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Treatment consolidation after vertical integration: Evidence from outpatient procedure markets

Michael R. Richards^{a*}, Jonathan Seward^a, Christopher Whaley^b

ABSTRACT

Hospital ownership of physician practices has grown across the US, and these strategic decisions seem to drive higher prices and spending. Using detailed physician ownership information and a universe of Florida discharge records, we show novel evidence of hospital-physician integration foreclosure effects within outpatient procedure markets. Following hospital acquisition, physicians shift nearly 10% of their Medicare and commercially insured cases away from ambulatory surgery centers (ASCs) to hospital outpatient departments and are up to 18% less likely to use an ASC at all. Distorting physician choices over treatment setting can generate allocative inefficiencies and forgo state and federal tax revenue.

Keywords: physician, vertical integration, health care competition, ambulatory surgery center, hospital outpatient department

JEL: I11, I18, L44

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1. Introduction

A long-running trend affecting hospitals is the shift from inpatient to outpatient sites of care. This shift more frequently allows patients to avoid a multiple day hospital course and instead receive a same-day discharge following their care. According to recent and national figures from the American Hospital Association, hospitals' aggregate annual revenue of nearly \$1 trillion is now almost evenly split between inpatient and outpatient hospital services (Bannow 2019). The momentum away from inpatient-delivered care has implications for a wide variety of hospitals' clinical business lines but has been especially pronounced for surgical procedures, which also account for roughly a third of all US health care expenditures (Muñoz, Muñoz, and Wise 2010). Outpatient delivery for surgery increasingly substituted for inpatient options starting in the early 1980s and has culminated in the majority of all hospital cases performed on an outpatient basis at this time.¹

Hospitals, however, are not solely responsible for the redirection toward outpatient settings for surgical as well as other types of procedural care, such as colonoscopies, endoscopies, and therapeutic injections. While inpatient care is limited to intra-industry competition (i.e., hospital-versus-hospital), outpatient procedures have rival industries competing for the same cases—namely, hospital outpatient departments (HOPDs) and free-standing ambulatory surgery centers (ASCs). ASCs are smaller and more specialized firms, in comparison to hospitals, and typically include direct ownership stakes by physicians. ASCs also try to differentiate themselves from competing hospitals by offering greater convenience and lower price points, which is widely believed to benefit commercially and publicly insured health care consumers (Paquette et al. 2008;

¹ See these statistics from the Agency for Healthcare Research and Quality, available here: <https://www.ahrq.gov/news/newsroom/ambulatory-surgery.html>.

Grisel et al. 2009; Hair, Hussey, and Wynn 2012; Munnich and Parente 2014; Weber, 2014; Munnich and Parente 2018; Aouad, Brown, and Whaley 2019; Sood and Whaley 2019).

ASCs currently number more than 5,000 across the US, and within the Medicare market alone, more than 6 million outpatient services have been annually performed in ASCs during recent years. In 2017, specifically, ASC facilities captured \$4.6 billion in total Medicare payments, and the rate of growth in ASC Medicare case volumes outpaced HOPDs for the first time (MedPAC 2019). Unsurprisingly, hospitals are known to suffer weaker consumer demand and profitability when facing greater ASC competition (Bian and Morrisey 2007; Courtemanche and Plotzke 2010; Carey, Burgess, and Young 2011), and recent work demonstrates that hospitals may be forced to reduce their service prices in markets experiencing increased patient demand for ASCs (Whaley and Brown 2018). These previous empirical findings, along with some industry perceptions, imply that market forces have at least partially disciplined hospitals through the threat and experience of losing profitable cases to ASCs. However, hospitals' responses to business stealing by ASCs are not necessarily confined to consumer welfare promoting actions (e.g., offering more outpatient services, increasing quality, and/or accepting smaller markups). Instead, hospitals may seek to relax the degree of competition between these otherwise rival firms.

One plausible mechanism to do so is through regulation, such as Certificate of Need (CON) legislation, which can restrain the expansion of incumbent ASCs and/or erect barriers to entry for new ones (Hollenbeck et al. 2014; Whaley 2018). However, lobbying for favorable (i.e., anticompetitive) state laws is costly, with uncertain time horizons and outcomes. Moreover, the likelihood of a slow policymaking process, even for advantageous changes, makes regulatory intervention a challenging and perhaps unprofitable strategic response for hospitals concerned with increasing ASC competition.

An alternative approach with potentially more immediate impact is simply to purchase the upstream supplier that both HOPDs and ASCs rely upon: physicians. Unlike many other markets where firms sell directly to consumers, patients access HOPDs and ASCs through physicians. Thus, HOPDs and ASCs need to attract physicians and their accompanying procedural cases in order to receive the facility component of payment attached to a given case. Physicians, on the other hand, face equivalent reimbursements when performing a surgery or procedure in either setting. Hospitals can either engage in a costly effort to match ASCs in terms of physician-patient amenity and convenience offerings, or, instead, make a lump-sum purchase in order to exercise more control over where the acquired physician's cases are performed. In other words, the ability of hospitals to create a vertical structure by directly owning physician practices creates a strategic opportunity to deny cases to competing ASCs and reallocate those cases to the owning hospitals' HOPDs. Doing so avoids direct horizontal competition between hospitals and ASCs and is similar to “exclusive dealing” actions studied outside of health care markets (e.g., see Bernheim and Whinston 1998).

Hospital-physician vertical integration is of course not restricted to surgical care and has been on the rise in health care markets across the U.S. (Gaynor, Ho, and Town 2015; Nikpay, Richards, and Penson 2018; Post, Buchmueller, and Ryan 2018). Currently, over a third of all US physicians are employed by a hospital or work within a practice owned by a hospital or health system—an increase of 5 percentage points since 2012.² Existing research indicates that hospital ownership of physician practices is associated with higher care utilization, service prices, medical spending, and insurance premiums—with little evidence of efficiency or quality gains (Baker, Bundorf, and Kessler 2014; Carlin, Dowd, and Feldman 2015; Neprash et al. 2015; Koch,

² See these and related statistics tabulated by the American Medical Association here: <https://www.ama-assn.org/press-center/press-releases/employed-physicians-outnumber-self-employed>.

Wendling, and Wilson 2017; Capps, Dranove, and Ody 2018; Koch, Wendling, and Wilson 2018; Post et al. 2018; Scheffler, Arnold, and Whaley 2018; Jung, Feldman, and Kalidindi 2019; Noel Short and Ho 2019). Though these studies are documenting important and policy-relevant outcomes, foreclosure effects have received comparatively less empirical attention to date.

Previous economics research remarks that vertical integration broadly (Hart et al. 1990; Ordoover, Saloner, and Salop 1990; Rasmusen, Ramseyer, and Wiley 1991; Segal and Whinston 2000) and as applied to hospital-physician combinations narrowly (Gaynor and Vogt 2000; Gaynor et al. 2015; Post et al. 2018) has the potential to exclude competitors from the market. Yet, we are aware of only three published studies that explicitly examine the role of hospital employment on physicians' choice of care setting. Baker, Bundorf, and Kessler (2016) use discrete choice estimation to show that physicians are much more likely to admit a given patient to their employing hospital and that these same hospitals tend to be higher cost, less convenient, and lower quality than nearby options—suggesting negative consumer welfare effects along key margins. Carlin, Feldman, and Dowd (2016) similarly find patients to be redirected toward acquiring hospitals for inpatient admissions and hospital-owned imaging facilities following three multispecialty physician practices being acquired by two health systems in the Twin Cities Minnesota market. And finally, Koch et al. (2017) also observe some declines in physician inpatient claims in competing (non-owning) hospitals post-integration for the 27 practices involved in their study; however, the predominant effect that the authors document is the redistribution of physician office-based claims to hospital outpatient-based care, rather than inpatient hospital switching. Each of these three studies raise key issues for regulatory and payment policy consideration, especially as it pertains to hospital-to-hospital competition, but none of them speak to anticompetitive effects

across industries where hospitals have private incentives to foreclose non-hospital rivals (e.g., ASCs) that otherwise offer lower cost treatment options.

In this paper, we investigate the presence and extent of anticompetitive effects from formal hospital-physician tie-ups in contested outpatient procedure markets. Using detailed physician practice ownership information from 2009-2015 linked to the universe of outpatient discharge records in Florida over this same period, we employ difference-in-differences (DD) and event study estimation to quantify how physicians' treatment setting choices and related costs of care respond to being newly purchased by a local hospital or health system.

We find that physicians consistently employed by hospitals are 65% less likely to use an ASC at all when compared to physicians that are never part of this type of vertical structure. Physicians that experience a hospital or health system acquisition during our study period reduce the number of ASCs they rely upon by 13% and are 9% less likely to perform any procedures within an ASC. The negative ASC extensive margin effect we observe also grows over time, with an approximately 18% reduction four years out from the acquisition. Consequently, physicians' share of Medicare and commercially insured outpatient procedures occurring in ASCs falls abruptly by 8-9% once they are vertically integrated with a hospital. Although hospitals do not induce acquired physicians to perform more cases or more procedures per case, these physicians begin charging considerably more for their outpatient services—approximately 29% over their baseline levels by the end of our study period. The increase in charges is also most pronounced for traditional Medicare (i.e., fee-for-service) cases. There is little evidence that competing hospitals experience business stealing by hospitals engaging in these physician acquisitions; rather, the foreclosure effects appear concentrated on the non-hospital rival industry.

Taken together, our findings offer a novel insight that augments the growing literature on the economic impacts of formal alliances between hospitals and physician practices. They also suggest risks of allocative inefficiency and related welfare losses from distorting physicians' treatment setting choices, especially insofar as HOPDs command higher payments without commensurately higher quality. Antitrust authorities should bear in mind that hospitals' strategic merger and acquisition (M&A) behavior can negatively influence firms outside of the hospital industry. These more diffuse market ramifications should therefore be a part of any regulatory scrutiny attached to a proposed hospital-physician acquisition.

2. Vertical integration in outpatient procedure markets

There are a variety of strategic benefits from vertical alignments between hospitals and physicians that have been proposed and investigated in the literature, including bargaining advantages with commercial insurers (Gal-Or 1999; Cuellar and Gertler 2006; Peters 2014; McCarthy and Huang 2018) and exploiting profitable site of care classification rules (e.g., see Koch et al. 2017; Capps et al. 2018; Dranove and Ody 2019).³ As previously noted, with respect to outpatient procedure markets, hospitals can have an additional motivation in the form of alleviating competitive pressure from ASCs.

Over 90% of ASCs are estimated to have some form of physician ownership (Dyrda 2017). Reimbursement for a given outpatient procedure largely consists of two separate payments: a physician-specific payment for her effort and a facility-specific payment to cover supporting infrastructure and personnel. An ownership stake therefore makes a physician the residual claimant on a share of profits from all services performed within the ASC via the collected facility revenues.

³ See Burns et al. (2013) and Post et al. (2018) for excellent reviews of the theoretical underpinnings of hospital-physician vertical integration strategies as well as related empirical evidence.

Moreover, ASC ownership financially rewards a physician's clinical effort more than in the non-owner state because, in the absence of an ownership share, she would not receive income from the facility fee component belonging to her personally performed procedures.⁴ Empirical evidence suggests that physicians' choices over treatment settings is at least partially linked to personal financial interests and case profitability (Lynk and Longley 2002; David and Neuman 2011; Plotzke and Courtemanche 2011). Hospitals relatedly argue that ASCs limit their services to those that are highly profitable, while hospitals must offer both profitable and unprofitable (but socially beneficial) care (Casalino, Devers, Brewster 2003; Voelker 2003; Vogt and Romley 2009). Because of the high-powered incentives for ASC-use facing physicians and the perceived threats to financial performance facing hospitals, hospitals tend to resent the ASC industry and support efforts to restrain its expansion.

One way for hospitals to directly exercise greater control over the market is to vertically integrate with upstream physicians in order to foreclose ASC rivals (as remarked in Section 1). Since firms from both industries rely on physician referrals (i.e., physicians bringing their surgical and other procedural cases to the facility), this strategic action is a way for hospitals to blunt any business stealing effects by ASCs as well as raise costs for their ASC competitors. We can see prima facie evidence of such behavior in Figure 1 (using our analytic data fully described in Section 3). While roughly a third of all outpatient procedures (all payers) are performed within an ASC in a given year (2009-2015) among non-integrated physicians, only about 5-10% take place within an ASC among hospital-owned physicians. Of course, cross-sectional differences could be explained by other factors (e.g., geographic and patient population differences across physician

⁴ Put differently, her earnings would be restricted to the physician-specific (non-facility) component of payment tied to the cases she performed.

organizational structures), so within-physician variation in integration status is necessary for causal interpretations (detailed in Section 4).

Once relevant physicians have been acquired by a local hospital, affected ASCs may need to generate new business to offset the resulting case losses. Doing so could require a given ASC to invest more in amenities, technology, or other physical capital to attract new (non-owner) physicians to the facility. Separately (or perhaps in conjunction), the ASC may need to offer more generous ownership opportunities to prospective physicians—and thereby redistribute future incomes from existing owners—in order to better align the physicians’ financial interests with its own. For either response type, the ASC would be forced to bear additional costs to target previously inframarginal physicians, which could then neutralize some of the (lower) operational cost advantages ASCs tend to enjoy vis-à-vis hospitals. Importantly, hospital-physician integration not only affects incumbent ASCs in contested markets, but it can also serve as an entry deterrent for new ASCs. Entry deterrence would further erode the risk of future case losses for the integrating hospital. And, in the extreme, if ASC competition is eventually foreclosed completely (i.e., incumbents exit and entry ceases), the integrating hospital can benefit from a captive upstream supplier without having to make further acquisitions—i.e., physicians will have no choice but to opt for HOPD delivery.⁵

It is unclear that such outpatient procedure market dynamics would be social welfare enhancing, and in fact, the opposite could prove true. For procedures common to both treatment settings (i.e., HOPDs and ASCs), there is the possibility of excluding a more efficient rival and creating allocative inefficiencies as the marginal case is redirected to the higher cost option,

⁵ Potentially, the hospital could even consider divestitures of existing practices—so long as doing so would not reintroduce the threat of ASC entry and/or sacrifice other profitable benefits from integration (e.g., insurance bargaining). Also, absent a monopoly position within the downstream hospital market, the hospital would still have to compete for physician referrals against other hospitals.

without commensurate quality gains or other consumer benefits. Furthermore, because ASCs are overwhelmingly for-profit and the vast majority of hospitals are not-for-profit, distorting physicians' choices can have fiscal implications in the form of forgone tax revenue. For these reasons, we argue that hospitals have strong private incentives to limit ASC-delivered care through a vertical strategy with physicians; however, quantifying the existence and degree of any anticompetitive integration effects in these markets ultimately requires new empirical investigation.

3. Data

3.1 Physician-hospital integration status

Our first source of data is from the SK&A database.⁶ SK&A is a commercial research firm that conducts an annual phone survey of physician offices across the US. The survey approximates a near-universe of (office-based) physician practices and collects detailed information on practice size, individual physicians working within the practice (including their associated National Provider Identification (NPI) number), specialization, and, crucially, the ownership structure pertaining to the practice. Specifically, the database documents if a practice is independently owned, part of a larger physician group (i.e., horizontally integrated), or owned by a hospital or health system (i.e., vertically integrated). A variety of recent studies have also relied on SK&A data resources for examining the effects of vertical ownership structures between hospitals and physicians (e.g., see Baker, Bundorf, and Kessler 2016; Richards, Nikpay, and Graves 2016; Koch et al. 2017, 2018; Nikpay, Richards, and Penson 2018).

⁶ Note, SK&A was recently acquired by IQVIA, which has now combined their respective physician survey data repositories.

3.2 Encounter data for outpatient procedures

Our encounter-level data encompass the universe of outpatient (ambulatory) procedure discharge records from the state of Florida, which we obtained from the Florida Agency for Health Care Administration (AHCA). We use the administrative data over a relatively long time series, starting in the first quarter of 2009 and ending in the fourth quarter of 2015. Unlike many other data resources, the data also capture all payers in Florida markets over this seven-year period. The detailed records include a rich set of variables, such as diagnosis and procedure codes, type of insurance, patient demographic information, the specific facility (e.g., ASC versus HOPD) where the procedure was performed, and provider charges for the care belonging to a given case. At times, we also explicitly restrict to the traditional (i.e., fee-for-service) Medicare discharge records or the commercially insured (i.e., non-Medicare, private coverage) discharge records for certain analyses. Nationally, more than 80% of ambulatory (outpatient) surgeries are estimated to have either commercial insurance or Medicare as the main payer (Hall et al. 2017).

Although the data are from a single state, Florida is home to a large share of the nation's Medicare population (3-4 million beneficiaries in recent years), which is second only to California in terms of size.⁷ Florida also has an accommodating regulatory environment toward ASCs (e.g., ASCs are not bound by any existing certificate of need laws), and in terms of ASCs per 100,000 Medicare beneficiaries, Florida falls in the middle of the distribution—ranking 24th in the country (MedPAC 2019). These contextual features are helpful when considering the generalizability of our Florida-specific findings and additionally suggest that Florida markets can be worthy of independent investigation due to its Medicare spending relevance and accompanying implications for federal fiscal outlays.

⁷ State-level statistics on aggregate Medicare populations can be found here: <https://www.kff.org/medicare/state-indicator/total-medicare-beneficiaries>.

4. Empirical strategy

Our analytic approach is the standard two-way fixed effects difference-in-differences (DD) research design. We begin by constructing a balanced panel of Florida physicians (2009-2015) from the SK&A data. We then use the practice ownership information to classify a given physician as never vertically integrated, always vertically integrated, or newly vertically integrated—including the exact year of integration—based on the reported ownership of the practice in each year of data.⁸ To ensure sufficient pre- and post-integration data for the newly integrating physicians, we also exclude those who vertically integrate in 2010, 2014, or 2015 from the analytic sample. We next combine the resulting physician-year ownership panels with the Florida discharge records after creating an analogous physician-year panel for aggregate outpatient procedure activity.⁹ Balancing the dataset in this manner results in 5,329 unique physicians who each performed roughly 200 outpatient procedure cases per year, on average, for our main estimation. The DD specification is as follows:

$$Y_{it} = \delta(\textit{VerticallyIntegrated}_{it}) + \theta_i + \lambda_t + \varepsilon_{it} \quad (1)$$

Equation (1) has a full vector of physician (θ) and year (λ) fixed effects. The δ parameter is our DD estimate of interest and is identified based on physicians newly acquired by a hospital during our study period. Our key outcome variables (Y_{it}) include the number of unique HOPDs used per

⁸ For the minority of physicians that practice in more than one office, we use a hierarchical classification of ownership so that the highest degree of ownership across all practices tied to a given physician in a given year is assigned to that physician in that year.

⁹ We collapse the quarterly discharge data to the annual level since our physician ownership data are necessarily at that level (i.e., we cannot observe the precise timing of an ownership transition within a calendar year).

year, the number of unique ASCs used per year, any ASC use (i.e., the extensive margin), total cases, procedures per case, total charges for all cases, share of Medicare (commercial) cases performed within ASCs, and total charges for Medicare (commercial) patients.

Our main identification assumption is that physicians with stable integration status from 2009-2015 serve as a sufficient counterfactual for the behavior of physicians acquired by a hospital in the absence of integration. While this assumption is not directly testable, referral patterns in the years leading up to the acquisition can lend support to this identifying assumption. Thus, we formally test for stable pre-integration trends using an event study approach that leverages our relatively long time series—consistent with related research in this area (e.g., Baker et al. 2016; Koch et al. 2017; Capps et al. 2018). The event study approach consequently allows us to observe differential physician behavior changes both in the lead up to and following vertical integration with a hospital or health system in order to add credence to our DD estimates and inferences from the simpler model in Equation (1).

The event study specification takes the form:

$$Y_{it} = \alpha_j \sum_{\substack{j=-4 \\ j \neq -2}}^4 \left[\text{VerticallyIntegrated}_i \times (\text{IntegrationYear}_i = j) \right] + \theta_i + \lambda_t + \varepsilon_{it} \quad (2)$$

Equation (2) is only a slight modification from Equation (1) insofar as we now allow the effect of hospital-physician integration to differ over time. This information is contained within the series of α estimates from Equation (2), which capture any differential behavior by newly acquired physicians relative to their specific year of integration (i.e., when the *IntegrationYear* variable is equal to zero). The omitted time point is two years prior to a given physician's acquisition event,

and we specify event year indicators for four years prior to the acquisition through four years following the year of integration. We subsequently use the resulting estimates from Equation (2) to ascertain that the parallel trends assumption needed for the DD research design to be valid is satisfied and to observe the persistency as well as dynamics of integration effects on a given outcome. We estimate both models using ordinary least squares (OLS) and cluster the standard errors at the physician level.

5. Results

5.1 Treatment setting choices

Table 1 stratifies our analytic data by the three mutually exclusive integration groups (i.e., newly, never, and always classifications) and summarizes their baseline year (2009) characteristics. 81% of our observed physicians are never acquired by a hospital or health system from 2009-2015. 441 physicians are vertically integrated during our analytic window and therefore comprise our treatment group of interest. Consistent with the patterns in Figure 1, only 15% of physicians persistently employed by a hospital use an ASC at all and less than 5% of their Medicare and commercially insured cases take place within an ASC. Conversely, 43% of the never vertically integrated physicians rely on an ASC at some point, and they devote approximately 30% of their Medicare and commercial outpatient procedure business to ASC settings. Across most baseline metrics in Table 1, the physicians that will eventually become integrated represent an intermediate group between the two extremes (i.e., the never and always integrated classifications). A notable exception is that the physicians targeted by hospitals during our study period actually perform more cases and have higher total charges (\$2.07 million), on average, than either of the other

groups in 2009. Though only suggestive, this could be indicative of strategic targeting by hospitals whereby more productive and higher revenue-generating physicians are sought out for acquisition.

Table 2 provides our first set of DD estimates and specifically focuses on changes in treatment setting decisions. Columns 1 and 2 reveal that becoming newly integrated with a hospital lowers the number of unique HOPDs and ASCs the physician relies on a given year. The effects are statistically significant, and relative to the treatment group's baseline levels (Table 1), suggest 6% and 13% relative declines, respectively. The DD estimate in column 3 further reveals a statistically significant and negative extensive margin effect for ASC use. Following a hospital acquisition, physicians delivering outpatient procedures are approximately 3-percentage points less likely to perform any cases within an ASC, which is 9% reduction from their baseline level (Table 1). Unsurprisingly, columns 4 and 5 of Table 2, show roughly 9% declines in the share of Medicare (column 4) and commercially insured (column 5) outpatient procedures devoted to ASCs. Importantly, the findings in Table 2 are collectively consistent with hospital-physician integration foreclosure effects on competing ASCs.

We examine these effects further with the corresponding event study results presented in Figures 2 and 3. Panel A of Figure 2 suggests anticipatory behavior in the reduction of HOPD use during the year immediately preceding vertical integration with a local hospital or health system. The coefficients are nearly identical in magnitude between the year of integration ($t = 0$) and the previous year ($t = -1$). The effect magnitudes also increase with time in Panel A of Figure 2, with the coefficients nearly twice as large three years post-integration. There is no clear evidence of anticipatory behavior with respect to the ASC intensive (Panel B) and extensive (Panel C) margins in Figure 2. The pre-period estimates oscillate around zero and are never statistically different from zero, but following the hospital acquisition, affected physicians demonstrate restrained ASC use.

The vertical integration effects in Panels B and C also grow over time—approximately doubling from the year of integration ($t = 0$) to four years after integration ($t = 4$). Specifically, the newly integrated physicians are roughly 6-percentage points less likely to perform any procedures within an ASC in the fourth year following a tie-up with a hospital or health system (Panel C, Figure 2), which is an 18% reduction over their baseline level (Table 1). Figure 3 shows no differential for the treatment group in terms of ASC allocations for Medicare and commercially insured cases (analyzed in isolation) prior to the year of integration (Panels B and C), and then an abrupt drop emerges during the year of integration ($t = 0$) that persists and is largely stable during the subsequent years.

5.2 Treatment output and charges

Table 3 moves to the effects on physicians' supply of outpatient services and associated charges. With respect to physician output and effort, it is at least theoretically possible that any prior financial interests in ASCs could have led these physicians to over-supply patients with elective procedures—consistent with other work demonstrating physicians' profit opportunities can distort agency on the behalf of patients (e.g., see Afendulis and Kessler 2007; Iizuka 2012). In this way, the weakening, if not severing, of such financial motives tied to ASCs could lower outpatient procedural intensity at the physician level. On the other hand, hospitals could exercise their own pressure on newly acquired physicians to increase effort and hence revenues, so any *a priori* prediction is ambiguous, which necessitates empirical investigation.

The estimates in columns 1 and 2 of Table 3 do not reveal any effect of becoming vertically integrated on physicians' annual case volume nor the average number of procedures performed per case. The DD coefficients are negatively signed, small in relative magnitude (compared to

Table 1 baseline levels), and nowhere near statistically significant at conventional levels. There is therefore no evidence of inducing greater outpatient procedure output; instead, the hospital-physician integration effects are confined to charges in Table 3. Across all cases and payers, acquired physicians increase their total annual charges by over \$200,000 (nominal dollars), on average, which is approximately 10% above their baseline levels in 2009 (Table 1). When examining Medicare and commercial charges in isolation (columns 4 and 5, respectively), we can further see that Medicare charges, specifically, account for over a third of the integration effect evident in column 3. Commercial charges are largely unchanged following physician ownership by a hospital or health system.

The event study results in Figures 4 and 5 support the inferences from the DD estimates in Table 3. Physicians brought into a vertical structure with a hospital show no meaningful differential behavior related to aggregate outpatient cases or procedures per case in the years prior to integration or after being integrated (Panels A and B, Figure 4). Conversely, the event study is well-behaved (i.e., no pre-trending) for the annual total charges across all payers in Panel C, and then a differential pattern begins in the year following integration ($t = 1$) and culminates in a roughly 25% increase over the baseline (2009) level by the end of the post period ($t = 4$). The Medicare charges event study (Panel A, Figure 5) demonstrates an analogous pattern; meanwhile, the commercial charges only begin to suggestively increase at three and four years out from the initial integration year (Panel B, Figure 5). Reported charges are admittedly not the same as true transaction prices; however, in panel estimation, existing economics studies argue and demonstrate that charges can be sufficiently accurate and informative for proxying within-provider price changes over time (e.g., see Garmon 2017; Darden, McCarthy, and Barrette 2018; Dafny, Ho, and

Lee 2019). Charges often serve as a basis for provider-payer contracting as well (e.g., see Cooper et al. 2019; Weber, Floyd, Kim, and White 2019)

We also acknowledge that it is possible that acquiring hospitals induce physicians to substitute toward more complex—and thus higher billing—outpatient services while leaving the aggregate quantity of services supplied to the market unchanged. However, it is unclear why the acquired physicians would have refrained from doing so prior to integration since any foregone opportunities to deliver higher complexity care would have sacrificed earnings from the physician fee component as well (i.e., such behavior would be inconsistent with physicians’ own profit-maximizing objective). The contrast between the Medicare and commercial payers in Figure 5 also seems to align with traditional Medicare billing rules. Namely, as a matter of federal law, the Medicare program is statutorily required to pay ASCs no more than 59% of the prevailing HOPD facility fee for an otherwise identical outpatient procedure—see Munnich and Parente (2018) for details. Other studies document the reallocation of physician services from physician office locations to hospital facility sites, at least partially to exact higher payments from the Medicare program (Song et al. 2015; Koch et al. 2017; Dranove and Ody 2019). The effects we observe, particularly for Medicare charges in Table 3 and Figure 5, are at least consistent with similar circumstances, whereby existing Medicare payment policy tied to outpatient procedure settings creates an opportunity to seek larger reimbursements for delivering the same care.

Within Appendix Figures 1 and 2, we display the event study results for two additional outcomes of potential interest. The former captures the total volume of Medicaid outpatient procedure cases. Although an association has been found between vertical integration and physician practice participation in the Medicaid program (e.g., see Richards et al. 2016; Haddad, Resnick, and Nikpay 2020), we find no effect on the number of outpatient procedures performed

for Medicaid patients (Appendix Figure 1). As another potential implication for consumer welfare, we examined the distance between the patient's residential zip code (centroid) and the outpatient facility's zip code (centroid) belonging to a given outpatient procedure discharge record. We again do not observe any effect along this margin, on average, which is perhaps not surprising since ASC firms are commonly found in urban areas where the market size effect is likely to encourage colocation by ASCs and HOPDs within the same geographic area. Foreclosing on ASC competitors through vertical integration with upstream physicians would consequently shift affected patients to a higher cost but not necessarily more distant treatment setting.

5.3 Effects on competing hospitals

We conclude our empirical analyses with a supplementary exercise that examines the allocation of HOPD cases between owning and non-owning hospitals and health systems. To do so, we restrict our estimation sample to physicians that are either always vertically integrated or newly integrated during our study period. We then use information provided by the Agency for Healthcare Research and Quality (AHRQ) to assign Florida HOPDs to their respective individual hospital or health system (i.e., multiple hospital) parent companies insofar as the reported HOPD facility name allowed for such a classification. For each individual physician, we next use the reported owning hospital or health system in the SK&A data to match to the corresponding *always* owning (with respect to the always vertically integrated group) or *eventually* owning (with respect to the newly integrated group) entity, again, insofar as the reported name is sufficiently accurate and specific to make a credible assignment. We are able to successfully complete these two stages of mapping (i.e., HOPD facility to owning hospital and physician to owning hospital) for 57% of our potential analytic sample (see Table 1 for physician integration group counts). We then allocate

all HOPD-delivered procedures in a given physician-year to one of two categories: the owning hospital or competing hospitals. This taxonomy of HOPD procedures allows us to implement Equation (1) and Equation (2) on this subset of physicians to observe if changes in integration status are associated with a consolidation of cases to the owning hospital at the expense of competing (non-owning) hospitals.

The DD and event study findings are displayed in Table 4 and Figure 6, respectively. We can see in Table 4 that, at baseline (2009), approximately half of all HOPD procedures were performed within the hospital or health system that would eventually acquire the physician. The share of HOPD cases flowing to the parent hospital or health system also increases with integration, by as much as 10% during the years following hospital acquisition (Panel A, Figure 6). However, there is no indication in Table 4 or Figure 6 that the owning hospital's gains in case volumes are the result of business stealing from competing hospitals. When coupled with the findings from Table 2 and Figure 2, the outpatient procedure redirection effect due to vertical integration seems to localize entirely to ASCs in contested markets—meaning the strategic maneuver appears to matter more for across industry, rather than within-industry, competition.

6. Discussion

A growing literature has documented deleterious health care price and spending influences from the recent trend in hospital-physician integration across the US. However, understanding the more diffuse consequences of these vertical structures as well as the various mechanisms underneath any observed price or spending rise requires empirical investigation into the anticompetitive (i.e., foreclosure) effects of these hospital acquisitions. A few existing studies (i.e., Baker et al. 2016; Carlin et al. 2016; and Koch et al. 2017) have shed needed light on vertical integration's impact

on hospital referral patterns, but we are able to extend these findings by providing evidence of foreclosure effects across industries. Specifically, our DD and event study results show a reallocation of outpatient procedures from ASCs to HOPDs across payers and as much as an 18% reduction in the likelihood of a newly acquired physician using an ASC at all. At the same time, other competing hospitals are not obviously losing cases following the purchase of a common upstream supplier (i.e., physician), but the acquired physicians are charging more for their outpatient procedural care—especially within the traditional Medicare market. The relaxing of horizontal competition between ASCs and HOPDs for outpatient care also occurs without any horizontal consolidation activity; instead, it results from hospitals’ vertical integration with physicians.

Others have relatedly highlighted that more than a billion dollars of savings is left on the table due to Medicare’s disparate payments between HOPDs and ASCs for otherwise identical care (Sood and Whaley 2019). And, more broadly, site of care differentials remain a source of elevated health care expenditures and hence key considerations for future policymaking (Song et al. 2015; Higgins, Veselovskiy, and Schinkel 2016; Koch et al. 2017; Capps et al. 2018; Dranove and Ody 2019; Jung, Feldman, and Kalidindi 2019). Our findings are consistent with these notions since as a matter of federally mandated payment policy every Medicare outpatient procedure redistributed from an ASC to a HOPD post-acquisition will generate at least a 69% increase in the corresponding facility fee. Furthermore, the high likelihood of a for-profit (ASC) to not-for-profit (HOPD) facility transition courtesy of these case reallocations can lead to foregone tax revenue at the state and federal levels. According to a trade press article, the ASC industry made nearly \$6 billion in tax payments in the year 2009 alone (Becker’s ASC Review 2017). By contrast, estimates

suggest that not-for-profit hospitals received over \$24 billion worth of tax exemptions in 2011 (Rosenbaum et al. 2015).

Upsides from formal hospital-physician alignments are possible. For example, vertical integration has shown positive associations with health information technology adoption and use (e.g., see Lammers 2013; Everson, Richards, and Buntin 2019). But greater scrutiny by antitrust authorities and regulators is likely warranted. Our study demonstrates that hospitals can and do leverage physician ownership to foreclose on more efficient rivals (i.e., ASCs). These anticompetitive consequences from hospital-physician integration have clear potential to generate consumer welfare losses among affected patients. They can also strain public finances through higher spending for the same basket of services as well as lower tax collections from outpatient care providers.

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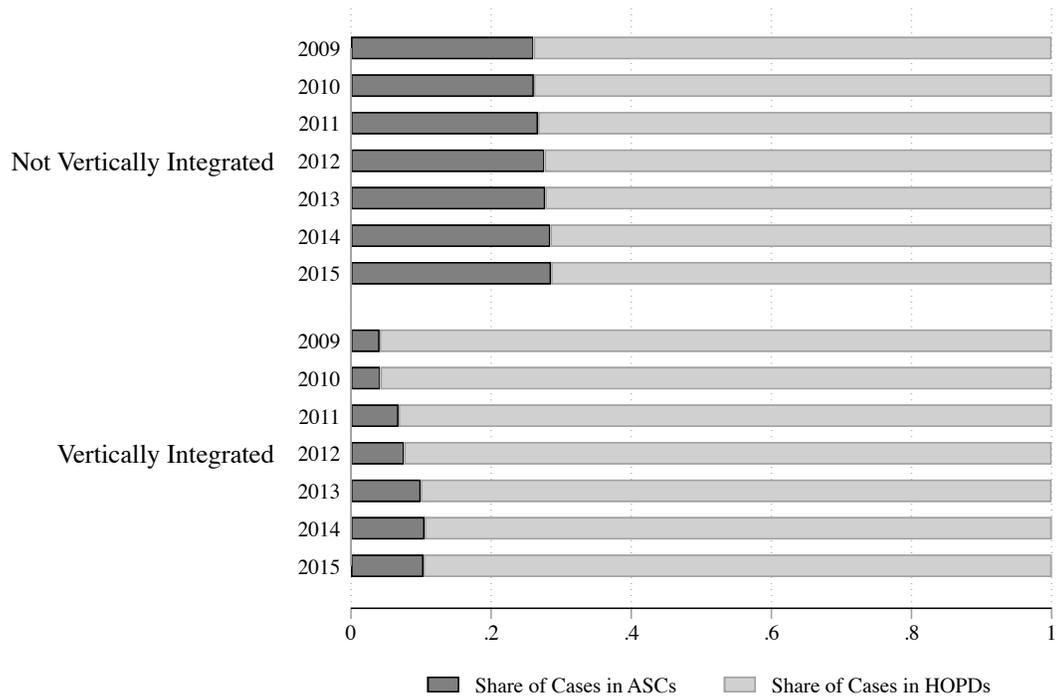
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MAIN RESULTS

Figure 1: Treatment Setting Balance by Physician-Hospital Integration Status, All Payers 2009-2015



Notes: Analytic data are from the universe of outpatient procedure discharge records in Florida. “HOPDs” are hospital outpatient departments. “ASCs” are ambulatory surgery centers.

Table 1: Baseline (2009) Summary Statistics for Analytic Sample

	Become Vertically Integrated	Never Vertically Integrated	Always Vertically Integrated
	<u>Mean (SD)</u>	<u>Mean (SD)</u>	<u>Mean (SD)</u>
Number of HOPDs	2.0 (1.1)	2.0 (1.2)	1.6 (0.8)
Number of ASCs	0.4 (0.7)	0.6 (0.8)	0.2 (0.4)
Share of Medicare Cases in ASCs	0.17 (0.33)	0.28 (0.40)	0.04 (0.13)
Share of Commercial Cases in ASCs	0.17 (0.32)	0.30 (0.40)	0.05 (0.16)
Total Cases	212.0 (320.9)	194.6 (345.0)	197.8 (280.4)
Total Charges ('000)	2,068 (1,151)	1,474 (2,083)	1,573 (2,030)
Avg. Number of Procedures per Case	3.4 (2.9)	3.3 (2.8)	3.9 (2.5)
	<u>(%)</u>	<u>(%)</u>	<u>(%)</u>
Any ASC Use	33.1	43.3	15.0
Any Rural Cases	80.7	68.0	81.5
Observations (N)	441	4,321	567

Notes: Analytic data are from the universe of outpatient procedure discharge records in Florida. “Commercial” refers to privately insured, non-Medicare patients. “HOPDs” are hospital outpatient departments. “ASCs” are ambulatory surgery centers. All reported charges are in nominal dollars and are not deflated by any cost-to-charge discount factor.

Table 2: Vertical Integration Effects on Physicians' Outpatient Procedure Allocations

	Number of HOPDs	Number of ASCs	Any ASC Use	Share of Medicare Cases in ASCs	Share of Commercial Cases in ASCs
	(1)	(2)	(3)	(4)	(5)
1[Vertically Integrated]	-0.115*** (0.035)	-0.051*** (0.017)	-0.029** (0.011)	-0.016** (0.008)	-0.015** (0.007)
Year FE	Yes	Yes	Yes	Yes	Yes
Physician FE	Yes	Yes	Yes	Yes	Yes
Observations (N)	37,303	37,303	37,303	33,214	34,683
Unique Physicians	5,329	5,329	5,329	5,100	5,272

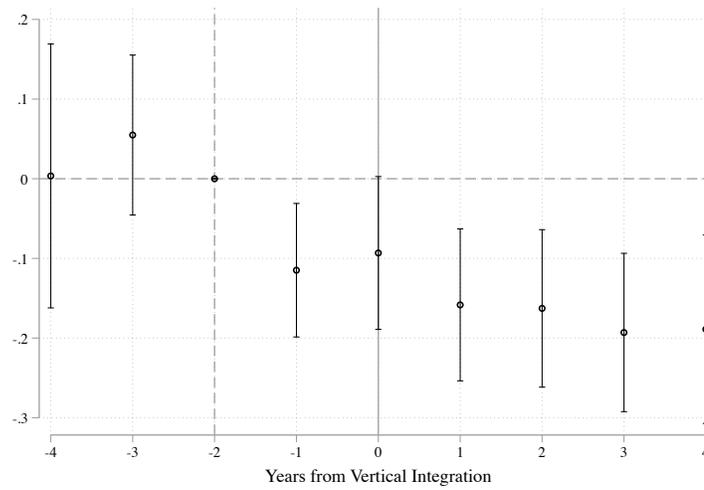
Analytic sample includes the universe of outpatient procedure discharge records in Florida from 2009-2015. "Vertically Integrated" is equal to one for physicians that report hospital or health system ownership of their practice in a given year. "Medicare" includes all patients in the traditional (fee-for-service) public insurance program. "Commercial" refers to privately insured, non-Medicare patients. "HOPDs" are hospital outpatient departments. "ASCs" are ambulatory surgery centers. Columns 1 and 2 capture the number of unique facilities where procedures are performed (by facility type) within a given year. All models include year and physician fixed effects (FE). Standard errors are clustered at the physician level.

** p < 0.05

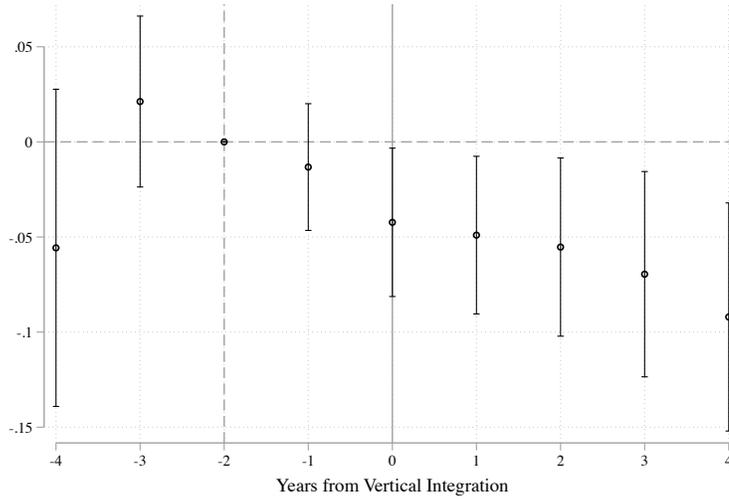
*** p < 0.01

Figure 2: Event Study Results for Effects on Physicians' Outpatient Procedure Allocations

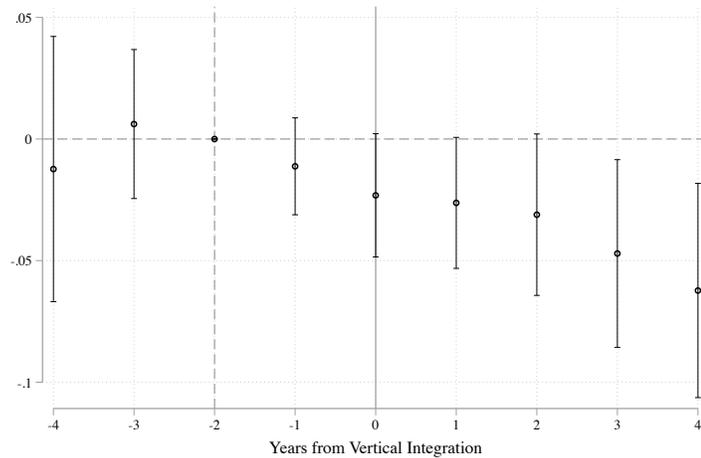
(a) Number of HOPDs



(b) Number of ASCs



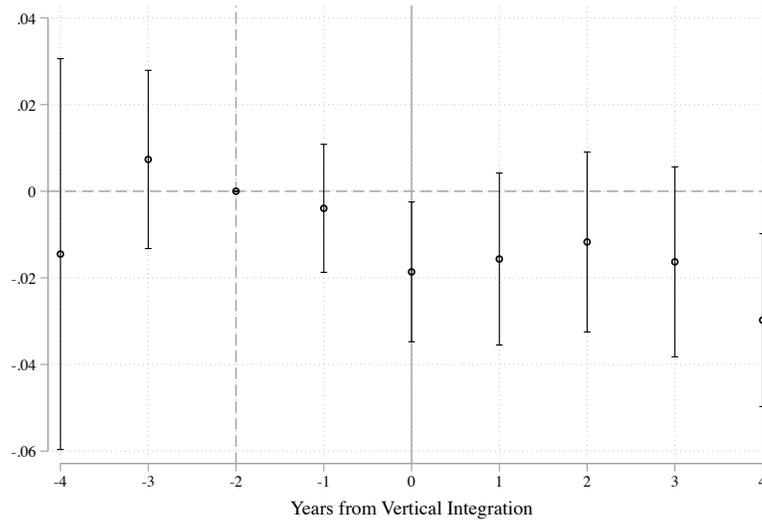
(c) Any ASC Use



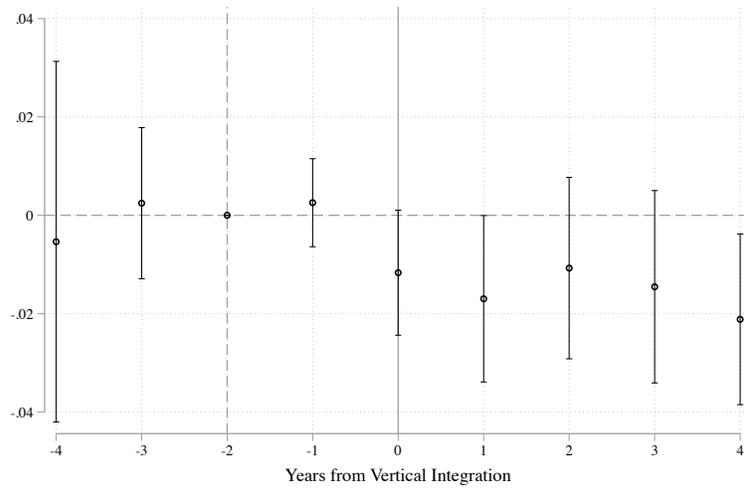
Notes: Analytic sample and variable definitions are the same as those belonging to Table 2.

Figure 3: Event Study Results for Effects on Physicians' ASC Use by Payer Type

(a) Share of Medicare Cases in ASCs



(b) Share of Commercial Cases in ASCs



Notes: Analytic sample and variable definitions are the same as those belonging to Table 2.

Table 3: Vertical Integration Effects on Physicians' Outpatient Procedure Output and Charges

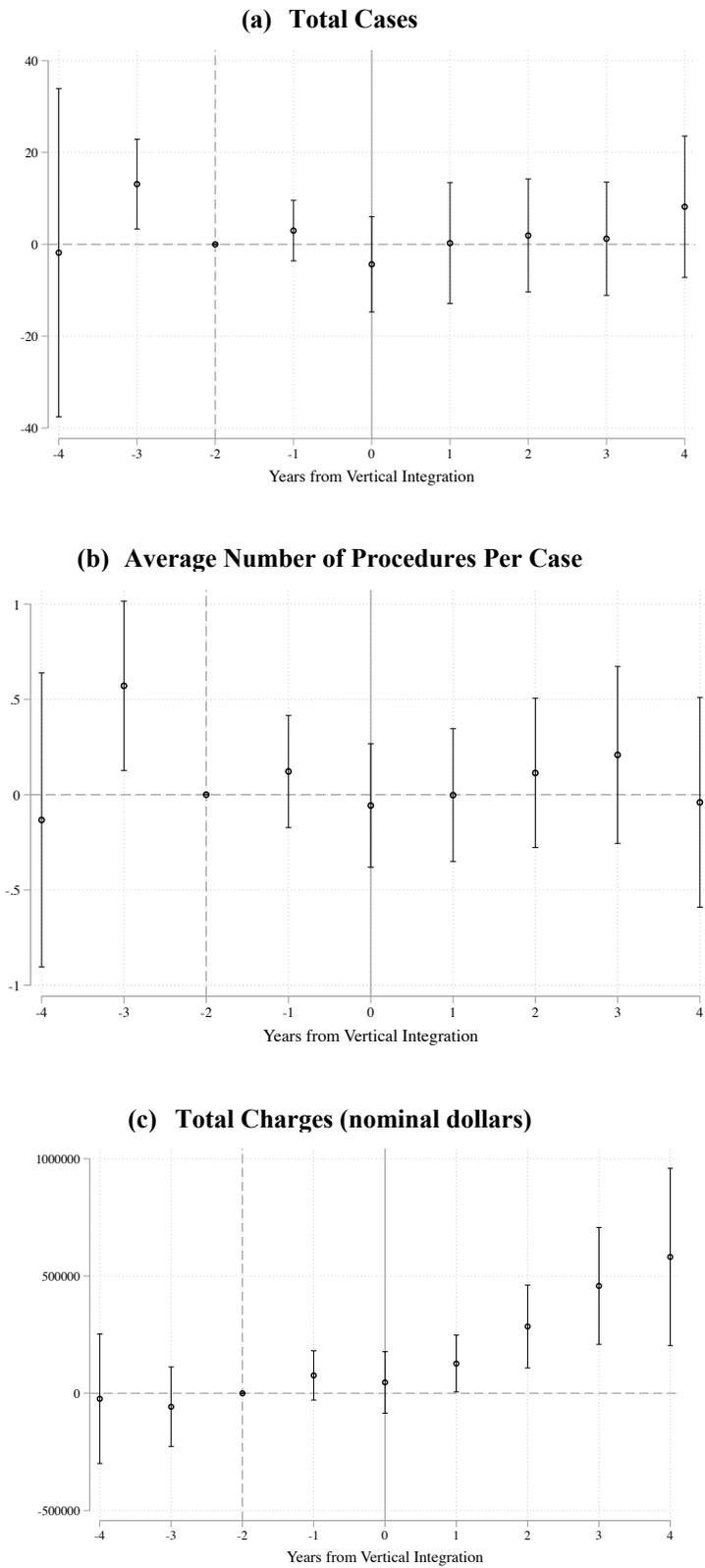
	Total Cases	Avg. Procedures Per Case	Total Charges (‘000)	Total Medicare Charges (‘000)	Total Commercial Charges (‘000)
	(1)	(2)	(3)	(4)	(5)
1[Vertically Integrated]	-3.121 (5.505)	-0.095 (0.139)	214.4*** (71.8)	76.3** (32.3)	4.3 (32.9)
Year FE	Yes	Yes	Yes	Yes	Yes
Physician FE	Yes	Yes	Yes	Yes	Yes
Observations (N)	37,303	37,303	37,303	37,303	37,303
Unique Physicians	5,329	5,329	5,329	5,329	5,329

Analytic sample includes the universe of outpatient procedure discharge records in Florida from 2009-2015. “Vertically Integrated” is equal to one for physicians that report hospital or health system ownership of their practice in a given year. “Medicare” includes all patients in the traditional (fee-for-service) public insurance program. “Commercial” refers to privately insured, non-Medicare patients. The procedures per case outcome captures the total number of Current Procedure Terminology (CPT) codes listed on a given outpatient discharge record. All reported charges are in nominal dollars (in thousands) and are not deflated by any cost-to-charge discount factor. All models include year and physician fixed effects (FE). Standard errors are clustered at the physician level.

** p < 0.05

*** p < 0.01

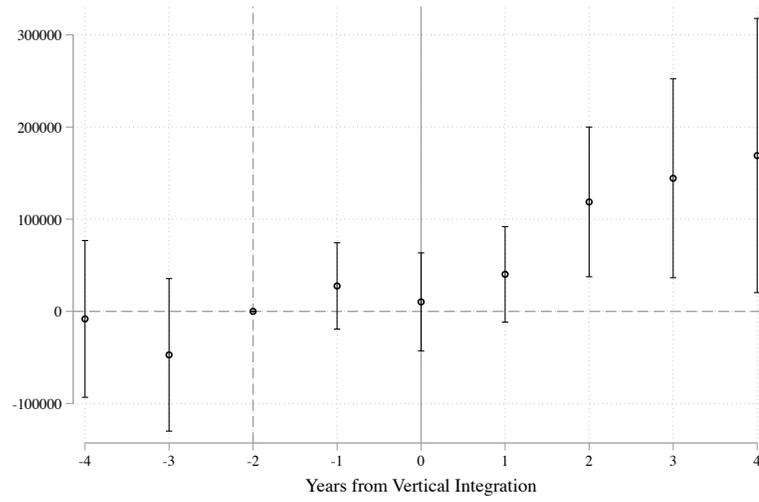
Figure 4: Event Study Results for Effects on Physicians' Outpatient Procedure Output and Charges



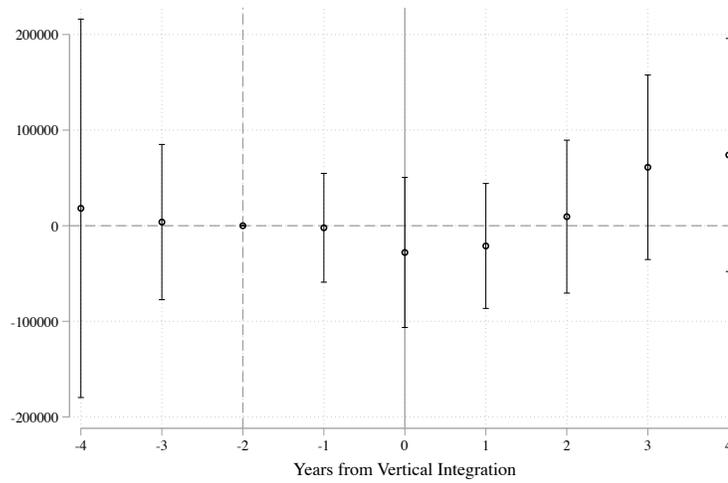
Notes: Analytic sample and variable definitions are the same as those belonging to Table 3.

Figure 5: Event Study Results for Effects on Physicians' Outpatient Procedure Charges by Payer Type

(a) Medicare



(b) Commercial



Notes: Analytic sample and variable definitions are the same as those belonging to Table 3.

Table 4: Vertical Integration Effects on Physicians' HOPD Procedure Allocations between Eventually Owning Firms and Their Competitors

	Share of Procedures Performed within Owning Hospitals' HOPDs	Number of Procedures Performed at Competing HOPDs
	(1)	(2)
1[Vertically Integrated]	0.027*** (0.010)	8.611 (6.334)
Year FE	Yes	Yes
Physician FE	Yes	Yes
Observations (N)	3,997	3,997
Unique Physicians	571	571
Baseline Mean (2009)	0.51	75.4

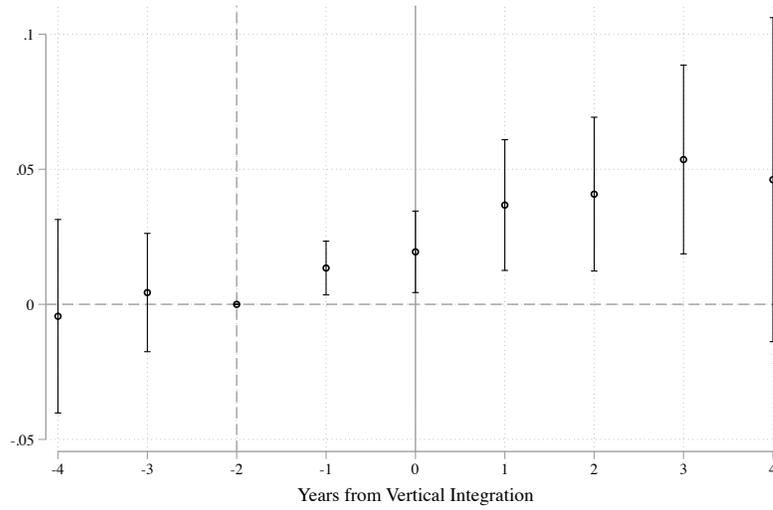
Analytic sample includes the newly vertically integrated and the always vertically integrated subgroups of Florida physicians during the 2009-2015 period. For both groups, we partition individual physicians' total HOPD procedures by two settings: owning hospitals and competing (non-owning) hospitals. For the physicians being newly integrated during our study period, we use the hospital/health system that will eventually acquire their practice to create their panel of procedure allocations. "Vertically Integrated" is equal to one for physicians that report hospital or health system ownership of their practice in a given year. "HOPDs" are hospital outpatient departments. All models include year and physician fixed effects (FE). Standard errors are clustered at the physician level.

** $p < 0.05$

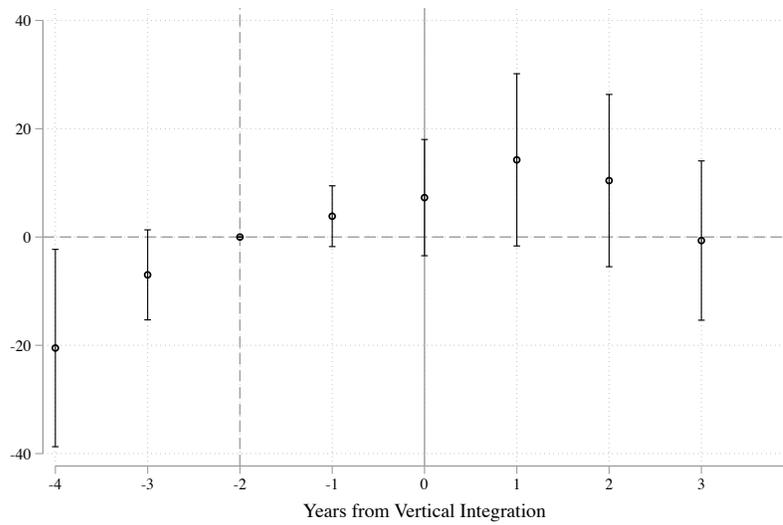
*** $p < 0.01$

Figure 6: Event Study Results for Effects on Physicians' HOPD Procedure Allocations between Eventually Owning Firms and Competitors

(a) Share of Procedures Performed within Owning Hospitals' HOPDs



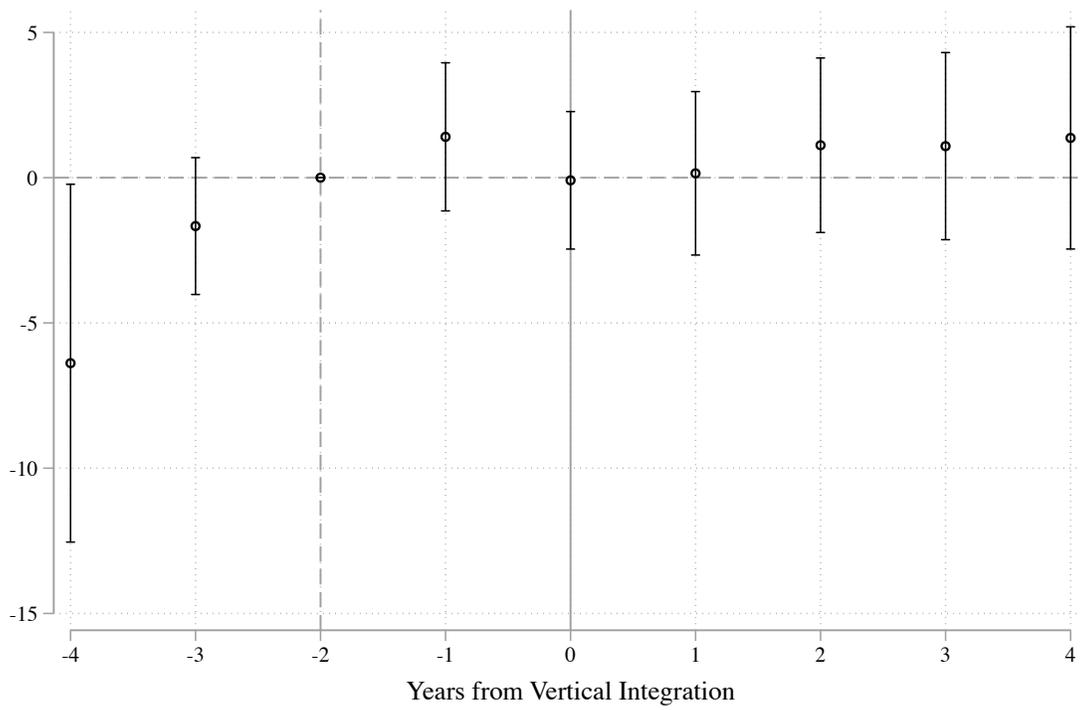
(b) Number of Procedures Performed at Competing HOPDs



Notes: Analytic sample and variable definitions are the same as those belonging to Table 4.

APPENDIX RESULTS

Appendix Figure 1: Vertical Integration Effects on Medicare Case Volumes



Appendix Figure 2: Vertical Integration Effects on Patient-to-Facility Distance (in miles)

