0079]	-0.0678 [0.0584]
Teaching Hospital	0.0002 [0.0029]	-0.0333 [0.0251]
Total Population (100,000) [County]	-0.001 [0.0065]	-0.1347 [0.1484]
Total Population Squared (100,000) [County]	0 [0.0001]	0.0015 [0.0016]
Constant	1.3245 [0.3955]**	37.2034 [33.7325]
Observations	13642	13533
R-squared	0.356	0.001

Standard errors in brackets are robust and clustered at the MSA level

Percentage uninsured, unemployment rate, percentage living in poverty, log of median income, and year dummies were included in the model, but the results are not shown here.

+ significant at 10%; * significant at 5%; ** significant at 1%

Table 5
Fixed Effects Estimates of ASC Entry on Hospital Surgical Output

	Log of Outpatient Surgery	Log of Inpatient Surgery
Number of ASCs Entering Last Year	-0.0227 [0.0131] ⁺	0.0058 [0.0109]
Number of ASCs Entering Two Years Ago	-0.0492 [0.0133]**	-0.0041 [0.0115]
Number of ASCs Entering Three Years Ago	-0.0353 [0.0135]**	-0.0003 [0.0133]
Market has between 4 and 6 ASCs	-0.0433 [0.0277]	0.0178 [0.0202]
Market has between 7 and 9 ASCs	-0.0985 [0.0417]*	0.0547 [0.0355]
Market has between 10 and 12 ASCs	-0.1542 [0.0463]**	0.0486 [0.0357]
Market has 13 or more ASCs	-0.1941 [0.0558]**	0.0973 [0.0461]*
(Num ASCs Entering Three Years Ago) * Between 4 and 6 ASCs	0.0183 [0.0174]	-0.0053 [0.0147]
(Num ASCs Entering Three Years Ago) * Between 7 and 9 ASCs	0.0131 [0.0158]	-0.0147 [0.0130]
(Num ASCs Entering Three Years Ago) * Between 10 and 12 ASCs	0.0274 [0.0171]	0.0003 [0.0130]
(Num ASCs Entering Three Years Ago) * 13 or more ASCs	0.0162 [0.0146]	-0.0056 [0.0113]
(Num ASCs Entering Two Years Ago) * Between 4 and 6 ASCs	0.0207 [0.0190]	0.0106 [0.0163]
(Num ASCs Entering Two Years Ago) * Between 7 and 9 ASCs	0.051 [0.0203]*	-0.0032 [0.0229]
(Num ASCs Entering Two Years Ago) * Between 10 and 12 ASCs	0.0521 [0.0176]**	0.0118 [0.0132]
(Num ASCs Entering Two Years Ago) * 13 or more ASCs	0.051 [0.0156]**	0.0055 [0.0121]
(Num ASCs Entering One Year Ago) * Between 4 and 6 ASCs	0.0179 [0.0171]	0.0012 [0.0159]
(Num ASCs Entering One Year Ago) * Between 7 and 9 ASCs	0.0392 [0.0188]*	0.0105 [0.0163]
(Num ASCs Entering One Year Ago) * Between 10 and 12 ASCs	0.0244 [0.0184]	0.0043 [0.0162]
(Num ASCs Entering One Year Ago) * 13 or more ASCs	0.0409 [0.0137]**	-0.0192 [0.0217]

Standard errors in brackets are robust and clustered at the MSA level

All Control Variables included in tables 3 and 4 were used to estimate the model, but the results are not shown.

+ significant at 10%; ** significant at 5%; * significant at 1%

Appendix A: Financial variables found in the Medicare Cost Report

MCRinpatrev: Inpatient revenue for all payers

- Worksheet G-2: Financial Statements
- Column 1: Inpatient
- Line number 16: Total inpatient routine care services

MCRinpatcost: Inpatient costs for all payers

- Worksheet C Part I: Computation of ratio of costs to charges
 - Column 5: Total Costs
 - Sum of line numbers 25-36: All these line numbers fall under the heading of Inpatient routine service cost centers
-

MCRoutpat_medchar: Outpatient charges for only Medicare patients

Worksheet D, Part V (Title XVIII, Hospital): Apportionment of Medical, Other Health Services, and Vaccine Cost (Apportionment of Medical and Other Health Services Costs) (For years after 2000, only column 5, 5.01, and 5.02 are reported)

- Sum of the following Columns (All under the header Program Charges)
 - Column 2: Outpatient Ambulatory Surgical Center
 - Column 3: Outpatient Radiology
 - Column 4: Other Outpatient Diagnostic
 - Column 5: All Other
 - Column 5.01: PPS Services
 - Column 5.02: All Other
- Line number 104: Net Charges

MCRoutpat_medcost: Outpatient costs for only Medicare patients (For years after 2000, only column 9, 9.01, and 9.02 are reported)

- Worksheet D, Part V (Title XVIII, Hospital): Apportionment of Medical, Other Health Services, and Vaccine Cost (Apportionment of Medical and Other Health Services Costs)
 - Sum of the following Columns (All under the header Program Costs)

- Column 6: Outpatient Ambulatory Surgical Center
- Column 7: Outpatient Radiology
- Column 8: Other Outpatient Diagnostic
- Column 9: All Other
- Column 9.01: PPS services
- Column 9.02: All Other
- Line number 104: Net Charges