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# HMO Penetration, Hospital Competition, and Growth of Ambulatory Surgery Centers

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*Using metropolitan statistical area (MSA) panel data from 1992-2001 constructed from the 2002 Medicare Online Survey Certification and Reporting (OSCAR) System, we estimate the market effects of health maintenance organization (HMO) penetration and hospital competition on the growth of freestanding ambulatory surgery centers (ASCs). Our regression models with MSA and year fixed effects suggest that a 10-percentage-point increase in HMO penetration is associated with a decrease of 3 ASCs per 1 million population. A decrease from 5 to 4 equal-market-shared hospitals in a market is associated with an increase of 2.5 ASCs per 1 million population.*

## INTRODUCTION

Freestanding ASCs have been a growing phenomenon in the U.S. health care market for the past 20 years. Winter (2003) indicated that the number of Medicare-certified freestanding ASCs had increased from about 400 in 1983 to over 3,300 in 2001. These facilities typically consist of a small number of operating rooms and provide a specific set of surgical procedures (Casalino, Devers, and Brewster, 2003). Their expanding role in the U.S. health care delivery system has been controversial. Some have argued that these “focused factories” lower the unit cost of surgical care by performing a narrow set of procedures in a remarkably efficient fashion (Herzlinger, 2004). Others have

argued that such facilities pose unfair cost advantages to hospitals by drawing profitable surgeries and procedures away from hospitals (Winter, 2003). There are also concerns that ASCs may lead to unnecessary surgeries and procedures because of the financial incentives inherent in physician-owned ASCs and that their narrow service availability may compromise quality of care (Casalino, Devers, and Brewster, 2003; Mitchell and Sass, 2006).

While the growth of specialty hospitals has been contentious with concerns centering on physician ownership and favorable selection of healthy patients (Mitchell, 2006; Guterman, 2006; Stensland and Winter, 2006; Greenwald et al., 2006), the growth of ASCs has been much more rapid. Surprisingly, there has been little empirical research on ASCs and virtually none that has examined the effects of market conditions on the growth of ASCs. The concerns about the growth of ASCs, however, are much the same. Winter (2003) examined differences in the case mix of Medicare patients receiving ambulatory surgeries and procedures between hospital outpatient departments and ASCs, suggesting that ASCs might have treated patients with less intense case mix. Two studies examined the association of ASCs with hospital surgery markets. Casalino et al. (2003) reported the perceptions of medical group, hospital and health plan executives on the effects of ASCs on hospital markets, but were not able to quantitatively support these perceptions. Lynk and Longley (2002) examined the impact of ASC entry on hospital surgery volume in two commu-

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nities. They concluded that hospital outpatient surgery volume declined as a result of the new ASC entry and that doctors with an ownership position in the new ASCs reduced outpatient surgery volume of hospitals where the doctors had admitting privileges. Two other studies explained the factors influencing the growth of ASCs. Casalino and colleagues (2003) suggested that the absence of State certificate-of-need (CON) laws and the presence of large single-specialty groups in a health care market were likely factors associated with the development of ASCs. A preliminary report by the Medicare Payment Advisory Commission (2004a), using cross-sectional data, suggested that markets with higher managed care penetration had slower growth of ASCs.

This study contributes to the existing literature on ASCs. In this analysis, we start with an overview of rapid growth of ASCs over the past two decades. We then present a model of how changes in health care market characteristics may affect the growth of ASCs. In particular, we focus on two key market characteristics—managed care penetration and hospital market concentration. Finally, we empirically analyze the effects of the two key market characteristics on the growth of Medicare-certified freestanding ASCs, using a balanced 1992-2001 MSA level panel dataset constructed from the 2002 Medicare OSCAR system.

## BACKGROUND

Advances in anesthetics and the development of minimally invasive surgical techniques since the 1980s have made it possible to move many surgeries and procedures from an inpatient to an ambulatory setting (Detmer and Gelijns, 1994). Contemporaneous changes in health care market characteristics, particularly the proliferation of managed care activities

accompanied by increasingly consolidated hospital markets and emerging hospital systems (Cueller and Gertler, 2003), may have also encouraged providers to shift deliveries of surgeries and procedures from the inpatient to ambulatory settings as a method of cost control.

ASCs have developed over time, as entities that are organizationally distinct from hospital outpatient surgery departments. Most ASCs are freestanding facilities that are not owned outright by hospitals. However, they are required by Medicare to be licensed by the States in order to be Medicare-certified providers (Casalino et al., 2003). Almost all ASCs are for-profit, located in large metropolitan areas, and equipped with two or more operating rooms (Medicare Payment Advisory Commission, 2004b). Many ASCs specialize in one or two types of surgical services such as ophthalmology, gastroenterology, and orthopedic surgeries or procedures (Winter, 2003; Medicare Payment Advisory Commission, 2004b). ASCs are assumed to be a lower cost alternative to hospital outpatient surgery departments possibly because of their specialization and lower overhead costs. However, they are paid more generously by Medicare in 8 of the 10 surgical procedure categories that account for the highest share of Medicare payments to ASCs (Winter, 2003). Thus, differences in Medicare facility payment rates between ASCs and hospital outpatient surgery departments may create potential incentives for ASCs to selectively perform certain types of more profitable surgeries or procedures (Winter, 2003).

Medicare pays surgeons the same professional surgical services regardless of delivery settings. Surgeons who have an ownership interest in an ASC, however, can earn a share of profit from their investment in the ACS in addition to their professional fee. Thus, there is some incentive

for surgeons to steer patients away from community hospital outpatient facilities to ASCs where they have an ownership interest. Federal laws (Stark I and II) generally prohibit physicians from referring their patients to facilities in which the physicians have an ownership (U.S. Department of Health and Human Services, 2004). However, ASCs are exempted from this prohibition (Iglehart, 2005).

Some State regulations such as CON laws are likely to influence the growth in ASCs (Casalino et al., 2003). CON laws require that a covered entity obtain approval from the State before undertaking major capital investments such as new construction, renovation, or expansion into new service lines. Some States do not have CON laws while in others the dollar threshold for investments to come under CON reviews is set higher than the amounts needed to open some types of ASCs. However, a preliminary report suggests that CON laws, as currently in place, may only be weakly associated with the growth of ASCs (Medicare Payment Advisory Commission, 2004a).

## CONCEPTUAL OVERVIEW

While advances in surgical technologies undoubtedly have driven the overall growth of ASCs, changing market characteristics may have much to do with the differential growth of ASCs across markets. Two factors of particular interest are the growth in managed care influence and the consolidation of hospital markets.

The comparative advantage of managed care plans is their ability to negotiate lower prices in exchange for greater service volume.<sup>1</sup> Altman, Cutler, and Zeckhauser (2003) found that HMOs offered to Massachusetts State employees in 1994-1995 paid \$20,808 less for coronary artery

bypass grafts and \$4,865 less for cesarean-sections than did the indemnity plans also offered to employees.

If ASCs have a cost advantage over hospital outpatient departments because of their quality and efficiency (Casalino, Devers, and Brewster, 2003; Herzlinger, 2004), one would expect managed care plans to seek contracts with them. This demand would lead more ASCs to enter the market. Thus, we hypothesize that greater managed care penetration will lead to more ASCs in a market.

A tenant of standard economics is that prices are more likely to be driven down to marginal costs when there are more competitors in the market. Melnick and colleagues (1992) were the first to show that a managed care plan (in California) was able to negotiate lower hospital prices when there were more hospitals in the local market. Bamezai et al. (1999) showed that managed care penetration had a larger restraining effect on hospital cost growth when there was greater hospital competition in the market. Their results implied that a market with four equally sized hospitals would have hospital cost growth that was 6 percentage points lower than a similar market with only two equal sized hospitals (Morrisey, 2001). More recently, the U.S. Government Accountability Office (2005) examined the transaction prices paid to hospitals by insurers participating in the Federal Employees Health Benefits Plan. They found that hospitals in the least competitive quartile of MSAs had prices that were 18 percent higher than those in the most competitive quartile of MSAs.

Other things equal, higher prices should lead to the entry of new competitors. ASCs serve as substitutes to hospitals for outpatient surgery. Thus, we hypothesize that greater hospital concentration will lead to more ASCs in a market.

<sup>1</sup> For a review of hospital markets, refer to Morrisey (2001).

## METHODS

### Data Sources

We used four secondary data sources for our empirical analysis. The main data source is an extract from the 2002 Medicare OSCAR system, which reported data on all Medicare-certified freestanding ASCs in operation at the end of 2001. (Hereafter, ASCs refers to Medicare-certified freestanding ASCs.) Relevant information in the OSCAR includes facility opening dates as well as State and county location. However, the OSCAR data provide no information on the volume of services provided by ASCs.

The three complementary data sources included an HMO enrollment file that reported the number of HMO enrollees at the county level from 1992-2001, the American Hospital Association (AHA) annual survey of hospitals including information such as the number of hospital admissions from 1992-2001, and the Area Resource Files (ARF), a public use file, that compiles county-level information such as the supply of physicians, population estimates, and demographic and economic characteristics from 1993 and 1995-2003. (We used multiple-year ARFs to construct a longitudinal database.)

We defined an MSA as the health care market and identified them based on the 2001 designations by the Office of Management and Budget. We aggregated all county-level data to the MSA level and constructed a 1992-2001 MSA-level balanced panel dataset by merging ASC data with HMO penetration, AHA survey files, and ARF data. (Data from non-MSA counties were excluded from the analysis.) In 2001, there were a total of 322 MSAs in the U.S., but the final panel dataset included only 317 MSAs each year because HMO penetration data were not available in 5 MSAs.

### Dependent Variable

The dependent variable is ASCs per 10,000 population, calculated as the number of ASCs in an MSA divided by the MSA population and multiplied by 10,000. We were unable to capture two important pieces of information on ASCs that were potentially relevant to this study. The first is specialties of ASCs. Market effects might vary by type of procedure because of their differential profitability implications to ASCs. Thus, analyzing the growth of ASCs only in aggregate may bias our results to the null. The second is mergers and closures information on ASCs. There have been ASC mergers and closures. For example, during the period from 1997-2002, there was an average of 58 ASC mergers and/or closures per year, while 279 new ASCs were opened per year (Medicare Payment Advisory Commission, 2004a). While information on new and terminated providers is available in the OSCAR data, complete information on mergers is more difficult to obtain.

### Explanatory Variables

Two market characteristics are key to our hypotheses about ASC growth. The first was managed care penetration. Managed care includes HMOs, preferred provider organizations, and their derivatives. However, the literature suggests that preferred provider organizations have been much less effective than HMOs in controlling health care costs (Bamezai et al., 1999; Morrissey, Jenen, and Gabel, 2003). Thus, we focused only on HMO penetration in this study. Publicly available HMO enrollment data are reported by the location of the headquarters of the HMO and, therefore, are misleading. We use a penetration measure constructed from HMO enrollment data previously reported

by Baker (1997). The number of HMO enrollees (all ages combined) were reported once in 1992 and 1993 using data from the Group Health Association of American (GHAA), twice (July by the Interstudy and December by GHAA) in 1994, and twice (January and July both by the Interstudy) from 1995-2001. We calculated HMO penetration as a ratio of the total number of HMO enrollees to the total population in each MSA. For the years during which the number of HMO enrollees were reported twice, we used the average number of HMO enrollees.

The second key market characteristic was community hospital concentration, measured by the Herfindahl-Hirschman Index (HHI) from AHA admissions data (U.S. Department of Justice Web site). The HHI is defined as the sum of the squared admission market shares of all community hospitals in an MSA. (The value of HHI ranges from 0 to 1. The higher value of HHI indicates a more concentrated market.) A potential limitation of using individual hospital market share to measure competition is that it may overstate market competition by failing to account for the rapid development of hospital systems (Cuellar and Gertler, 2003).

Other MSA-level covariates, all constructed from ARF data, included per capita specialty surgeons (specializing in colon/rectal surgery, general surgery, neurological surgery, obstetrics-gynecology subspecialties, ophthalmology, orthopedic surgery, otolaryngology, plastic surgery, thoracic surgery, and urology), per capita total non-Federal physicians (i.e., excluding physicians full-time employed by the Federal Government), the proportion of population age 65 or over, per capita income, and the unemployment rate among those age 16 or over.

## Multivariate Statistical Analysis

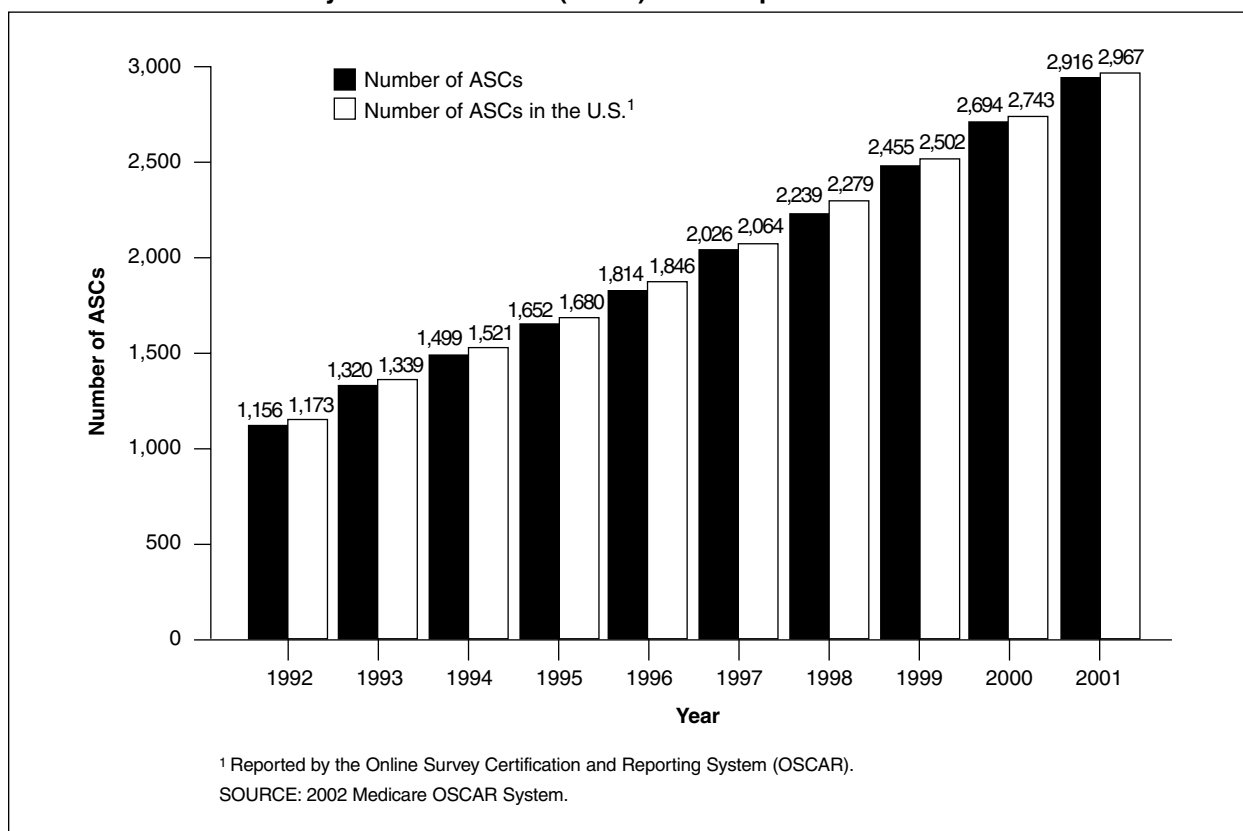
The main concern about estimating the market effects on ASCs is that unobservable market heterogeneity and secular time trends (i.e., unobservable factors correlated with both the dependent variable and the two key explanatory variables) could yield biased estimates. With this concern in mind, we estimate ordinary least squares regression models with MSA and year fixed effects. This two-way fixed effects specification may mitigate potential biases arising from any time-invariant MSA-level covariates (e.g., geographic location of ASCs, differential preference or tastes of surgery delivery setting) as well as important time trends (e.g., advances in medical technology, nationwide policy changes). In addition, we control for a set of observed time-varying MSA-level demand and supply covariates in the regression models. Our regression model took the following form:

$$ASC_{it} = \alpha + \beta HMO_{it} + \gamma HHI_{it} + \delta Z_{it} + \sigma_i + \tau_t + \mu_{it}$$

where the number of ASCs per 10,000 population in MSA  $i$  in year  $t$  is a function of HMO penetration, hospital concentration (HHI), a vector of other market conditions ( $Z$ ) as well as year ( $\tau$ ) and MSA ( $\sigma$ ) fixed effects. The  $Z$  vector includes measures of the number of specialty surgeons per 10,000 population, the number of non-Federal physicians per 10,000 population, the proportion of the MSA population age 65 or over, per capita income, and the unemployment rate. Standard errors were adjusted via Huber robust standard errors correction (White, 1980).

In sensitivity analyses, we ran the model using lagged right hand side variable to account for ASC delays in adjusting to market conditions. In addition, we ran

**Figure 1**  
**Growth of Ambulatory Service Centers (ASCs) in Metropolitan Statistical Areas: 1992-2001**



the model interacting HMO penetration and hospital concentration to see if ASCs depended on the interaction of HMO penetration and hospital competition.

## RESULTS

### Trends and Market Characteristics

Table 1 shows the total number of ASCs in MSAs growth rate from 1,156 in 1992 to 2,916 in 2001, whereas the corresponding number of ASCs in MSAs reported by the 2002 OSCAR grew from 1,173 to 2,967 (Figure 1). Thus, our data captured almost all operating ASCs in MSAs in 2001. The number of ASCs per 10,000 population increased at a similar rate from 0.07 to 0.17 during the same period. (Twenty of the 317 MSAs had no ASC during the study period.)

HMO penetration almost doubled from 11.8 percent in 1992 to 20.1 percent in 1999, but declined slightly after 1999. Hospital market concentration remained relatively stable until 1996, but began to increase afterward, reflecting an increase in hospital mergers in the late 1990s (e.g., the number of community hospitals used to calculate HHI in this study decreased from 3,037 in 1992 to 2,791 in 2001).

Figure 2 shows the results of two bivariate comparisons relating changes in HMO penetration and hospital market concentration to the growth in ASCs per 10,000 population because the MSA fixed effects approach only uses within-MSA variation for estimation. For each of the three variables, we first calculated the absolute change within MSAs between 1992 and 2001. We then plotted the change in ASCs per 10,000 population by the lowest and

Table 1

**Trends of Growth of Ambulatory Surgery Centers (ASCs) and Market Characteristics at the Metropolitan Statistical Area (MSA)<sup>1</sup>**  
**Level: 1992-2001**

Characteristic	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total Number of ASCs	1,156	1,320	1,499	1,652	1,814	2,026	2,239	2,455	2,694	2,916
ASCs Per 10,000 Population	0.066	0.074	0.084	0.092	0.108	0.122	0.134	0.147	0.158	0.169
HMO Penetration	0.118	0.127	0.138	0.147	0.165	0.182	0.194	0.201	0.196	0.190
Hospital Concentration (HHI)	0.361	0.363	0.366	0.368	0.378	0.386	0.391	0.394	0.398	0.399
Per Capita Specialty Surgeons <sup>2</sup>										
(Per 10,000 Population)	4.431	4.492	4.446	4.570	4.709	4.811	4.872	4.723	4.781	4.829
Per Capita Non-Federal Physicians										
(Per 10,000 Population)	23.971	24.612	24.627	26.205	26.867	27.561	28.088	28.723	28.682	28.801
Proportion of Population > 64 Years	0.125	0.126	0.127	0.127	0.127	0.127	0.128	0.128	0.126	0.126
Per Capita Income (in \$10,000)	1.781	1.880	1.946	2.039	2.177	2.285	2.362	2.552	2.666	2.734
Unemployment Rate	0.072	0.067	0.061	0.056	0.054	0.050	0.046	0.043	0.042	0.048

<sup>1</sup> N=317.

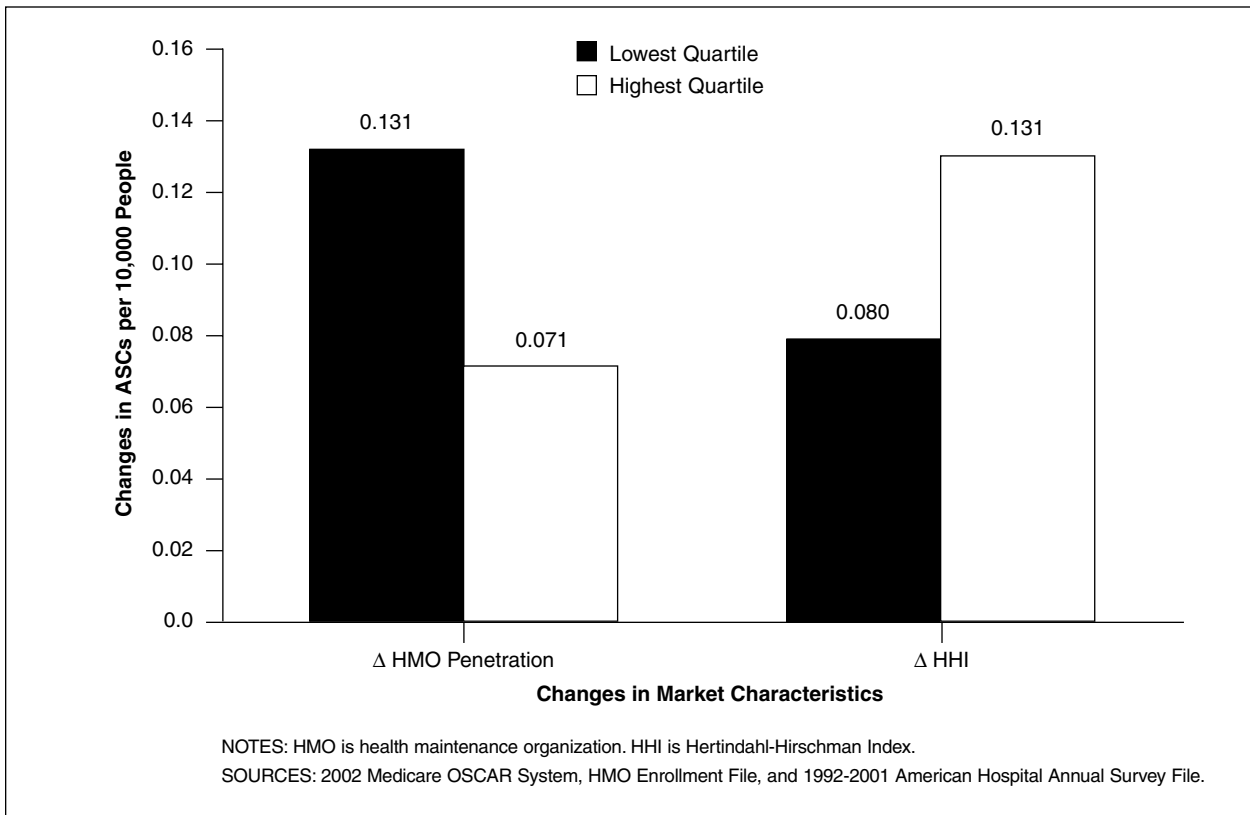
<sup>2</sup> Surgery specialties include colon/rectal surgery, general surgery, neurological surgery, obstetrics-gynecology subspecialties, ophthalmology, orthopedic surgery, otolaryngology, plastic surgery, thoracic surgery, and urology.

NOTES: HMO is health maintenance organization. HHI is Herfindahl-Hirschman Index (higher HHI means less competitive a market).

SOURCES: 2002 Medicare OSCAR System. HMO Enrollment File, 1992-2001 American Hospital Association Annual Survey Files, and Area Resource Files.

**Figure 2**

**Differential Growth of Ambulatory Surgery Centers (ASCs) Corresponding to Differential Changes in Market Characteristics: 1992 and 2001**



highest quartiles of the change in each of the two market variables. Although the two bivariate comparisons of changes from the beginning (1992) to the end (2001) of the study period did not use any of the information from the years in between, nor did they control for other explanatory variables that may be correlated with both ASCs and the two market characteristics. However, the figure suggests that the growth of ASCs had a negative association with increased HMO penetration and a positive association with increased hospital market concentration.

### **Results of Multivariable Regression Analysis**

The estimates from the concurrent and lag models with MSA and year fixed effects are presented in Table 2. Because the esti-

mates of both models were similar in magnitude, direction, and significance, we only focused on the results of the concurrent model. After controlling for the numbers of surgeons and physicians and demographics and economic characteristics, greater HMO penetration was associated with a reduction in ASCs per 10,000 population ( $p < 0.01$ ). To put this in context, a 10-percent-age-point increase in HMO penetration was estimated to result in 3.0 fewer ASCs per million population.

Greater hospital concentration was associated with greater ASC presence ( $p < 0.01$ ). An increase in the value of the HHI of 0.05 is the equivalent of a reduction from 5 to 4 equal sized hospitals in a market. The coefficient estimate implies that this increase in hospital concentration would result in 2.5 more ASCs per million population in a market. In a model that interacted the HHI



**Table 2**  
**Estimated Effects of Market Characteristics on Growth of Ambulatory Surgery Centers (ASCs)**  
**From Least Squares Regression with Metropolitan Statistical Areas (MSAs) Level and Year**  
**Fixed Effects: 1993-2001**

Dependent Variable <sup>1</sup>	Concurrent Model	Lagged Model
HMO Penetration	***0.3.00 (0.065)	***-0.278 (0.069)
Hospital Concentration (HHI)	***0.494 (0.156)	**0.435 (0.170)
Per Capita Specialty Surgeons (Per 10,000 Population)	-0.020 (0.012)	-0.013 (0.012)
Per Capita Non-Federal Physicians (Per 10,000 Population)	0.003 (0.004)	0.002 (0.003)
Proportion of Population > 64 Years	** -3.098 (1.249)	***-3.740 (1.412)
Per Capita Income (in \$10,000)	***-0.060 (0.019)	***-0.079 (0.025)
Unemployment Rate	** -1.065 (0.446)	-0.693 (0.520)
<b>Year</b>		
1993	0.013 (0.009)	—
1994	*0.021 (0.011)	*0.018 (0.011)
1995	**0.031 (0.014)	*0.030 (0.013)
1996	***0.055 (0.015)	***0.052 (0.015)
1997	***0.071 (0.019)	***0.076 (0.018)
1998	***0.088 (0.021)	***0.095 (0.020)
1999	***0.104 (0.023)	***0.114 (0.023)
2000	***0.112 (0.021)	***0.134 (0.025)
2001	***0.132 (0.022)	***0.145 (0.024)
Number of MSAs	317	317
Number of Years	10	9
Huber Standard Errors Correction	Yes	Yes

<sup>1</sup> ASCs per 10,000 population.

\* Statistical significance at 10 percent.

\*\* Statistical significance at 5 percent.

\*\*\* Statistical significance at 1 percent.

NOTES: Standard errors are in parentheses. HMO is health maintenance organization. HHI is Herfindahl-Hirschman Index. MSA is metropolitan statistical area.

SOURCES: 2002 Medicare OSCAR System, HMO Enrollment File, 1992-2001 American Hospital Association Annual Survey Files, and Area Resource Files.

with HMO penetration, the coefficient of the interaction term was statistically insignificant and the other coefficients in the model were essentially unchanged.

The estimated effects of other covariates show that the growth of ASCs is also significantly associated with demographic and economic characteristics. ASCs were less likely to enter a market with a higher proportion of the elderly ( $p < 0.05$ ), a market with higher per capita income ( $p < 0.01$ ), or a market with a higher unemployment rate

( $p < 0.05$ ). All the estimates of year indicators were positive, statistically significant, and monotonically increasing from 1994-2001, indicating a strong secular trend of increased ASCs over time.

## DISCUSSION

This study has sought to provide insight into the growth of ASCs in the U.S. from 1992-2001, during which period the number of ASCs increased from approximately

1,150 to over 2,900 in the MSAs studied. Two hypotheses were advanced to explain the diffusion of ASCs across metropolitan areas. First, we argued that greater managed care penetration would result in greater entry of ASCs. This hypothesis was rejected by the analysis. We found that ASCs were less likely to enter markets with greater HMO penetration. There are at least three explanations for this result. One explanation is that ASCs are not the efficient, low-cost providers of care that their advocates claim. If HMOs aggressively seek value in contracting, the negative relationship between HMO penetration and ASC entry would suggest that HMOs do not find ASCs attracting contracting partners. A second explanation is that HMOs have been able to negotiate lower prices with existing hospital providers of outpatient surgeries. As a result, the negotiated lower prices have deterred ASCs to enter and service the market. Without information on prices we are unable to test this speculation. A third explanation is that greater HMO penetration has led to greater reliance on ASCs as outpatient surgery providers, but our data are too crude to show this reliance. We only know the number of ASCs in each MSA in each year. If managed care penetration is associated with exclusive contracting with one large ASC, to the exclusion of others, we could have fewer (but larger) ASCs in the local market and all our data would indicate would be fewer ASCs.

The second hypothesis was that there would be more ASCs in more concentrated hospital markets. This hypothesis was confirmed by the analysis. A metropolitan market with 4 equal sized hospitals rather than 5, other things equal, was likely to have 2.5 additional ASCs per million people. This suggests that ASCs have been more likely to enter markets in which there may not

have been sufficient competition among local community hospitals to keep ambulatory surgical prices low. Again, without information on prices, we are unable to directly confirm this speculation.

Our study has some limitations. First, we only have information on the number of ASCs in each year. We do not know the specialty or specialties of each ASC, nor do we know the volume of services provided. As a result, we have only the crudest sense of the market presence of each ASC. Clearly, further work would benefit from the use of claims data from CMS or private sectors that would allow a more detailed examination of the role that ASCs play in providing outpatient surgical care. Second, because of the crudeness of the ASC data, we have not invested in developing an MSA specific mapping of the hospital network formation that has occurred over this period. As a result, our measures of hospital contraction are understated. Third, although a preliminary report (Medicare Payment Advisory Commission, 2004a) using cross-sectional data suggested that CON regulations did not appear to be a major factor in ASC growth, we have not tested the impact of CON regulations, but instead have relied on MSA fixed effects to control for these generally stable legislative programs. However, if CON regulations have an impact on the growth of ASCs, and there were changes in CON regulations specifically aimed at curbing the growth of ASCs, our estimated effects of HMO penetration and hospital concentration might be biased.

The traditional hospital market is in the midst of significant changes with the ongoing diffusion of ASCs, the entry of specialty hospitals, and the development of other traditionally hospital based services that are being offered independently of the hospital. Much more research needs

to be directed at understanding the market forces at play, and the effects of these new types of providers on the volume and quality of care provided.

## ACKNOWLEDGMENT

The authors would like to thank Laurence Baker and Kathleen Dalton for generously providing part of the data for our analysis. In addition, we appreciate many constructive comments from Kathleen Dalton on this manuscript.

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