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The Impact of Management on Clinical Performance: Evidence from Physician Practice Management Companies

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Mergers and acquisitions in health care are increasingly leading to changes in firm management. This paper studies how a change in firm management impacts clinical performance using data on an understudied phenomenon: medical practice acquisitions by Physician Practice Management Companies (PPMCs). PPMCs market themselves as offloading the administrative burden of running a medical practice without compromising physician autonomy over clinical decisions. However, a PPMC's management strategy and practices, such as performance monitoring and financial incentives, could influence physician behavior. For example, some PPMCs advertise increasing revenue through better financial management, while others also advertise improving quality through better clinical management. In this paper, I collect data on three large PPMCs that manage the practices of over 40% of Obstetricians and Gynecologists (Ob-Gyns) in Florida between 2006 and 2014. An Ob-Gyn's main clinical decision in childbirth involves a trade-off between financial and clinical outcomes: C-sections are often more highly reimbursed than vaginal births but pose risks to maternal and infant health when not medically necessary. Using difference-in-differences methods, I find heterogeneous effects on C-sections depending on a PPMC's publicized management strategy. Physicians acquired by PPMCs that focus on financial management increase the use of C-sections, resulting in less clinically appropriate care and worse patient outcomes. The opposite result is found when PPMCs focus on clinical management. I provide qualitative and quantitative evidence that differences in firm management are the most likely driver of changes in C-sections. This paper informs how the corporatization of medicine can alter clinical performance outcomes.

Key words: Acquisitions, Management Practices, Physician Behavior, Quality of Care, Empirical

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1. Introduction

Across nearly all industries, variation in firm performance can be partly explained by differences in management. For example, large-scale survey collection efforts have revealed that better management practices are associated with higher productivity and financial success in the manufacturing, retail, and health care sectors (Bloom and Van Reenen 2010; Bloom et al. 2014).

Differences in management practices may also help explain variation in clinical performance across health care organizations (McConnell et al. 2013; Bloom et al. 2015; Tsai et al. 2015).

Understanding how differences in managerial priorities, processes, and practices influence health care outcomes is of particular importance given the ongoing corporate transformation of medicine. For-profit corporations are increasingly acquiring health care organizations, leading to changes in firm ownership and management. For example, corporate takeovers have been documented among dialysis clinics and nursing homes, with evidence that they lead to quality reductions because of managerial emphasis on financial rather than clinical outcomes (Eliason et al. 2020; Gupta et al. 2020). A similar pattern has emerged among physicians: as of 2016, the majority of physicians no longer own their medical practice because of acquisitions by hospitals (Kane 2016), private equity firms (Zhu et al. 2020), and management companies (Frack and Hong 2014).

This paper studies how a change in management impacts clinical performance using the context of medical practice acquisitions by Physician Practice Management Companies (PPMCs). Most physicians in the U.S. are not taught the management skills needed to run a practice in medical school (Finnegan 2020). For this reason, PPMCs advertise themselves as providing the business expertise and administrative support needed to increase practice profitability, typically through services such as insurance contracting, medical supply purchasing, and human resources (Burns 1997). PPMCs are similar to property management and financial services companies, but PPMCs provide in-house rather than outsourced management through a centralized Management Services Organization (MSO). Acquired practices remain distinct legal entities that are unified under a single tax identification number, which allows the MSO to collectively bargain with insurance companies and realize other operational efficiencies (Hoyme 2014; Graham 2019).[1] To comply with state and federal regulations, PPMCs also minimize disruptions to a physician's clinical environment: physicians maintain control of clinical care, continue to work in the same locations with the same colleagues and retain admitting privileges to the same hospitals.

Therefore, unlike acquisitions that lead to structural integration between the target firm and the acquiring firm, acquisitions by PPMCs provide an opportunity to study a change in management absent concurrent changes to the medical practice environment. The appeal of this organizational structure has led physicians to increasingly sell their practices to PPMCs instead of hospitals (Pruzansky 2019; Frack and Hong 2014). In fact, PPMCs market themselves as a better option to hospital ownership by claiming physicians can receive the economic benefits of a larger organization without compromising their autonomy over clinical decisions (Luria and Hagood 2019).

[1] The acquired practices operate as subsidiaries of a holding company set up by the PPMC, meaning they are separate legal entities for tax, regulation, and liability purposes. See Section 3.2 for details.

While a PPMC's organizational structure and marketing materials may promote physician autonomy, the management strategies and practices implemented by PPMCs could influence physician behavior. For example, management practices such as performance monitoring and financial incentives could be used to align physician behavior with a PPMC's stated objectives. The typical PPMC markets itself as a strategic partner for practice growth, with websites using physician-centered language such as "are you seeing ever-increasing bites taken out of your ever-diminishing income?"[2] These PPMCs focus on financial support services, including negotiating higher-paying managed care contracts and improving revenue cycle management, which can provide physicians with new incentives and feedback on their medical practice's financial performance. As an alternative approach, more PPMCs are evolving to address the growing demands of value-based care (Madden 2016). In addition to financial management services, these PPMCs provide clinical management services such as analyzing and tracking clinical outcomes and developing clinical guidelines to make practices competitive for value-based contracts. The websites of these PPMCs typically emphasize patient-centered care: "As healthcare transforms from volume-based to value-based care, you'll enjoy having a practice development partner who helps you implement population health management programs."[3] These PPMCs, therefore, also provide physicians with feedback on their clinical performance.

This paper studies three PPMCs that acquire medical practices focused on women's health in Florida between 2006 and 2014, representing over 40% of Obstetricians and Gynecologists (Ob-Gyns).[4] Two of the PPMCs have marketing materials consistent with a strategy focused on financial management, and one of the PPMC's has marketing materials consistent with a strategy focused on clinical management. To evaluate the impact of these management strategies, I study the trade-off between revenue and quality inherent to an Ob-Gyn's choice of C-section or vaginal birth for low-risk births. Labor and delivery account for the majority of an Ob-Gyn's income, and C-sections are often more highly reimbursed than vaginal births but can pose risks to maternal and infant health when not medically necessary (Truven Health Analytics 2013; Grivell and Dodd 2011). As a result, the overuse of C-sections is often an indicator of low-value care or subpar clinical performance (Baker 2019). PPMCs that emphasize financial performance outcomes could lead Ob-Gyns to increase their use of C-sections and shift care away from lower-income patients as a

[2] This quote is from the 2015 website of the PPMC Women's Health USA (not studied in this paper): https://web.archive.org/web/20150211122827/https://www.womenshealthusa.com/.

[3] This quote is from the 2015 website of the PPMC Privia Health (not studied in this paper): https://web.archive.org/web/20150808034152/http://www.priviahealth.com/doctors.html

[4] The PPMCs in this paper resemble others that manage private practices (e.g., QualDerm Partners) rather than those that provide hospital staffing services (e.g., TeamHealth).

means of increasing revenue. Alternatively, by tracking clinical outcomes and developing protocols to standardize care, PPMCs could encourage more appropriate C-section use.

I use a difference-in-differences design to estimate how a change in management affects the C-section decision and associated outcomes. Identification is based on the staggered timing of PPMC practice acquisitions between 2006 and 2014. I hand-collect data from corporate filings to determine when a medical practice was acquired and use SK&A physician survey data to identify the name and location of each Ob-Gyn's practice. Florida hospital discharge records provide unique physician identifiers, allowing the physician data to be linked to patient data.

On average, PPMCs lead to a 1.6 percentage point increase in low-risk C-sections. This average obscures significant heterogeneity based on each PPMC's publicized management strategy. The PPMC that focuses on providing clinical management services decreases low-risk C-sections by 5.7 percentage points (22.3% reduction of the pre-acquisition C-section rate), resulting in more clinically appropriate care and a decrease in patient morbidity. In contrast, the PPMCs that focus on providing financial management services increase low-risk C-sections by 2.6-2.9 percentage points (10.1%-11.2% increase), resulting in less clinically appropriate care and an increase in patient morbidity. These PPMCs also treat a greater share of Medicaid patients, but after an acquisition, the share of Medicaid patients is reduced in favor of more privately-insured patients. Sub-sample analyses also reveal that while C-sections increase regardless of patient insurance, physicians perform more C-sections among privately-insured patients than Medicaid patients. This result is consistent with physician behavior being influenced by a PPMC's emphasis on financial performance and raises concerns over equity in access to care and appropriate treatment.

The empirical challenge is to determine whether the observed post-acquisition changes in C-sections are driven by changes in management, changes in the patient population, or by differences in which types of physicians join a PPMC. The primary estimation includes controls for over 20 patient risk factors observed by the Ob-Gyn before the onset of labor, allowing for comparisons of patients with the same characteristics being treated by the same physician before and after acquisition. Even excluding patient controls yields similar point estimates and analyses using patient risk factors as outcomes finds no systematic evidence that patient C-section risk changes after acquisition. As an additional strategy, I estimate whether an increase in the proportion of Ob-Gyns in a PPMC within a 15-mile radius of a patient influences their probability of C-section. This patient exposure analysis yields qualitatively similar results to the primary difference-in-differences analysis and is robust to the inclusion of controls for market concentration. Primary results are also similar between acquisitions that did or did not lead to an increase in market concentration that would warrant scrutiny by antitrust agencies.

Selection is an inherent feature of the PPMC setting: physicians choose to sell their practice to a specific PPMC, and each PPMC chooses to acquire a specific practice. While I employ several empirical strategies to mitigate concerns of selection bias, the results should be interpreted as capturing the effect of PPMCs in the presence of selection. First, to minimize confounding factors at the time of acquisition, the primary analysis only includes "switchers:" physicians observed in the same practice before and after acquisition by a PPMC. Therefore, only physicians eventually acquired by a PPMC act as controls for those yet to be acquired. This strategy helps compare physicians that may be similar in unobservable ways given their choice to sell to a PPMC; though results are similar in a matched sample with non-PPMC physicians. Second, event study analyses show limited pre-trends in the C-section probability, providing evidence of exogeneity in the timing of practice acquisitions. Third, I show results are robust to different time periods with minimal overlap in a physician's choice between the PPMCs. Lastly, based on reports that include the timing of clinical initiatives, I show that C-sections also decrease among Ob-Gyns that joined the PPMC focused on clinical management before the sample period.

This paper provides evidence that a change in firm management can impact clinical performance using data on medical practice acquisitions by PPMCs. I find heterogeneous effects on C-sections depending on a PPMC's publicized management strategy and practices. The PPMC that focuses on clinical management reduces C-sections and improves the quality of care, while the opposite result occurs under the financial management model. These two models represent the publicized management approaches undertaken by other PPMCs nationwide and are important in their own right. Fueled by recent private equity investments, these three PPMCs continued to expand, and by 2019, delivered 1 in every 25 babies in the US. Such expansions have raised concerns that PPMCs are simply a means to increase market power and reduce competition (Scheffler et al. 2021). While I find that PPMCs influence C-sections regardless of changes in competition, the PPMCs do amass considerable market power, and their growth may eventually lead to more salient anti-competitive effects. Another policy consideration is whether PPMCs comply with Corporate Practice of Medicine (CPOM) laws meant to prevent corporations from influencing clinical decisions. Most scrutiny for CPOM violations has focused on staffing companies such as TeamHealth and Envision (Arnsdorf 2020; Haefner 2020); however, this research shows that even PPMCs claiming to preserve physician autonomy can alter clinical outcomes for better or for worse.

2. Literature and Contribution

This paper contributes to the research on "management as technology", or how the adoption of different management priorities, processes, and practices influence firm performance. Management practices often include performance monitoring (i.e., performance tracking and feedback), target

setting (i.e., setting and communicating specific goals), and incentives (i.e., reward provision) (Bloom, Sadun, and Van Reenen 2012). Using cross-sectional surveys in the hospital setting, researchers find that management quality is strongly correlated with financial and clinical outcomes (McConnell et al. 2013; Bloom et al. 2015; Plough et al. 2017; Bloom et al. 2020) and that hospital boards that emphasize clinical quality have more effective management practices and better outcomes (Tsai et al. 2015). However, a recent study of CEO turnover in U.K. hospitals finds little evidence that CEOs change hospital performance despite large variation in perceived CEO managerial quality (Janke, Propper, and Sadun 2020). Given the complex and dynamic nature of the health care industry, more research is needed to understand how managerial changes impact performance. PPMCs provide a useful setting to evaluate a change in management because their stated business purpose is to manage the back-end administrative functions of medical practices without disrupting a physician's clinical environment. In addition to studying within-firm changes, this paper complements the management research by providing a case study of how differences in publicized management strategies can contribute to differences in firm performance.

This paper also adds to the literature on the impact of health care mergers and acquisitions (M&A). There is substantial evidence that health care consolidation leads to higher prices (Dafny 2009; Gowrisankaran, Nevo, and Town 2015; Baker, Bundorf, and Kessler 2014; Capps, Dranove, and Ody 2018; Dunn and Shapiro 2014). There is also a growing literature studying the effect of M&A on health care quality. Studies of US hospitals find that either quality deteriorates or there are no changes after acquisition (Ho and Hamilton 2000; Huckman 2006; Beaulieu et al. 2020). Research linking physician market concentration to quality of cardiac care finds quality deteriorates when prices are administratively set but no change when prices are negotiated (Dunn and Shapiro 2017; Koch, Wendling, and Wilson 2018). In addition to changes in market structure, this paper considers how acquisitions could impact quality through changes in a firm's management strategy. This approach complements the research on corporate takeovers in health care, which finds that regardless of changes to market structure, quality deteriorates after acquisition because acquired firms adopt the parent company's strategies (Eliason et al. 2020; Gupta et al. 2020).

Another related literature studies physician behavior and variation in treatment choices. In particular, the use of C-sections varies dramatically: among low-risk mothers, the C-section rate varies between 2% and 36% across U.S. hospitals (Kozhimannil et al. 2013). Epstein and Nicholson 2009 find evidence that within-hospital variation in C-sections is even larger than between hospital variation and that Ob-Gyn treatment patterns do not converge over time. The rigidity of treatment decisions makes the findings of this paper more striking. The PPMC focused on clinical management distributed clinical guidelines and performance feedback on physician C-section use among other initiatives, which coincided with a decline in C-sections. The effectiveness of these interventions

is supported by research on changes in physician behavior in response to new information such as letters, feedback, and report cards (Kolstad 2013; Sacarny et al. 2018; Song et al. 2017). In contrast, acquisitions by PPMCs focused on financial management coincided with an increase in C-sections. Potential channels for this behavior change include receiving new knowledge on practice revenue trends and billing, feeling pressure to increase productivity, and changes to financial incentives. In particular, PPMC marketing materials emphasize negotiating higher-paying managed care contracts, which could lead physicians to substitute towards C-sections (Gruber, Kim, and Mayzlin 1999; Johnson and Rehavi 2016; Foo, Lee, and Fong 2017).

Lastly, this paper contributes to research on different models of physician organization. While researchers have studied the characteristics and effectiveness of practice models such as Accountable Care Organizations (Shortell et al. 2014; Nembhard and Tucker 2016) and Independent Physician Associations (McMenamin et al. 2004; Casalino et al. 2013), research on PPMCs remains limited. Exceptions include research on physician staffing firms, a type of PPMC that focuses on providing hospital staffing and management solutions (Cooper, Scott Morton, and Shekita 2020; La Forgia et al. 2022). In contrast, this paper focuses on PPMCs that manage the business functions of private practices. There has been a resurgence in both types of PPMCs over the past decade, with their growth often fueled by private equity investments (see Appendix A for a brief history). In this sample, two of the PPMCs were acquired by private equity firms with the goal of expanding the models nationwide. As PPMCs continue to proliferate, it will become even more important to understand how they impact health care delivery.

3. Institutional Background

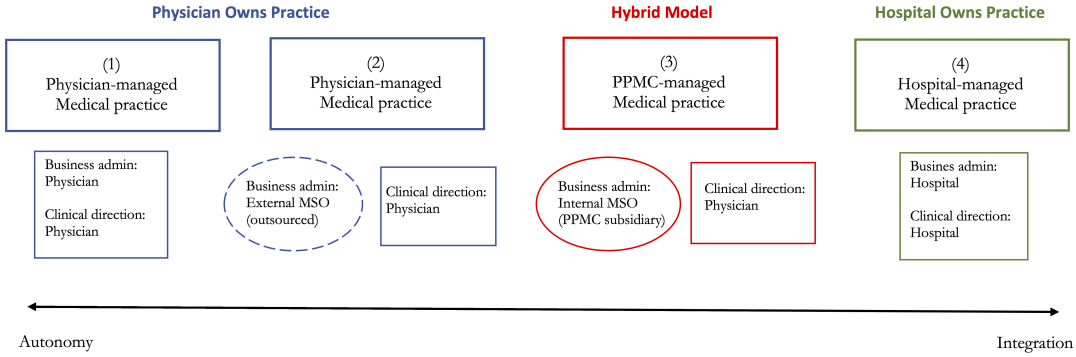
3.1. Physician Choice Set

To understand the value proposition of a PPMC, it is important to consider the other options available to physicians. Figure 1 provides a spectrum of organizational structures based on the degree of professional autonomy offered to the physician. Under full autonomy, the physician manages all clinical care and practice administration and bears the financial risk of their decisions. Under no autonomy (full integration), the physician is a salaried employee with clinical care and practice administration directed by the hospital.

Model (1) is the most common type of physician organization: the medical practice is physician-owned and operated, and the physician has autonomy over business and clinical decisions. Model (2) is similar to (1), except the physicians outsource their business administration to an independent Management Services Organization (MSO). MSOs often specialize in certain non-clinical service areas such as practice administration (e.g., human resources and IT support), revenue cycle management (e.g., billing and claims processing), and patient access and communication (e.g.,

patient portals) (Swift and Barnes 2016). A single practice often hires several MSOs to manage different parts of the business (Cantlupe 2018). In this model, the physician still manages clinical care and essentially directs the MSO as an employee.

Figure 1 Comparison of PPMCs to Other Models of Physician Organization



Notes: Author's illustration.

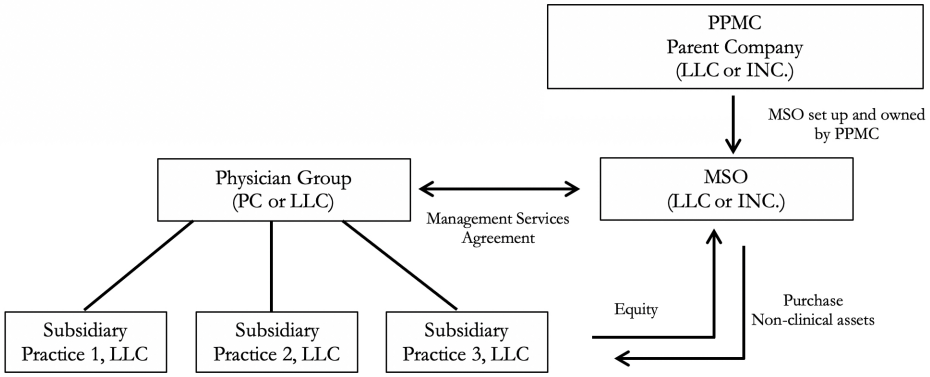
While the outsourcing model allows physicians to remain independent of the MSO, the PPMC-managed medical practice (model (3)) sets up a full-service in-house MSO that owns the assets of practices and manages them directly. In other words, the medical practice "no longer owns the administrative expense and burden of managing those assets" (Madden 2016). The PPMC model unifies physician practices under a single tax identification number (TIN), allowing the MSO to conduct insurance contract negotiations, group purchasing arrangements, and realize other operational efficiencies not available in the outsourcing model (Hoyme 2014). The aim is to offer physicians higher and more stable revenue compared to model (1) or (2). The potential downsides associated with selling to a PPMC can include pressure to keep minimum productivity thresholds, non-compete clauses that make it difficult to leave a PPMC, and loss of control over business decisions and practice operations (more details provided in Section 3.2).

PPMCs are also commonly contrasted to the hospital ownership model (model (4)). After being acquired, physicians usually become salaried employees of the hospital, and both the clinical and business functions of the practice become managed by the hospital. While physicians relinquish significant autonomy, they benefit from income stability through salary guarantees and legal protections provided by the hospital. Still, the loss of autonomy is often used as a PPMC marketing strategy that promises an alternative that alleviates the burden of running a business while preserving clinical autonomy. Another appealing feature is the easy transition into a PPMC since no structural changes or integration occurs with other acquired practices. Overall, for a physician in model (1) or (2), the choice between a PPMC and a hospital will depend on their preferences over autonomy and the associated financial risks.

3.2. PPMC Organization

3.2.1. Corporate Structure Figure 2 illustrates the general corporate structure of a privately-held PPMC. For example, suppose a medical practice called Practice 1 sells its practice to a PPMC. Upon selling, the practice dissolves its existing business entity and files to become a subsidiary of a holding company representing all other acquired practices (the Physician Group in Figure 2). This change allows Practice 1 to go from billing under its own TIN to billing under the TIN of the Physician Group. This means Practice 1 gives up its existing health plan contracts and accepts the health plan arrangements of the Physician Group after acquisition (Hoyme 2014). However, Practice 1 does not share patients with the other subsidiary practices, and physicians may never even interact with physicians in other subsidiary practices.

Figure 2 General Corporate Structure of a PPMC



Notes: Author's illustration. Actual PPMC corporate structures may vary.

On the business side, the PPMC operates as the parent company. The PPMC's subsidiary MSO acquires the medical practice's tangible assets (e.g., medical equipment, office space, supplies). The purchase price is often a multiple of practice earnings to be paid out over a 3-5 year period if the practice complies with the terms of the acquisition. These terms can include keeping practice revenue to 90% of the pre-acquisition level.[5] Through the Physician Group, the medical practice enters a long-term, exclusive contract with the MSO to provide comprehensive administrative support services in exchange for a monthly fee. The physician is not an employee of the PPMC. Each practice remains the residual claimant of their practice revenue less the management fee and other direct expenses such as rent and overhead. However, to align financial incentives, physicians often receive an equity stake in the MSO in the form of company stock (Cohen Healthcare Law 2015). Overall, the MSO manages the business aspects of each practice, the physicians manage clinical care, and they are tied together through a service contract and equity.

[5] Physicians often sign a restrictive covenant that prevents them from practicing in the state (or other specified regions) if they decide to leave the PPMC and/or impose a cash penalty for exiting the company (Hernandez 2020).

The Physician Group and the MSO are organized as separate entities to comply with Corporate Practice of Medicine (CPOM) laws, among other state and federal regulations such as fee-splitting and anti-kickback laws. CPOM laws vary by state but generally prohibit "corporations from practicing medicine or employing a physician to provide professional medical services" so that physicians "maintain actual control over the practice of medicine" (Chapman Insights 2017).[6] However, a PPMC's corporate structure does not guarantee autonomy: the same management services provided by the PPMC could still influence a physician's clinical decision-making.

3.2.2. PPMC Objectives and Management Strategy The goal of a PPMC is to increase company value by increasing practice revenue. Many PPMCs also actively seek outside funding to continue acquiring practices, especially from private equity (Maruca 2019; Meyer 2019). This occurs whether the PPMCs advertise providing financial management or clinical management services.

The typical PPMC focuses on increasing practice revenue through better financial management and negotiating higher-paying managed care contracts. Financial management services can include accounting and taxes, billing and claims processing, accounts payable, and financial forecasts and compensation reports. Other relevant support services include human resources, facilities management, including group purchasing for medical supplies, and information technology. These support services are meant to offload the administrative burden of running a practice and provide physicians with new information on the financial health of their practice. The marketing language used by these PPMCs often centers around physician concerns over loss of income and autonomy. For example, a PPMC's website says: "Are you seeing ever-increasing bites taken out of your ever-diminishing income? While caring for patients, are you fighting to find time to deal with business? Partner with us. We're Women's Health USA, The Business Partner for Physicians. Consider us your "back room" business support team" (Women's Health USA 2015). Similarly, a PPMC focused on dermatology advertises "QualDerm Partners helps top-tier dermatologists position their practices for sustainable growth and profitability" (QualDerm Partners 2021).

In response to the rise in value-based payments, other PPMCs are increasingly focusing on clinical management to help practices become competitive for these performance-linked contracts (Madden 2016). Clinical management can include tracking and analyzing clinical care metrics, providing performance feedback, and helping physicians develop prevention and wellness programs, clinical guidelines, and best practices. Some PPMCs always adopted a clinical management strategy, but some established PPMCs are also shifting towards this model. Either way, the websites of these PPMCs still promise an increase in practice profitability and offer the typical practice management

[6] Regardless of regulation, enforcement varies widely (Cohen Healthcare Law 2018). Some states like Florida have no formal CPOM laws, but past legal cases have established that corporations should not interfere with the "physician-patient relationship." See Indest III 2012 for details.

services while emphasizing population health management. For example, Axia Women's Health advertises: "We're about improving patient outcomes, achieving value-based care, and setting an example for how women's health care should be managed" (Axia Women's Health 2021). Similarly, the multi-specialty PPMC CareMount Health Solutions helps "providers develop and execute on a population health strategy including development of risk-based contract optimization, population health analytics, and clinical care redesign that transform group practice reimbursement models from fee-for-service to value" (CareMount Health Solutions 2021). These quotes emphasize how the PPMCs harness clinical data to help physicians improve health outcomes.

4. Research Setting

4.1. PPMC Sample

This paper collects data on three privately-held PPMCs that manage the practices of Ob-Gyns in Florida between 2006 and 2014. These PPMCs (referred to as PPMCs 1, 2, and 3) were the dominant non-hospital owners of Ob-Gyn practices in Florida. Table 1 presents a high-level comparison of key characteristics. The PPMCs vary in size, location, and founding dates, which limits the choice that physicians had between the PPMCs. This PPMC information was collected through archived website data using "The Wayback Machine", publicly available corporate filing data, and off-the-record conversations with PPMC executives that provided high-level background. The quoted materials in this section come directly from PPMC or insurer websites. Documentation and details on the qualitative data collection process are provided in Appendix B.

Table 1 Summary of PPMC Characteristics and Advertised Objectives

	PPMC 1	**PPMC 2**	**PPMC 3**
Date Founded	1998	2004	2009
Location Founded	West Central Florida	South Florida	South Florida
Physicians (2018)	400	600	1500 (600 in FL)
Mission/ Aim	"Improving the lives of women every single day"	"Best of both worlds together: solo practice autonomy with the resources of a group practice"	"Protect the private practice of medicine and the economic security of Ob-Gyns"
Financial Objectives	Increase practice revenue and operational efficiency	Increase practice revenue and operational efficiency Increase company value through practice acquisitions	Increase practice revenue and operational efficiency Increase company value through practice acquisitions
Clinical Objectives	Reduce early term deliveries & primary C-section deliveries Increase primary care visits	None Specified	None Specified

Notes: PPMC 1 says it was founded in 1998 but did not resemble a PPMC until 2002. The number of physicians is the total (of any specialty) reported by the PPMC in 2018. Only a selected list of advertised clinical and financial objectives are presented. The mission/aim is a representative quote from the PPMC websites' "About Us" pages.

4.1.1. PPMC 1 - "Clinical Management" PPMC 1 was founded by Ob-Gyns in West Central Florida who united to form their own MSO in 2002. New practice acquisitions focused on the same region, with member practices mainly located between Tampa and Orlando. Before 2004, the PPMC operated a website that resembled a typical PPMC model. For example, PPMC 1 described itself as "Consolidation for Business. Individualization for Health Care" where each practice operates as an "independent care center." PPMC 1 also emphasized practice profitability, advertising that within a year, practices "experienced 15% higher reimbursements from third party payers" and a "60% reduction in accounting costs." Then, starting in 2005, they created a single, patient-facing website that included a patient portal and information on member practices. This change signaled a shift towards clinical management, as seen in their advertised mission of "improving the lives of women every single day." Based on conversations with PPMC 1, their goal was to increase quality and decrease costs to position themselves for value-based contracts.

As an organization, PPMC 1 emphasized care quality by encouraging physicians to join quality committees, establishing a code of conduct signed by all physicians, and creating a publicly available "value report" that summarized key objectives, initiatives, and clinical data. However, efforts to standardize care quality became particularly salient in 2011 when they implemented a series of initiatives to reduce the primary C-section rate. These efforts included creating and distributing best practices for labor management and tracking and sharing C-section rates with physicians, including comparisons across practices. By late 2013, PPMC 1 achieved its objective by signing "collaborative care" contracts with Cigna and United Healthcare, where Ob-Gyns would be paid on performance measures in labor and delivery.[7] In this way, PPMC 1 advertised itself as providing both typical management services meant to increase practice profitability and clinical management services meant to improve the quality of care.

4.1.2. PPMC 2 - "Financial Management" PPMC 2 was founded by Ob-Gyns in the Miami Metropolitan area in 2004 with the explicit goal of speaking "with one powerful voice to managed care organizations." Acquisitions of new practices remained in South Florida until 2010 when it began expanding into East Central and Central Florida. The website of the PPMC was primarily focused on physician recruitment, while PPMC 2 physicians kept their own separate website and patient portals. The lack of unified branding supports PPMC 2's marketing emphasis on "maintaining a physician's autonomy." PPMC 2 materials also predominantly emphasized increasing the financial performance of practices: "our goal is to support you in any way that can improve your bottom line" and "physicians who have joined [PPMC 2] have experienced

[7] A press release from Cigna describes the arrangements aim "to reduce primary cesarean delivery" and shares that "practices participating in the program are compensated with a patient care management payment that rewards them for meeting a comprehensive set of quality and cost efficiency targets." See Appendix B for more details.

significant practice growth and increased reimbursements." The 2007 website listed accounting and finance, managed care negotiations and contract administration, operations, human resources and personnel management, and IT support as the key service offerings. While PPMC 2 stated that these services would "improve the quality of healthcare to their patients," they did not advertise clinical management services or specific quality initiatives.

PPMC 2's focus on negotiating higher-paying contracts also created push-back from insurers. For example, in 2013, Florida Blue entered a payment dispute with PPMC 2 and shared a press release discussing "affordability concerns" and "collective concerns over [PPMC 2's] business model" as well as scrutinized PPMC 2's "demand for uncontrolled physician acquisition growth." Similarly, in 2014, Aetna shared that "the [PPMC 2] physicians are generally more costly to Aetna and our plan sponsors compared to some of their peer physicians." While agreements were eventually reached, these quotes show PPMC 2's ability to increase reimbursement for acquired practices and highlight PPMC 2's managerial emphasis on financial performance.

4.1.3. PPMC 3 - "Financial Management" PPMC 3 was founded by Ob-Gyns in the Miami Metropolitan area in 2009. The PPMC grew rapidly throughout Florida, including into less urban areas. The PPMC 3 website focused on promotional materials, while physicians in PPMC 3 kept their own websites and patient portals. Similar to PPMC 2, PPMC 3 "wants to protect the private practice of medicine and ensure the economic security of Ob-Gyns for the foreseeable future." PPMC 3 materials also explicitly focused on profitability, suggesting that the top five reasons to join the PPMC were "1. Increased income, 2. Stabilization of income, 3. Reduced costs, 4. Preservation of independent practice model, and 5. Increased Productivity." PPMC 3 even provided profit projections that suggested "many of our group members enjoy up to a 30% increase in profits and a 30% decrease in expenses." PPMC 3 advertised the same services as PPMC 2 and similarly did not list clinical management services or quality initiatives on their website. However, PPMC 3 did emphasize that reducing managerial burden would create "a profitable medical practice that provides top quality patient care and an excellent working environment."

PPMC 3 also had some legal troubles and contract disputes. While not in Florida, PPMC 3 received push back from United Healthcare for "seeking a 20 percent increase in reimbursements" after expanding into North Carolina in 2014. The Department of Justice also led an investigation into whether a PPMC 3 subsidiary group in Florida focused on urogynecology intentionally billed Medicare for services never performed and for unnecessarily large amounts. This example illustrates the potential pressure physicians in a PPMC face to increase practice profitability.

4.2. How Can PPMCs Influence Clinical Performance?

This paper studies three PPMCs: two that emphasize increasing practice profitability through better financial management and one through better clinical management. While a PPMC's organizational structure and marketing materials may promote physician autonomy, these different management strategies and practices implemented by PPMCs could influence a physician's clinical decision-making. To understand the impact of a PPMC on clinical performance, I focus on an Ob-Gyn's decision in childbirth to perform a C-section or vaginal birth. C-sections are the most common major surgical procedure performed in the United States: 31.9 percent of births (37.4% in Florida) are delivered via C-section, more than twice the recommended rate of 10-15% (Hall et al. 2010; CDC 2014; WHO 2015). C-section overuse has received widespread attention, with a growing consensus that unnecessary C-sections contribute to rising medical spending while at best providing no medical benefit and at worst harming maternal and infant health (Ellison and Martin 2017; Dembosky 2018; Oster and McClelland 2019). This is because the decision to perform a C-section often involves a trade-off between revenue and quality.

On average, C-sections are more highly reimbursed than vaginal births: claims data from 2004-2010 indicate that insurers paid a total of $16,673 for C-sections and $12,520 for vaginal births (Truven Health Analytics 2013).[8] Of this amount, physicians received, on average, $3,350 for Cesarean birth and $2,887 for vaginal birth. Additionally, procedure time may factor into a physician's choice: C-sections are often more convenient, generally lasting between 45 and 60 minutes, whereas vaginal births are more variable and can require monitoring up to 8 hours before delivery (NIH 2018; Patterson and Winslow 2008). Since labor and delivery account for the majority of an Ob-Gyn's income, Ob-Gyns could increase revenue by performing more C-sections (See Appendix C for more information on Ob-Gyn income.)

While C-sections can be a medically necessary or life-saving intervention, the majority occur at the discretion of the physician (Main et al. 2011). This discretion is especially salient for unplanned C-sections: the two most common clinical justifications, fetal distress during labor and failure to progress to labor, are considered subjective diagnoses (Cunningham et al. 2010).[9] As a result, even among low-risk mothers, the C-section rate varies between 2% and 36% across US hospitals (Kozhimannil, Law, and Virnig 2013). The major problem with C-section overuse is that, on average, C-sections lead to longer hospital stays, longer recovery times, and increased severe maternal and infant morbidity compared to vaginal births (Grivell and Dodd 2011).

[8] These payment amounts include facility, physician, laboratory, radiology and pharmacy fees for a mother's prenatal, intrapartum and postpartum care.

[9] Clinical reasons for scheduling a C-section in advance of labor (referred to as "planned" C-section) can include severe maternal hypertension, previous C-section, or problems with the placenta. Patients could also request a C-section. In 2006, the NIH found evidence that 2.5% of all US births were by maternal request.

In the PPMC setting, an emphasis on improving practice profitability through financial management, including negotiating higher-paying contracts, could lead to an increase in C-sections. This is supported by empirical work that links higher reimbursement to increases in C-sections (Gruber, Kim, and Mayzlin 1999; Johnson and Rehavi 2016; Foo, Lee, and Fong 2017). New information and feedback provided on the financial health of their practice could also motivate physicians to shift care towards patients with higher-paying insurance, increase their patient panel size, and change treatment patterns on the margin. More generally, critics of management companies suggest the pressure to increase shareholder value could increase the use of high-cost, low-value care (Luria and Hagood 2019). This concern is supported by past legal cases against staffing firms and PPMCs (Heath and Rosenbaum 2012; Stewart 2018; Oberheiden P.C. 2021).

Alternatively, by decreasing time spent on administrative responsibilities, providers could have more time to spend with patients during labor, leading to a decrease in C-sections (Shute 2014). If offered by PPMCs, clinical management services could also help reduce C-section overuse. In labor and delivery, clinical protocols, checklists, and other health care standardization methods have been shown to improve quality outcomes (see ACOG Committee Opinion 2015 for a review). Tracking clinical data and providing relative performance feedback could also have powerful effects on physician behavior (Kolstad 2013; Staats et al. 2016; Song et al. 2017; Sacarny et al. 2018). Altogether, it remains an empirical question whether the financial and clinical management services offered by PPMCs impact clinical decisions after a practice acquisition.

5. Data and Sample

5.1. Patient Data

Patient-level data is available from hospital discharge records purchased from the Florida Agency for Health Care Administration. This data includes all recorded inpatient episodes in Florida between 2006 and 2014. Each observation is a birth record that consists of the patient's age, race, insurance status, zip code, and procedure and diagnosis codes, as well as the hospital identification number, hospital location, and the operating physician's medical license number.

5.2. Physician Data

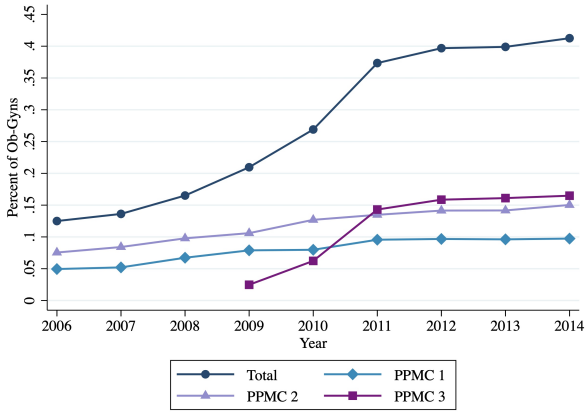
I use SK&A physician survey data (re-branded as IQVIA OneKey), which has information on a physician's medical practice name and location, to link physicians to a single practice in a given year. I then hand-collected data from corporate filing data to determine when a practice filed to become a PPMC subsidiary. This information was merged with the SK&A data and verified using Medicare Physician Compare data in 2014 and Florida Licensure Data. I also used historical versions of physician and PPMC websites to verify the date a physician appeared on the website. See Appendix D for more details on data sources and construction.

5.3. Sample Selection

Over the sample period, there are 1,930,033 total births and 1,400,412 low-risk births. To make relevant comparisons between PPMC and non-PPMC physicians, I limit the sample to physicians delivering at least 100 babies between 2006 and 2014. Births from patients under 13 and over 55 are excluded, as are births from patients residing outside the US or that have no documented residence. The primary analysis focuses on the sample of low-risk births since physicians yield more discretion over this decision. Using the AHRQ Inpatient Quality Indicators #33, low-risk births are defined as live babies born at or beyond 37 weeks' gestation to women with no prior C-section, that are singleton (no twins or beyond) and in the vertex presentation. The final analytic sample includes 1,770,722 total births and 1,262,357 low-risk births performed by 1,693 physicians between 2006 and 2014, with an overall C-section rate of 40.6% and low-risk C-section rate of 24.0%.

Figure 3 PPMC Growth and Sample Size

(a)



(b)

	Ob-Gyns	Practices	Births Low-Risk	Births All
Panel A: Full Sample				
PPMC 1	151	23	91,010	124,887
PPMC 2	220	90	135,925	194,363
PPMC 3	282	117	238,563	326,078
Non-PPMC	1040	487*	796,859	1,125,394
Total	1,693	717	1,262,357	1,770,722
Panel B: Switcher Subsample				
PPMC 1	40	12	30,247	41,916
PPMC 2	114	57	70,776	100,643
PPMC 3	183	104	190,743	261,472
Total	337	173	291,766	404,031

Notes: Fig 3a shows the share of Ob-Gyns in a PPMC. Fig 3b shows the sample statistics for the full sample of Ob-Gyns, the switcher subsample of PPMC joiners, and physicians who never joined a PPMC. Only Ob-Gyns who perform at least 100 births between 2006 and 2014 are included in all samples. *Practice data excludes information on 145 Ob-Gyns who did not match to the SK&A data.

As shown in Figure 3(a), over 40% of Ob-Gyns in Florida were in a PPMC by 2014. Figure 3(b) presents the sample size of each PPMC, where the switcher subsample is defined as Ob-Gyns observed in the same private practice before and after acquisition. This distinction is made because other Ob-Gyns may join a practice already in a PPMC after completing residency or after leaving a hospital-based position. Additionally, for PPMCs 1 and 2, many Ob-Gyns are always observed as part of the PPMC because practices were acquired before the first year of the sample. The primary analysis focuses on the switcher subsample to minimize confounding factors at the time of acquisition since they remain in the same private practice, retain the same physician colleagues, and deliver in the same hospitals after acquisition (Appendix Table E.1).

5.4. Descriptive Statistics

For the sample of low-risk births, Table 2 presents the unadjusted mean C-section rate, birth volume, and patient characteristics for PPMC and non-PPMC physicians. These summary statistics shed light on whether patients in PPMCs are inherently different from non-PPMC patients and whether the patient mix changes after an acquisition. There are several notable differences. PPMCs 1 and 2 have higher unadjusted C-section rates than non-PPMC physicians. PPMC 2 has the highest C-section rate with a pre-acquisition average of 28.20% (though risk-adjusted rates are more similar as seen in Appendix Figure E.1). All the PPMCs see a larger share of privately-insured patients compared to non-PPMC physicians who treat a larger share of Medicaid patients. In particular, in PPMC 1, 80% of patients are privately insured in the pre-acquisition period. Across the PPMCs, the unadjusted birth volume declines after acquisition. However, once year fixed effects are included to account for overall declines in fertility rates, the volume change is not economically or statistically significant (Appendix Table I.2).

Table 2 Descriptive Statistics by PPMC, Low-Risk Births

	PPMC 1		PPMC 2		PPMC 3		Non-PPMC
	Pre	Post	Pre	Post	Pre	Post	
Birth Type (%)							
All C-Sections	25.47	24.28	28.20	28.43	22.79	23.56	23.24
Planned	12.15	11.67	14.09	14.80	10.95	11.25	11.15
Unplanned	13.32	12.61	14.11	13.63	11.84	12.31	12.10
Birth volume							
Yearly births per Ob-Gyn	99.47	85.74	96.32	80.16	139.90	109.28	116.35
Total births	11,041	19,206	22,923	47,853	108,561	82,182	796,859
Patient Demographics							
Age*	28.99	29.17	28.79	29.61	27.03	27.80	26.52
Insurance (%)							
Private	80.00	77.25	62.00	65.36	48.25	45.90	32.42
Medicaid	12.78	16.17	27.96	24.08	40.26	39.18	49.18
Medicaid Managed	1.55	2.74	3.87	4.19	4.69	8.1	10.01
Self pay	3.38	1.87	3.74	3.84	3.3	2.51	4.46
Other insurance	2.29	1.96	2.43	2.53	3.5	4.31	3.93
Race/Ethnicity (%)							
Black	11.41	11.09	16.48	14.35	15.26	15.31	24.45
Hispanic/Latina	10.46	9.90	30.42	32.71	18.47	24.98	22.27
White	70.17	70.75	44.12	44.33	58.26	52.78	45.60
Other race	7.96	8.26	8.98	8.60	8.02	6.92	7.69

Notes: Unadjusted mean values are shown for the switcher subsample and non-PPMC physicians. The sample is restricted to Ob-Gyns performing 100 yearly deliveries of any type. Therefore, the number of low-risk births may be less than 100 a year. *Regressions only include "Advanced Maternal Age" (a mother 35 years or older) as a control. See Appendix Table E.2 for patient risk factors for low-risk births and Appendix Table E.3 for all births.

Appendix Table E.2 shows mean values for maternal risk factors, which were identified using ICD-9-CM diagnosis and procedure codes commonly used by researchers to control for a patient's risk of C-section (Henry et al. 1995; Gregory et al. 2002; Xu et al. 2015; Johnson and Rehavi 2016). These risk factors represent preexisting or developing complications observed by the Ob-Gyn before the onset of labor that could impact the C-section decision, such as diabetes, hypertension, and fetal abnormalities. In the empirical analysis that follows, I utilize several strategies to account for differences in patient risk factors across PPMCs and changes within PPMCs.

6. The Impact of PPMCs on Clinical Performance

In this section, I use a difference-in-differences research design and data on acquisitions by PPMCs to study the impact of management on clinical performance. The primary specification focuses on the switcher sample of physicians observed in the same practice before and after acquisition. Therefore, estimates capture the effect of PPMCs among physicians who choose to join a PPMC. The identifying variation is based on the staggered timing of practice acquisitions by PPMCs and the comparison of physicians in their overlapping periods. Since all practices eventually become acquired, the key assumption is that the average C-section rate for physicians first acquired by a PPMC would follow a similar trend to those yet to be acquired in the absence of acquisition. This strategy intends to minimize selection bias driven by the observable and potentially unobservable differences between physicians acquired by a PPMC and those never acquired by a PPMC. The primary specification is as follows, where the key clinical performance outcome is whether patient i received a C-section from physician p in year y:

$$Csection_{ipy} = \sum_{j=1}^{3} [\alpha^j * \mathbf{1}\{y = t_{pj}\} + \beta^j * \mathbf{1}\{y > t_{pj}\}] + \gamma \mathbf{X}_{iy} + \theta_p + \theta_{yj} + \epsilon_{ipy} \quad (1)$$

In Equation 1, t_{pj} represents the time of acquisition by PPMC j. Therefore, $\mathbf{1}\{y > t_{pj}\}$ is an indicator for the years after acquisition, while $\mathbf{1}\{y = t_{pj}\}$ is an indicator for the year of acquisition. This variable accounts for the transition period from private practice into a PPMC since the date of switch is likely different than the corporate date of filing. The coefficient of interest, β^j, estimates the treatment effect for each PPMC. The preferred specification controls for patient sociodemographic characteristics and clinical risk factors ($\mathbf{X}_{iy}$), physician fixed effects (θ_p), and year $\times$ PPMC fixed effects (θ_{yj}). Year $\times$ PPMC fixed effects account for differences between physicians who eventually join PPMC 1, 2, or 3 that may vary other time. Alternative specifications assess robustness of the results to 1) year $\times$ hospital fixed effects, which account for hospital-specific factors that vary over time, 2) year $\times$ patient zip code fixed effects, which account for region-specific factors that vary over time, and 3) year fixed effects, which account for statewide factors that vary over time. Each estimation uses cluster-robust standard errors at the practice level.

In this setting, a management change occurs when the practice is acquired. The concern with the identification strategy is that the timing of acquisition may be correlated with other contemporaneous factors that impact the C-section decision, such as changes to the patient population or the non-random acquisition of practices. To help mitigate selection concerns, I conduct several additional analyses and robustness checks described in Sections 6.2 and 6.3.

6.1. Main Effect on C-sections

Table 3 Column 1 shows that low-risk C-sections increase by 1.6 percentage points after acquisition when the three PPMCs are pooled together. However, the results of estimating Equation 1 reveal important differences across the PPMCs (Column 2): for the patients of Ob-Gyns acquired by PPMC 1, the probability of a low-risk C-section decreases by 5.7 percentage points (22.3% of the pre-acquisition C-section rate), for PPMC 2, the probability increases by 2.9 percentage points (10.1%), and for PPMC 3, the probability increases by 2.6 percentage points (11.2%). Results are qualitatively similar when using different fixed effects (Columns 3-5), though point estimates are attenuated for PPMC 1. One reason why PPMC 1 estimates are attenuated when Year × PPMC are excluded is that the C-section rate of physicians who eventually joined PPMC 1 was trending upwards before acquisition whereas the rates were flat or weakly negative for PPMCs 2 and 3.

Table 3 PPMC Effects on C-sections, Low-Risk Births

	(1)	(2)	(3)	(4)	(5)
Pooled Estimate					
β^{PPMC}	0.016**				
	(0.008)				
By PPMC Estimate					
β^{PPMC1}		-0.057***	-0.025**	-0.030***	-0.019*
		(0.017)	(0.011)	(0.010)	(0.010)
β^{PPMC2}		0.029**	0.026***	0.025**	0.025**
		(0.013)	(0.007)	(0.011)	(0.010)
β^{PPMC3}		0.026***	0.034***	0.027***	0.017**
		(0.008)	(0.007)	(0.008)	(0.007)
Patient Controls	X	X	X	X	X
Physician FE	X	X	X	X	X
Year x PPMC FE	X	X			
Year x Hospital FE			X		
Year x Patient Zip FE				X	
Year FE					X
Observations	291,766	291,766	291,737	289,390	291,766
R^2	0.172	0.172	0.178	0.196	0.172

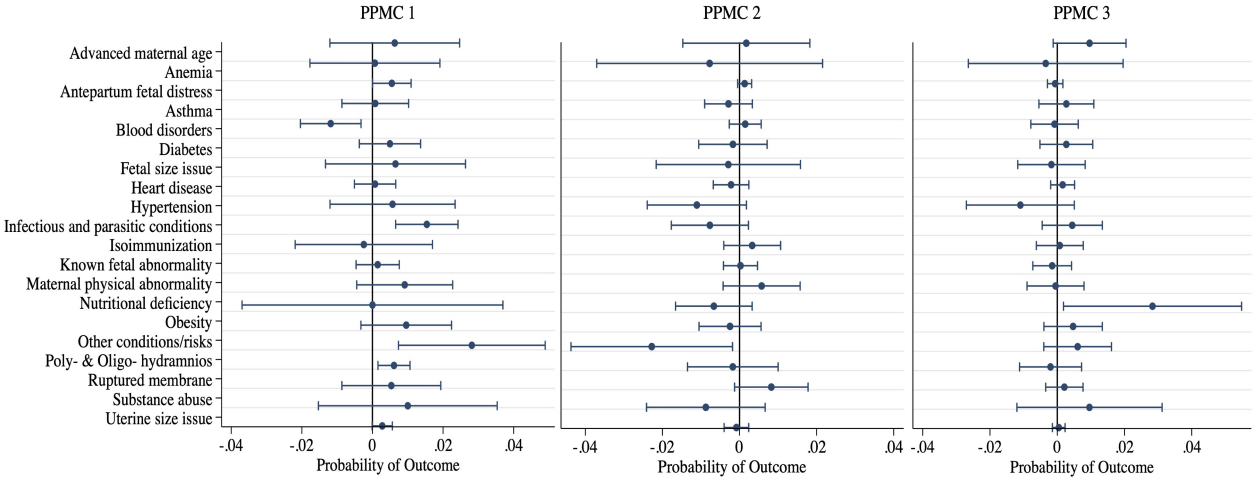
Notes: The dependent variable is a C-section (1 for C-section, 0 otherwise). An observation is a patient-year. The pre-acquisition unadjusted C-section rate is 25.5% in PPMC 1, 28.2% in PPMC 2, and 22.8% in PPMC 3. Standard errors are clustered at the practice level. Significance levels: *p<0.1, **p< .05, ***p< 0.01

6.2. Patient Selection

The results of Table 3 include controls for patient insurance, race, and risk factors, allowing for comparisons of patients with the same characteristics being treated by the same physician before and after acquisition. However, if observable patient characteristics changed after acquisition, this would raise the concern that changes in unobservable patient characteristics may create omitted variables bias in the estimates. Physicians could also select patients of higher or lower risk, which would directly impact the C-section decision. Below I provide evidence that changes in patient risk composition do not appear to drive changes in C-sections.

6.2.1. Changes in Patient Risk Appendix Table F.1 shows that point estimates for Equation 1 are similar when excluding all patient controls, when controlling for a parsimonious set of preexisting comorbidities, and when using the full sample of births instead of only low-risk births, suggesting that changes in patient risk are not driving observed results. Results are also robust to including interactions between patient risk factors and the PPMC post-acquisition variables to account for potential changes in coding practices, to including patient zip code fixed effects that help capture patient risk factors associated with residence, and to restricting the sample to patients with Florida zip codes (predominantly excludes patients from bordering states). I also estimate a series of difference-in-differences specifications with patient risk factors as the dependent variable displayed in Figure 4. Across the three PPMCs, there is no systematic evidence that patients became of higher or lower risk. If anything, patients in PPMC 1 became of slightly higher risk, which would work against finding a decrease in C-sections.

Figure 4 PPMC Effects on Patient Risk, Low-Risk Births



Notes: This figure depicts patient risk factors as the outcome of the difference-in-differences specification. "Previous pregnancy" is omitted for scaling purposes given a large confidence interval; the point estimates and standard errors are -0.042 (0.044) for PPMC 1, 0.014 (0.026) for PPMC 2 and 0.038 (0.029) for PPMC 3. As seen in Table H.2, all risk factors positively impact a patient's probability of C-section except for previous pregnancy, isoimmunization, nutritional deficiency, and substance abuse, which reduce C-section risk. Regressions include physician and year × PPMC fixed effects. Bars are 95% confidence bands. Standard errors are clustered at the practice level.

6.2.2. Patient Exposure to a PPMC As an alternative strategy, I consider whether a patient's exposure to a PPMC could impact their probability of receiving a C-section. The intuition is that as PPMCs expand by acquiring practices, this increases a patient's probability of being treated by a PPMC physician only based on their location. That is, a patient's health and preferences are not likely to change concurrently with physicians in their area becoming acquired by a PPMC. The empirical model is as follows:

$$Csection_{ipy} = \sum_{j=1}^{3}[\delta^j Share_i^j] + \gamma \mathbf{X}_{iy} + \theta_p + \theta_y + \epsilon_{ipy} \quad (2)$$

The analysis uses the full data sample to estimate the share of PPMC j physicians within a given distance of a patient i's zip code centroid in year y. The mean distance between a patient's zip code centroid and a physician's practice (based on the coordinates of a physician's primary office location) is 11.3 miles, excluding the top percentile of distances. To assess robustness to different distances, I use the following measures: 1) 15-mile radius, 2) 10-mile radius for urban zip codes and 20-mile radius otherwise, and 3) sample-based cutoffs based on mean distances between patients and physicians: 10-mile radius if the mean distance is less than 10 miles, 15-miles radius if the mean distance is greater than 10 miles but less than 15 miles, and 20-mile radius if the mean distance is greater than 15 miles.[10] Table 4 displays the results of Equation 2.

Table 4 Role of Patient Exposure to a PPMC on C-sections, Low-Risk Births

	(1) 15mi radius	(2) 10mi if urban, 20mi otherwise	(3) Sample-based cutoffs
δ^{PPMC1}	-0.027***	-0.023***	-0.031***
	(0.007)	(0.006)	(0.008)
δ^{PPMC2}	0.044***	0.028***	0.024***
	(0.009)	(0.007)	(0.008)
δ^{PPMC3}	0.019***	0.009**	0.012**
	(0.006)	(0.004)	(0.005)
Observations	1,177,810	1,159,413	1,205,571
R^2	0.164	0.164	0.164

Notes: The dependent variable is a C-section (1 for C-section, 0 otherwise). The δ represent that share of PPMC physicians within a given radius of a patient zip code centroid. All regressions adjust for patient controls, and include physician and year fixed effects. Standard errors are clustered at the patient zip code level. Significance levels: *p<0.1, **p< .05, ***p< 0.01

[10] 78% of patients live within 15 miles of an Ob-Gyn in the sample. 91% of patients reside in zip codes considered urban based on US Census rural-urban commuting areas.

The estimates are qualitatively similar to the primary difference-in-differences analysis, though estimates are smaller and less precise for PPMC 3. This is likely because PPMC 3 is more geographically dispersed than PPMCs 1 and 2, which means patients would receive less exposure to PPMC 3 within a defined geographic area. Similar results are also found in an analysis using the hospital location where the physician performed the most deliveries in a given year rather than using a physician's practice location (Appendix Table F.2). This robustness check is provided because 1) 145 out of 1,693 physicians do not match to SK&A and so do not have practice location data, and 2) there may be measurement error in practice location based on SK&A reporting.

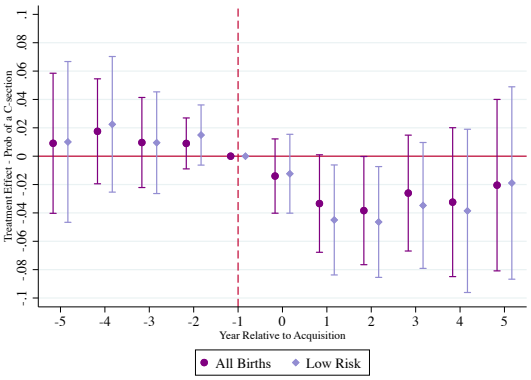
6.3. Physician Selection

Selection is an inherent feature of the PPMC setting: physicians choose to sell their practice to a specific PPMC, and each PPMC chooses to acquire a specific practice. To help account for this non-random selection, all analyses include physician fixed effects that control for time-invariant differences across physicians, including observable characteristics such as physician gender and medical school training, and unobserved characteristics such as technical skill and fixed treatment beliefs (Epstein and Nicholson 2009; Currie et al. 2016). While the inclusion of physician fixed effects and the additional analyses described below help to mitigate selection concerns, physicians could still select into a PPMC with the intention of changing their treatment style to align with that PPMC's objectives. Therefore, the estimates should be interpreted as capturing the effect of PPMCs in the presence of selection.

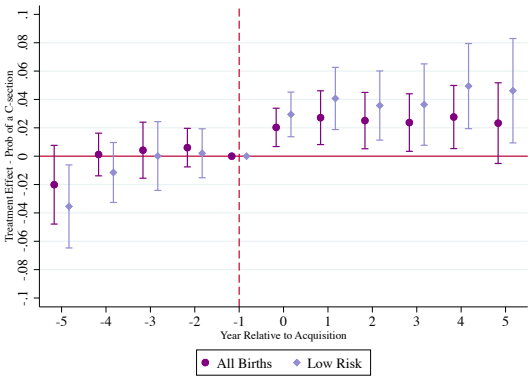
6.3.1. Event study The event study is an extension of Equation 1, where instead of aggregating years before and after an acquisition, each physician's C-section decision is estimated relative to the year of acquisition. Empirically, indicators are included for each year relative to acquisition for each PPMC. For the three PPMCs, Figure 5 shows that there are limited pre-acquisition trends in the probability of a C-section. In the post-period, there is an immediate increase in the probability of a C-section for PPMC 2. PPMC 3 also shows a small and immediate increase after acquisition. The estimates for PPMC 1 are less precise and the only significant effects for low-risk births are observed in the 2nd and 3rd years after acquisition. This contrast may be from the differences between clinical and financial management, where it could take longer to change behavior through clinical initiatives than through financial incentives. In Appendix Figures F.1-F.3, I find similar results for specifications using a balanced physician panel, a control group of non-PPMC physicians, and two relative period indicators to address potential multicollinearity in treatment timing (Borusyak and Jaravel 2016).

Figure 5 Event Study Results by PPMC

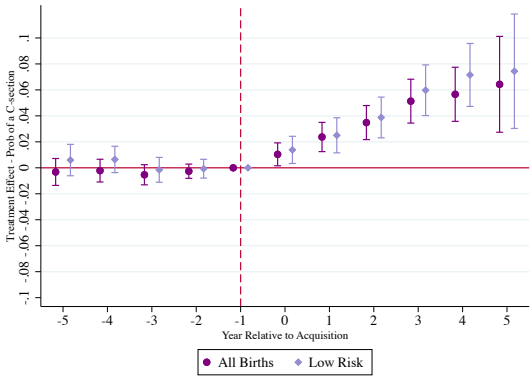
(a) PPMC 1



(b) PPMC 2



(c) PPMC 3



Note: The dependent variable is a C-section (1 for C-section, 0 otherwise). Bands indicate 95% confidence intervals constructed from practice level clustered standard errors. Regressions adjust for patient controls, and physician and year × PPMC fixed effects. Base period of t = -1 normalized to zero.

6.3.2. Additional Control Group Equation 1 is estimated using the sample of eventually acquired physicians, where the benchmark model (Table 3, Column 2) includes year × PPMC fixed effects. This equation limits comparisons to physicians who eventually become acquired by the same PPMC to mitigate concerns over observable and unobservable differences between physicians that may lead them to select a specific PPMC. However, including non-PPMC physicians would help account for common year and location effects that could influence the C-section rate. To homogenize comparisons between PPMC and non-PPMC Ob-Gyns, I estimate nonparametric nearest neighbor matching regressions where each PPMC physician is matched to three non-PPMC physicians based on all patient panel risk factors in the year before acquisition. Appendix Table F.3 replicates Table 3 with the matched sample. While point estimates are qualitatively similar, they are smaller and less precise in several specifications, especially for PPMC 2. This suggests some degree of selection on unobservables between PPMC and non-PPMC physicians and supports using the sample of physicians in practices eventually acquired by a PPMC.

6.3.3. Selection Between PPMCs A related concern is physician selection between PPMCs. In other words, are the observed changes in C-sections driven by differential sorting of physicians across the PPMCs? First, Appendix Figure E.1 shows that the three PPMCs and non-PPMC physicians have similar distributions in the risk-adjusted C-section rate before acquisition. While PPMC 2's C-section rate does skew right compared to non-PPMC physicians, the distributions still suggest that PPMCs were not targeting physicians with significantly higher or lower C-section rates. Second, variation in when and where a PPMC was founded limited the diffusion of PPMCs to specific geographic areas, which limited a physician's choice between the three PPMCs. Specifically, there was minimal regional overlap between practices in PPMC 1 and PPMC 2 (and no overlap until 2011), while overlap with PPMC 3 did not start until it was founded in 2009. Appendix Table F.4 shows that the point estimates are similar whether or not physicians had a choice of PPMC and that acquisitions earlier in the sample had similar effect sizes.

7. Mechanisms

The previous analyses find that physicians decrease C-sections after being acquired by PPMC 1 and increase C-sections after being acquired by PPMCs 2 and 3. Alternative specifications and robustness checks help minimize concerns that these changes are driven by patient or physician selection into PPMCs. Based on the qualitative research and marketing materials provided in Section 4 and Appendix B, the key distinction between the PPMCs appears to be their management strategy of focusing on financial versus clinical management. This section provides evidence that the differences in firm management are the most likely explanation for the changes in C-sections.

7.1. Market Concentration

PPMC marketing materials suggest one way they increase practice profitability is by negotiating higher-paying insurance contracts. Higher payment could result from better negotiating tactics or increased market power, or a combination of both. Either way, before acquisition, physicians had little ability to negotiate with insurers and would often accept a standard contract from an insurer. After acquisition, the practice would likely receive higher payments based on the PPMC's collective bargaining with insurance companies. An increase in payment could lead physicians to substitute from vaginal birth to C-sections after acquisition.[11] In addition to influencing payment, an increase in PPMC market power could also reduce incentives to provide higher quality care. Therefore, a physician's decision to perform a C-section could be influenced by increases in market concentration in addition to changes in management. I conduct several robustness checks and additional analyses to examine the role of market concentration (see Appendix G for details).

[11] Even an equal percentage increase in payments for both procedures would widen the differential. Additionally, while the income effect could dominate the substitution effect, previous research has found that higher reimbursement for C-sections can lead physicians to substitute towards C-sections (Gruber, Kim, and Mayzlin 1999).

First, in Appendix Tables G.1 and G.2, I show that the patient exposure results from Table 4 are quantitatively similar after including controls for broad changes in market concentration. Second, I examine whether there is heterogeneity in the effect of PPMC acquisitions on C-sections in markets that became more concentrated due to acquisition. In this analysis, I assess robustness to different market definitions using the location of the physician's practice as follows: the 4-digit zip code in which a physician's practice is located or the 4, 6, or 10-mile radius around each practice (based on the coordinates of a physician's office location). To measure the increase in concentration only driven by a PPMC acquisition, I calculate the Herfindahl-Hirschman Index (HHI) using each PPMC's pre-acquisition share of births but post-acquisition ownership for each market. Scatterplots of pre and post-acquisition HHI show that most markets are already moderately concentrated (pre-acquisition HHI greater than 1500) and that PPMC acquisitions often lead to increases in concentration (Appendix Figures G.1-G.5).[12]

Using the 2010 U.S. Horizontal Merger Guidelines, I make mutually exclusive indicators for whether an acquisition leads to a change in HHI in the green, yellow or red zone (green means the acquisition is unlikely to have adverse competitive effects and red means the acquisition raises significant competitive concerns). Appendix Table G.4 shows the result of interacting these terms with the post-PPMC indicators and transition period indicators in Equation 1. For the most part, PPMC acquisitions have similar effects on C-sections whether or not the acquisition led to an increase in HHI that would warrant scrutiny. This analysis suggests that there are PPMC-specific effects on C-sections irrespective of the changes in market concentration.

7.2. The Role of Management

7.2.1. Clinical Initiatives The low-risk C-section rate is a widely used measure of maternal and perinatal quality. PPMC 1 achieved a considerable reduction in the low-risk C-section rate, suggesting that their specific clinical management initiatives impacted the C-section decision. In particular, PPMC 1 focuses on improving labor management through the dissemination of clinical guidelines, which would encourage physicians to allow longer labor and avoid unplanned C-sections. As expected, for PPMC 1, most of the reduction in C-sections occurs among unplanned C-sections (Figure 6(a) and (b) provide a graphical representation of β^j from Equation 1). Recall that planned C-sections usually occur for a clinically indicated reason, so the lower the risk of the mother, the lower the probability of a planned C-section (Ohio Perinatal Quality Collaborative 2010)). Given that the estimates in Figure 6 are for low-risk births, it is surprising that in PPMC 2, most of the increase in C-sections occurs among planned C-sections. Changes in clinical justifications reveal

[12] For example, 44%, 64% and 39% of 4-digit zip code market-years had increases in HHI that would warrant scrutiny according to the 2010 U.S. Horizontal Merger Guidelines after an acquisition by PPMCs 1, 2 and 3, respectively.

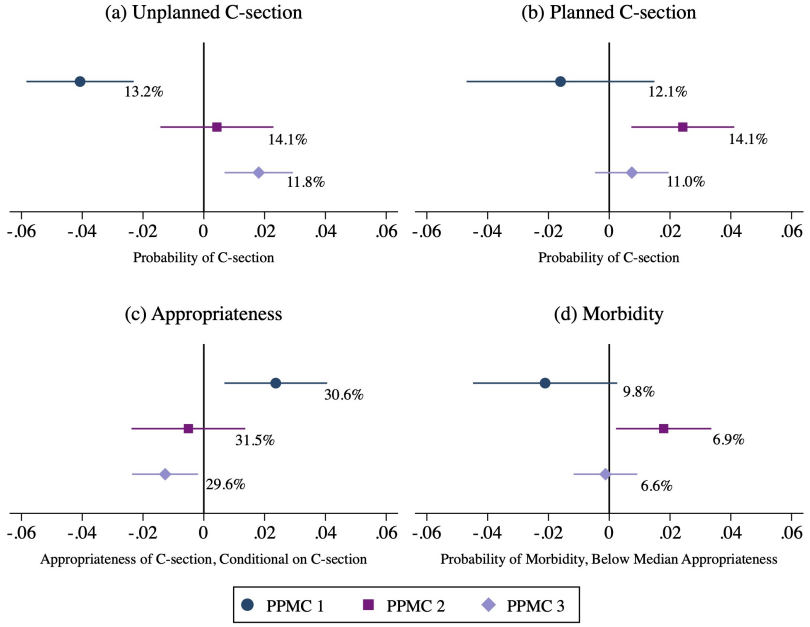
a potential explanation (Appendix Table H.1): use of the diagnosis code "no clinical indication for C-section" increases by 6.0 percentage points (124.3%) in PPMC 2, suggesting C-sections may not have been medically necessary. In contrast, for PPMC 3, most of the increase was among unplanned C-sections, with failure to progress to labor as the most commonly coded clinical reason. This suggests PPMC 3 physicians potentially took advantage of the subjectivity around a woman's failure to progress to labor to justify an increase in C-section use.

A change in the C-section rate does not necessarily indicate that quality of care improved. For example, though PPMC 1 aims to increase quality by reducing C-sections, if patients who require a C-section do not receive one, they may experience worse outcomes. To account for this possibility, I test whether C-sections are provided to more medically appropriate patients and whether patient morbidity decreases. I adapt methodology from Baicker, Buckles, and Chandra 2006 to determine the medical appropriateness of treatment by calculating a patient's probability of receiving a C-section based only on their risk factors, aggregated over the entire sample (see Appendix H). As seen in Figure 6(c) and 6(d), patients are 2.4 percentage points (7.8%) more likely to receive appropriate treatment in PPMC 1 post-acquisition, and the probability of morbidity decreases by 2.1 percentage points (21.4%) for patients of below-median appropriateness.[13] In PPMC 2, there is no change in clinical appropriateness, suggesting that these Ob-Gyns increase C-sections regardless of the medical risk of the patient. This result is consistent with PPMC 2 physicians providing "systematically more aggressive" C-sections and is associated with a 1.8 percentage point (26.0%) increase in patient morbidity. In contrast, though there is a decline in the medical appropriateness of C-sections in PPMC 3, there is no change in morbidity. A potential reason is that PPMC 3 physicians "rank patients on a distribution of clinical appropriateness and work their way down that distribution;" therefore, by targeting treatment based on patient risk, they may be less likely to harm patient health (Baicker, Buckles, and Chandra 2006).

Lastly, I provide evidence that the clinical initiatives implemented by PPMC 1 may have also influenced physicians acquired before the sample period. Starting in 2011, PPMC 1 instituted several additional initiatives to reduce unnecessary C-sections specifically. Appendix Figure H.1 plots the risk-adjusted low-risk C-section rate for physicians in the switcher subsample and physicians always observed in PPMC 1. The initiatives coincide with reductions in C-section across both groups and to convergence in the low-risk C-section rate over time.

[13] I define morbidity as any adverse maternal or infant event during or immediately after childbirth (Currie and Macleod 2017). I focus on morbidity below median appropriateness because, in areas of intensive treatment, patients least appropriate for treatment may have worse outcomes (Chandra and Staiger 2007). For patients of above-median appropriateness, there are no observed changes in morbidity across the PPMCs, likely because low-risk mothers may still not benefit from a C-section.

Figure 6 PPMC Effects on Quality of Care, Low-Risk Births



Note: For panels (a) and (b), the dependent variables are a planned C-section and an unplanned C-section (1 for C-section, 0 otherwise). A C-section was considered unplanned if there was any indication a woman entered labor using the methodology of Gregory et al. 2002 and Henry et al. 1995. For panels (c) and (d), the dependent variables are C-section appropriateness conditional on receiving a C-section (continuous from 0, least appropriate, to 1, most appropriate) and infant or maternal morbidity (1 in case of morbidity, 0 otherwise) for those below median appropriateness. Pre-acquisition averages are shown below each 95% confidence interval and β^j from Equation 1 are the point estimates. Regressions adjust for patient controls, and physician and year × PPMC fixed effects. Standard errors are clustered at the practice level. See Appendix Table H.1 for regression output.

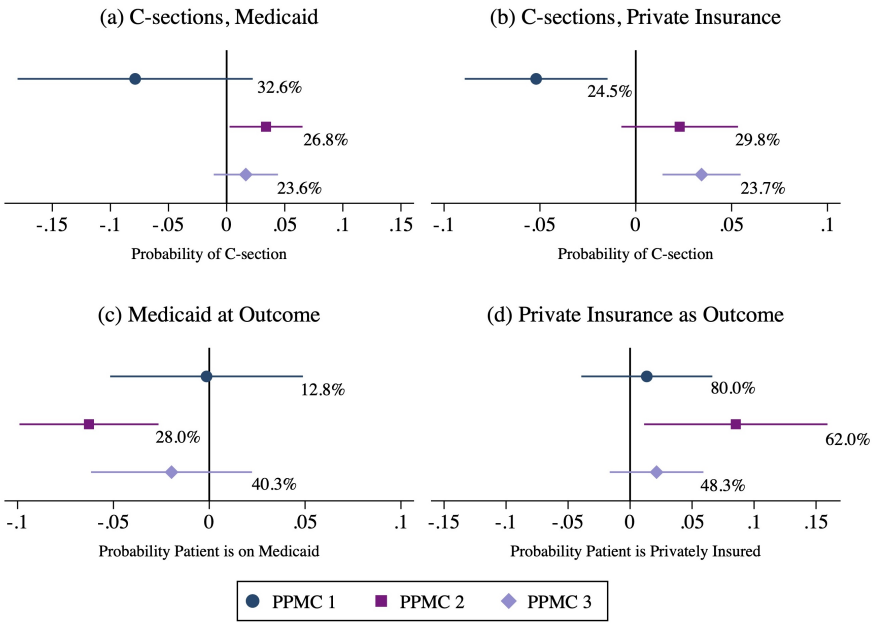
7.2.2. Financial Incentives The increase in the C-section rates for PPMCs 2 and 3 are consistent with their financial focus, given the higher reimbursement associated with C-sections. Ideally, data on physician payments would be used to test the role of financial incentives on the C-section decision. Using the data at my disposal, I exploit differences in payment rates between commercial insurance and Medicaid in Florida. Florida is one of the few states where Medicaid reimburses C-sections and vaginal births at the same rate. In 2012, physicians were paid $1,456 for a routine vaginal delivery or C-section (Alexander 2015). Therefore, for Medicaid patients, there should be no differential financial incentives to perform a C-section. If PPMCs were motivating physicians to increase income through unnecessary treatment, the prediction would be an increase in C-sections among privately-insured patients rather than Medicaid patients.

Figure 7(a) and 7(b) shows that across all the PPMCs, changes in the probability of a C-section are similar within the sample of Medicaid patients and privately-insured patients. A potential reason for this externality is "time is money": since C-sections typically take less time, increasing C-sections for Medicaid patients allows more time to treat other patients. However, Appendix Table I.1 Column (3) shows that PPMCs 2 and 3 increase C-sections by 1.5 and 2.0 percentage points more

among privately insured relative to Medicaid patients, respectively. These results provide evidence that PPMC 2 and 3 physicians shift C-sections towards patients with higher reimbursement.

As seen in Figure 7(c) and 7(d), there are also large changes to the insurance composition of the patient panel: for PPMC 2, the probability of an Ob-Gyn treating a privately insured patient increases by 8.5 percentage points (13.8%), while the probability of treating a Medicaid patient drops by 6.2 percentage points (22.4%). Results are directionally similar for PPMC 3 but not significant. This shift towards privately-insured patients and away from Medicaid patients is consistent with physician behavior being influenced by a PPMC's emphasis on financial performance. Appendix Table I.2 shows other outcomes that could impact productivity or influence provider payment. There are not economically meaningful changes to birth volume or length of stay, but because C-sections are more costly to provide, total hospital charges increased by \$1,264-\$1,609 (10.2%-12.7%) in PPMCs 2 and 3, respectively.

Figure 7 PPMC Effects by Patient Insurance, Low-Risk Births



Note: For panels (a) and (b), the dependent variable is a C-section (1 for C-section, 0 otherwise) by patient insurance status. For panels (c) and (d), the dependent variable is patient insurance (1 for Medicaid or private insurance, 0 otherwise). Pre-acquisition averages are shown below each 95% confidence interval and β^j from Equation 1 are the point estimates. All regressions include physician and year × PPMC fixed effects, but only panels (a) and (b) adjust for patient controls. See Appendix Table I.1 for regression output.

7.3. Limitations

The majority of the analyses estimate changes in a physician's C-section decision comparing physicians within each PPMC. While I provide evidence that physicians do not differentially sort across the PPMCs, the PPMCs differ in important ways that would caution comparison. For

example, most patients in PPMC 1 are privately-insured, while PPMC 3 physicians see a greater share of Medicaid patients. By treating a higher-paying patient population, PPMC 1 may be able to perform fewer C-sections but still generate greater revenue than PPMC 3. Therefore, the managerial choices made by PPMC 1 may not generalize to patient populations with lower shares of privately-insured patients. A similar argument applies to the generalizability of these findings to other PPMCs nationwide. For example, PPMCs in other states may be subject to different regulations which influence their organizational structure. Another limitation of this study is the difficulty linking the exact PPMC management practices to observed results. Without payment data, for example, it is difficult to isolate the role of financial incentives. Nonetheless, the qualitative research and the empirical analyses suggest the most apparent difference between the PPMCs is their publicized focus on clinical versus financial management.

8. Discussion and Conclusion

This paper studies the impact of management on clinical performance using novel data on an understudied phenomenon: medical practice acquisitions by Physician Practice Management Companies (PPMCs). PPMCs provide a useful setting to evaluate a change in management because their stated business purpose is to increase practice profitability through better management while minimizing disruptions to the physician's clinical environment. To study PPMCs, I collect data from corporate registries on physician practice acquisitions by three PPMCs in Florida between 2006 and 2014. These PPMCs manage the practices of Ob-Gyns and represent over 40% of Ob-Gyns in Florida. Using difference-in-differences methods, I find large and significant changes in the C-section decision: the probability of low-risk C-section decreases by 5.7 percentage points (22.3%) for Ob-Gyns acquired by PPMC 1, while in PPMCs 2 and 3, the probability increases by 2.9 percentage points (10.1%) and 2.6 percentage points (11.2%), respectively.

I collected archived PPMC website information to understand the mechanisms underlying these changes. This qualitative research reveals that while a PPMC's organizational structure and marketing materials may promote physician autonomy, PPMCs adopt different management strategies and practices that could influence physician behavior. In this setting, PPMC 1's marketing materials are consistent with a strategy that emphasizes improving clinical outcomes through clinical management services, and PPMC 2 and 3's marketing materials are consistent with a strategy that emphasizes improving financial outcomes through financial management services. Qualitative research also suggests that PPMCs utilize different management practices such as performance monitoring and incentives to align physician behavior with their stated objectives. Data limitations prevent linking these specific management practices to the changes in C-sections. Instead, I connect the broad PPMC strategies to other observable outcomes. I find evidence

consistent with PPMC 1's clinical objectives: PPMC 1 provides more clinically appropriate C-sections and decreases patient morbidity, and the timing of their clinical initiatives coincides with declines in C-sections among all physicians in the PPMC. In PPMCs 2 and 3, I find evidence consistent with their financial focus: C-sections increase more for patients with private insurance relative to Medicaid patients, and PPMC 2 in particular, greatly reduces their panel of Medicaid patients in favor of more privately-insured patients. This result raises concerns over equity in access to care and appropriate treatment.

The two management strategies explored in this paper represent the publicized management approaches undertaken by other PPMCs across a wide range of specialties in the US. These three PPMCs are also important in their own right. PPMCs 1, 2, and 3 have continued to acquire practices, with expansions often supported by investments from private equity firms. As a result of this growth, these three PPMCs alone delivered 1 in every 25 babies in the United States in 2019.

8.1. Managerial and Policy Implications

Most physicians in the U.S. are not taught management skills in medical school (Finnegan 2020). For many physicians, this generates the burden of running both the complicated business side and clinical side of a medical practice. To offload this burden, many physicians have sold their medical practices to larger organizations, such as hospitals and PPMCs, that would take over much of the managerial responsibilities. Despite the managerial changes that occur after an acquisition, little research has explored this management channel. This paper provides evidence that changes in practice management can alter clinical outcomes and finds heterogeneous effects depending on a firm's publicized management strategies and practices. This case study cautions against pooling together management companies, and more broadly, informs how changes in quality outcomes may be specific to the acquiring firm's strategy.

The differences in management strategies also provide insights into how medical practices can balance profitability and the quality of care in the era of value-based care. The typical PPMC model benefits from a fee-for-service system: these PPMCs leverage their size to negotiate higher-paying contracts, in addition to the operational efficiencies generated from economies of scale. However, the growing transition from fee-for-service to pay-for-performance has prompted PPMCs like PPMC 1 to shift towards clinical management services to make practices competitive for such contracts. In 2013, PPMC 1 achieved its stated objective and signed "collaborative care" agreements with two insurers that paid Ob-Gyns on performance measures in labor and delivery. While this may be a less lucrative or niche strategy in the short term, organizations with similar objectives such as Accountable Care Organizations and Patient-Centered Medical Homes may benefit from these managerial insights. In fact, some PPMCs focused on clinical management, such as Privia Health,

have expanded their services to help Accountable Care Organizations achieve higher savings. As the United States continues to transition to value-based care, more research is needed on how practice management can help achieve lower cost, higher quality care.

However, most PPMCs still advertise that they can negotiate higher payment rates by leveraging their size and expertise. The rapid acquisition of practices by PPMCs raises concerns that they are simply a vehicle to quietly increase market power and reduce competition (Scheffler et al. 2021). In particular, private equity-backed PPMCs and medical practices have been found to increase prices paid to physicians after acquisition and have been involved in several legal disputes with insurers and government agencies (Braun et al. 2021; La Forgia et al. 2022). While the PPMCs in this paper gain market power through acquisitions, the changes in C-sections do not appear to be predominantly driven by this market power channel. These results suggest that at least within this setting and study period, there are PPMC-specific effects on C-sections not explained by changes in competition. Since 2014, the PPMCs have continued to acquire practices, often with support from private equity firms, which may lead to more salient anti-competitive effects in the future.

The growth of PPMCs also brings to light the role of corporations in health care. Several state and federal laws, such as Corporate Practice of Medicine (CPOM) doctrines, explicitly prohibit corporations from influencing clinical decisions. Yet, research by Eliason et al. 2020 find that dialysis clinics acquired by a large chain increase patient hospitalizations and mortality, and Cooper, Scott Morton, and Shekita 2020 find that hospitals that contract with TeamHealth and Envision increase surprise medical bills, contributing to several investigations of CPOM violations by these staffing firms (Arnsdorf 2020; Haefner 2020). While the results of this paper are more nuanced, the PPMCs still alter clinical outcomes despite claiming to preserve clinical autonomy, with two PPMCs increasing the use of high-cost low-value care. These findings suggest CPOM laws need to be revisited or more strictly enforced, as corporations may appear to comply on paper, but not necessarily in practice (Arnsdorf 2020). Lastly, though policymakers have pushed for a corporate transparency bill that would require private equity companies to provide "the federal government with information on payments and real estate investments," the first-order problem is the lack of data and difficulty in determining changes in ownership in health care (King 2020). Increased transparency and access to data on acquisitions and other organizational relationships will be necessary for future researchers to study the impact of corporate ownership on health care delivery.

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Appendix A: PPMC History and Resurgence

PPMCs were once hailed as the "capitalist salvation" of the fragmented physician services market. Their goal was to organize and consolidate physician practices to gain economies of scale, provide administrative support and capital for growth, and improve physicians' opportunities and bargaining position for managed care contracting (Burns 1997). Many of the PPMCs in the 1990s were founded by non-physician business leaders and financed by venture capitalists or by stock publicly traded on Wall Street (e.g., PhyCor, MedPartners). In 1998, there were 45 public PPMCs and 125 private PPMCs in operation (Physician Practice Options 1998). By 2000, the entire industry lost as much as half of its commercial value, leading many PPMCs to declare bankruptcy, exit the market, or restructure their companies. Uwe Reinhardt (2000) summarizes their demise as "driven mainly by pyramid-like funny-money games". That is, to increase their financial valuation PPMCs focused on the rapid acquisition of practices across several markets and pooled the revenue streams of acquired practices to generate earnings. These higher earnings were used by investors to publicly evaluate PPMCs stock prices and price/earnings multiples. Driven by investor interest, PPMC stock prices reached 30 to 40 times earnings (Burns 1997). The higher valuations enabled PPMCs to raise more money for acquisitions of practices whose earnings accrue immediately to the PPMC's bottom line, continuing a growth cycle (Burns and Robinson 1997). By the late 1990s, this scheme of accretive acquisitions was no longer sustainable, leading to the burst of the PPMC bubble.

Over the past decade, there has been a resurgence in PPMCs. Industry experts suggest a confluence of contributing factors, including an increase in physician administrative burden, an increasing need for population health management services, and changes in physician attitudes towards alternative practice models (Keckley 2016). While the PPMCs of today share similarities to the PPMCs of the 1990s, they differ in several important ways. PPMCs today are more likely to 1) be founded by physicians rather than business leaders, 2) focus on a single speciality or area of practice (ex. dermatology, primary care, women's health) rather than multiple specialties, 3) focus on improving business management and practice efficiency before implementing practice growth, 4) not employ physicians and have them remain residual claimants, and 5) be privately-held rather than publicly-traded. However, private equity and venture capitalists have started to invest heavily into PPMCs. These expansions should be taken with caution if the problems of the 1990s are to be avoided (Luria and Hagood, 2019).

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Appendix B: Qualitative Data Collection

This appendix provides details on the management services typically provided by a PPMC, further details on the history and characteristics of the PPMCs in this sample, and documentation of the quotes and other qualitative information referenced in the manuscript. The majority of information collected on PPMCs was based on website searches using the "Wayback Machine," a search tool that allows users to observe historical versions of websites. For each PPMC, I am able to observe the evolution of the websites between 2006 and 2014; however, what was captured via the Wayback Machine during this period does not necessarily represent the organization or strategy of the PPMCs in their current form. This study received an IRB exemption from the University of Pennsylvania Institutional Review Board in October 2017.

B.1. Unstructured Interviews

Between 2017 and 2018 I conducted several informational interviews with at least one executive or founder of each PPMC. These off-the-record conversations occurred over the phone and over email. I received consent to take notes and identified myself as a researcher studying PPMCs in Florida. The interviews were used to learn about the history and background of each PPMC.

B.2. PPMC Websites

I use the "Wayback Machine" to analyze the websites of the PPMCs in my sample, as well as the websites of other PPMCs to better understand the financial management and clinical management services provided by a PPMC. In the manuscript I provide the direct URL to PPMCs not studied in this paper. In this section, I provide documentation of the quotes for the PPMCs in my sample.

B.2.1. PPMC Services PPMCs generally offer a similar set of management services. Figure B.1 provides screenshots from PPMC 2, which provides detailed descriptions of services. PPMC 1 and 3 also list very similar services on their websites but do not provide as detailed descriptions.

Figure B.1 Management Services Typically Offered by PPMCs

Managed Care Negotiations and Contract Administration:
This service offers the most important benefits to the practice and to your bottom line. In today's medical profession, physicians face pressure from managed care organizations that impede the way they practice medicine. Most physician providers do not have the resources needed to negotiate with managed care plans. Consequently, their reimbursements fall below industry standard and may not cover their costs. At [redacted] we have been successful in partnering with managed care companies to obtain better contract terms and higher reimbursements.

Negotiating Power
Under the group concept we are able to speak with one powerful voice to managed care organizations. With our excellent reputation we are able to form respectful business relationships with payors and work with them to negotiate optimal rates. These renegotiated rates represent a significant increase in reimbursement in comparison to industry standards. Under this partnership philosophy, we have found that managed care plans are willing to negotiate a contract under mutually beneficial terms. We build on what matters most to our physicians, which is the ability to provide quality care to their patients. In turn, managed care plans enjoy the added value top-quality physicians bring to their organization and hope that it will attract prospective members to join their plan.

Management of Contracts
In addition to rate negotiation, [redacted] has established open lines of communication with managed care plans that allow us to proactively monitor claims payment to ensure reimbursement is made in accordance with contracted rates. We facilitate claims projects that resolve underpayments and erroneous denials. We also maintain current fee schedules to guarantee the allowables on EOB's are consistent with billing system information as well as being the primary source of reference for all managed care updates and concerns.

Accounting and Finance:
Accounting & Taxes
We provide all corporate accounting and tax services to the practice, including:

- Monthly Accounting (bank reconciliation and write-up);
- Preparation of the company's quarterly financial statements (consolidated), including an annual CPA review;
- Preparation of the annual tax return and related tax documents;
- Preparation of quarterly payroll returns, including coordination of tax deposits and preparation of annual W-2's and tax form 940;
- Preparation of annual tangible tax returns, and
- Preparation of annual 1099 forms.

In addition, we are available to meet with your financial and tax advisor to discuss the practice's financials, and how these matters may affect your personal "bottom line."

We utilize an independent CPA firm to review and issue all quarterly financial statements and to prepare the annual tax returns.

In addition, we are available to meet with your financial and tax advisor to discuss the practice's financials, and how these matters may affect your personal "bottom line."

We utilize an independent CPA firm to review and issue all quarterly financial statements and to prepare the annual tax returns.

Accounts Payable
All practices retain control over their accounts payable. At the same time, we have secured a number of group purchasing contracts with vendors to assist you in keeping the practice's costs down, thereby improving your take-home pay.

- Office supplies – up to 20-40% off corporate rates.
- Medical supplies at hospital rates.
- Laboratory services at a negotiated reduced rate, including a special online interface for our clients only.
- Outside collections at a specially negotiated reduced rate.
- Record storage.

Banking
We open a bank account for each new practice. This account is solely operational, to be used by the practice only for practice receipts and related expenses.

In addition, we arrange for banking materials (checks, deposit books, endorsement stamps) as well as deposit delivery services for the practice.

Distributions
About 85% of your medical service receipts flow through the central office. We post these payments to your patients' accounts, along with the appropriate contractual adjustments.

We distribute collected receipts to the practices on a bi-weekly basis. The funds are internally wire-transferred into the practices' operating accounts for immediate availability and use by the practice.

Reports are provided to the practice reconciling the bi-weekly distribution of funds.

Refunds
We also take extra work away from the practice by preparing all insurance refunds for the practices.

Once the practice administrator has approved a refund, a signed authorization is faxed to the central office. The accounting department will research the refund, write the check, post the refund to the patient's account, mail the check, and follow up with the insurance company.

Operations:
Billing
Although billing is conducted through our highly-secured and central computer billing system, we offer the following additional billing services for a nominal fee at the practice's discretion.
* Electronic billing of claims with verification of receipt;
* Error-checking claims for miscoding; and
* Printing and mailing of paper claims and re-bills.

Because of our highly specialized billing personnel, we ensure accurate and prompt claim payment. In addition, we maintain all insurance plan files in the computer billing system and add new plans/payors as requested.

In addition, we offer at reduced rates electronic patient statements and recall notices. Training for billing through our computer system is provided to all practices that wish to bill individually.

Collections
The practice is responsible for its own collections efforts. However, we are able to use our leverage and outstanding relationship with managed care to assist and support the practice personnel in resolving collection issues with insurance companies through our on-staff insurance liaison. Due to our large group status, we enjoy having assigned provider relations representatives for all large insurers to assist in resolving any claim issues.

Our collections department provides continuous monitoring of practice accounts receivable and collections training on our computer system to practice personnel. In addition, our experienced collections personnel conduct random account/collections assessments and give recommendations on effective collections procedures.

Practice Administration Support Services
We provide continuing support for all practice administrators on managing the practice. Procedures,methods, and reports are provided to practice administrators on a regular basis to work towards the improvement of the practice. In addition, monthly informative meetings are held to discuss all issues affecting the practice.

Practice administrators are encouraged to contact the operations department for guidance and support whenever needed with regards to:

- Billing and coding questions
- Collections and payor relations
- HIPAA guidelines
- Staff efficiency
- Workflow analysis

Payment Posting
We post approximately 85% of total practice revenues. We post directly to your patients' accounts and post contractual adjustments as appropriate. Each practice can stipulate how they want the payments posted and adjustments handled. EOBs are also available electronically and/or in paper format.

Training
Our centralized training department has highly skilled and knowledgeable trainers in both technical and practical aspects of our practice management software. We train new-hire personnel, physicians, and provide
advanced system training for current staff.

We conduct yearly workshops including Medicare Compliance, Fraud and Abuse, and Advanced System Modules. We deliver these workshops with the utmost professionalism.

We assist physicians with chart review as it pertains to coding guidelines. Physicians and administrators are welcomed into our training center to learn effective practice management through our software system.

Human Resources and Personnel Management:
The function of the Human Resources department is to provide our members with the knowledge and tools to hire/terminate, train, and pay the practice personnel. In addition, we provide payroll and employment tax processing services, offer employee group benefits which include a 401K-retirement plan, and help practices meet government record-keeping requirements.

Staffing

- Job openings are posted internally to all practices to maximize employee retention.
- To ensure that all documents (W4, I-9, EEOC and ADA) are processed in accordance with state guidelines, new hire paperwork is handled through the central office.
- Employee orientation is held at the central office. The new staff member is provided an employee handbook where they are informed of the benefits and responsibilities of working for the practice, including a pre-employment drug test. Standard group policies and eligibility dates such as vacation, sick and holiday pay are also discussed.
- Employee documentation is essential in all aspects of personnel management. We offer guidance in effective record-keeping which includes any and all disciplinary actions, terminations, and changes in employee status. Properly documenting the time and reason of any termination will minimize the risk of costly litigation.

Training

- Management and supervisory training is scheduled on a monthly basis.
- OSHA compliance training is required and provided on an annual basis.

Wage and Salary Administration

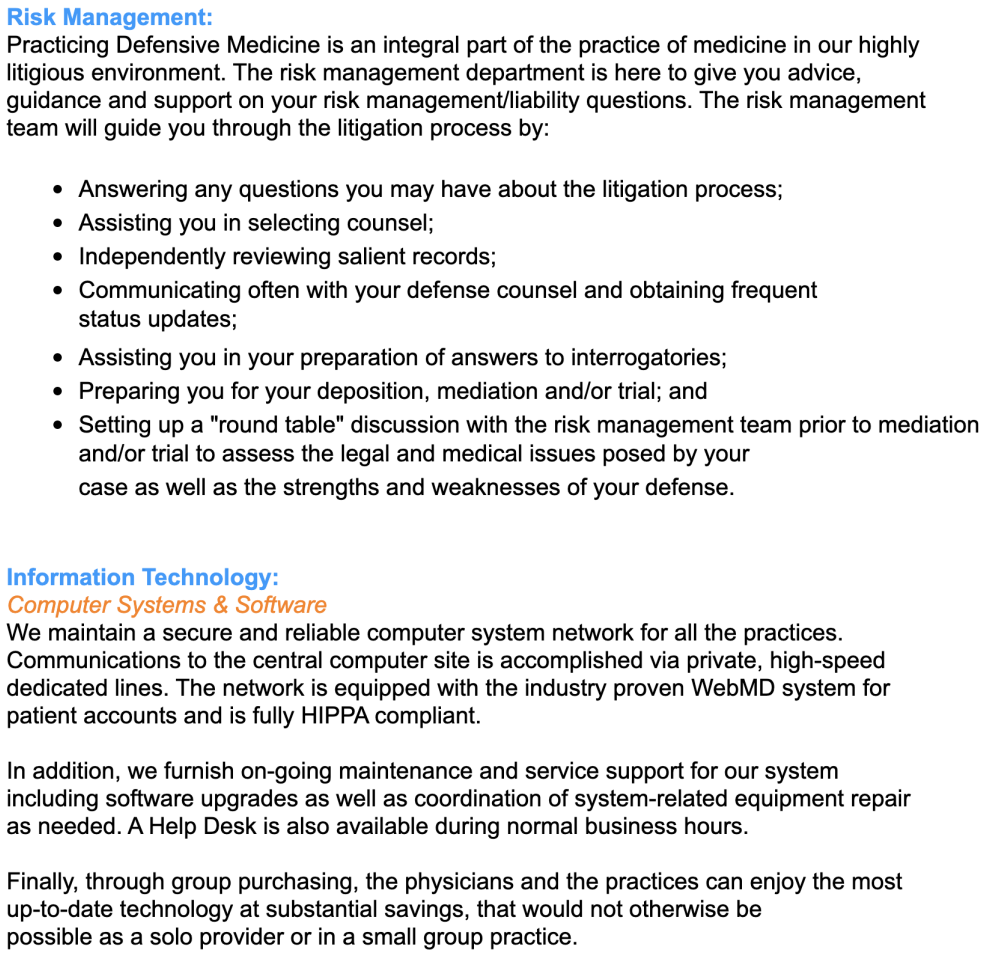
- We monitor that all practices are in compliance with state laws to include minimum wage, overtime, child labor and exempt/non-exempt employees.
- We report and process payment of federal, state and local withholdings, as well as social security and medicare taxes for all practice employees.
- We prepare W2's for all practice employees.

Group Benefits

- Medical, dental, vision, life Insurance, short-term and long-term disability, long-term care, and employee assistance programs are offered to eligible practice employees. We handle all aspects of administering group benefits and processing of all bi-weekly deductions.
- We also offer a 401K savings plan to all eligible practice employees.

Other Services

- Job descriptions for all entry-level and management positions are available upon request.
- We are available to meet with employees and supervisors to mediate any complaints to avoid arbitration or any other legal action.



Note: This figure shows screenshots from the Wayback Machine for the website of PPMC 2 as it existed on August 26, 2007. The services listed by PPMC 2 are representative of the services listed by PPMC 1 and 3, and other PPMCs in general.

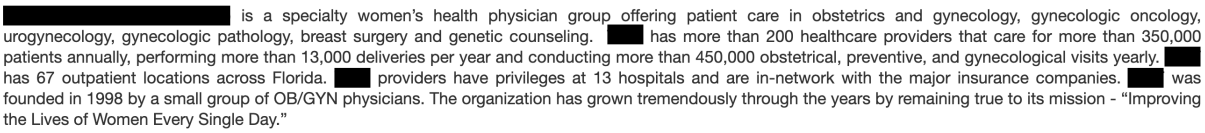
In addition to the services listed here, PPMCs often provide marketing and public relations services. This includes building better websites, patient portals and appointment scheduling. The marketing team can also provide support with social media, videos, and blogs to help boost patient engagement. They can also provide assistance in managing a physician's online reputation. Specific information on clinical management services or other services unique to each PPMC (if applicable) will be explained below.

B.2.2. PPMC 1

History, Branding and Mission. PPMC 1 was founded in 1998 (sometimes the website reports 1997, but the first document filings are in 1998) by a group of Ob-Gyns in West Central Florida. Throughout the 2000s neighboring practices joined PPMC 1 and by 2013, had 138 Ob-Gyn members (Refer to Figure E.2 for maps showing the growth of the PPMCs over the sample period). Between 1998-2004, PPMC 1 operated a sparse website which appeared to be created for physician recruiting rather than patients. Starting in 2005, PPMC 1 transitioned to a single cohesive website of all practices for patient use. The website provides all information on member-practices (most practices do not have an independent website, though they keep their same name and branding) as well as a patient portal. Therefore, any patient using the patient portal was likely aware their physician was part of PPMC 1. In 2008, PPMC 1 changed its name to be more succinct (i.e., the name of the organization changed, but the new name was based on the original name).

PPMC 1's website did not describe an explicit mission statement until 2016, shown in the last line of Figure B.2 below. However, past websites did have similar slogans or related versions. For example, the website from 1998-2004 emphasized the "shared mission of providing the highest quality health care to women in the Tampa Bay area," from 2006-2008 the website included the slogan "Mastering the Art of Women's Care" and between 2008 and 2016 the website featured the slogan "Exceptional Women's Care for Every Patient, Every Time."

Figure B.2 Screenshot from PPMC 1's Website, December 2, 2016



Financial Goals. According to website marketing materials, PPMC 1 transitioned from a more traditional PPMC focused on financial management to a PPMC focused on clinical management. For example, between 2002 and 2004, Figure B.3 illustrates the company's desire to increase the revenue and efficiency of each member practice. Note that starting in 2005, PPMC 1 underwent an organizational restructuring so that practices were incorporated as professional Limited Liability Companies (LLCs) of PPMC 1 (as opposed to Limited Liability Partnerships). Therefore, the language in Figure B.3 reflects partnerships, but after 2005 practices were considered acquired subsidiaries.

Figure B.3 Screenshot from PPMC 1's Website, August 31, 2004

The Beginning

[redacted] was founded in 1997 when a group of Obstetricians and Gynecologists recognized the need for unity in the women's health care industry in West Central Florida. At that time, the health care industry was facing many challenges and it became clear that providing cost-effective strategies and solutions for physician practices was fast becoming a necessity.

There were some attempts by other groups to organize into large, non-exclusive IPA's or physician-hospital organizations, but these endeavors were weak and ineffective. The regional health care market was in need of a stronger, more cohesive solution.

The team that would eventually become [redacted] realized that developing a specialty group in the form of a Limited Liability Partnership (LLP) was the best choice. This would not only benefit the physicians, the partners, but also, and more importantly, allow them to provide better care to their patients.

Today, [redacted] is the premier provider of women's health care in the Tampa Bay area.

Success

Working together toward a common goal has led to the success of [redacted] Relationships between partners within the group are kept strong by a shared vision for progress. This combination makes [redacted] one of the most respected women's health care groups in the industry.

Currently, [redacted] has over 50 physicians at more than 10 divisions and 24 practice sites. Recruitment of physicians is based on reputation, quality of care and location. All physicians within the partnership are board-certified or board-eligible by the American Board of Obstetrics and Gynecology.

A vision for a strong position in the community has become a reality. [redacted] serves as a model to the rest of the country of how affiliation within a tightly structured, large group empowers physicians to deliver high quality health care.

From its ambitious beginning, [redacted] has progressed toward the continued success of creating strong partnerships with top Obstetricians and Gynecologists in the Tampa Bay area.

Our Progress

[redacted] partners enjoy the benefits that come with common tax identity and the uniformity of a Central Business Office (CBO). The CBO provides accurate and timely billing, financial reports and general accounting services, managed care contracting, human resources support, and MIS technical support.

One of [redacted] most impressive assets is its computer network system. +Medic Vision is a state-of-the-art, highly efficient system for billing, accounting, and database services. The software provides daily claims processing, clinical appointment setting, and accounts receivable management and reporting. Additionally, this technology monitors and analyzes claims patterns, financial and utilization reports, and A/R trends. +Medic Vision is an integral part of the success of [redacted]

In the first 12 months of operation, [redacted] experienced 15% higher reimbursements from third party payers, 37% reduction in malpractice premiums, 98% collections rate, 30% reduction in worker's compensation premiums, 15% reduction in telephone costs and 60% reduction in accounting costs. Practice overhead is reduced and the number of days in A/R is at an all time low.

Clearly, partners see an almost immediate result from their affiliation with [redacted] Physician satisfaction is high and the mission of providing a wide range of services while utilizing resources that help reduce operation costs and increase revenue has been and will continue to be accomplished.

By 2008, the information above was no longer on the website. Instead, the website became more patient-facing but still provided a brief organizational description for providers as seen in

Figure B.4 below. Regardless of the time period, PPMC 1 clearly emphasizes individualization and independence for physicians. In 2017, PPMC 1 was acquired by a private equity firm which funded a series of large-scale acquisitions in Florida and expanded the model into different states.

Figure B.4 Screenshot from PPMC 1's Wesbite, May 10, 2008

Consolidation for Business.
Individualization for Health Care.

Founded in 1997, [redacted] is currently comprised of 18 Divisions (Care Centers) and 38 practice sites located around Tampa Bay and Orlando.

The organization of highly qualified specialists in Women's Health Care allows our medical providers to concentrate on our patients and the practice of medicine. This concept has resulted in a large but personal medical group applying modern principles of practice, designed to enhance both the quality and efficiency of health care for women.

While integrated administratively, each Division of [redacted] is as distinctive as the woman who seeks their care. Each Division acts as an individual Care Center for you as a patient, providing outstanding 24 hour medical care by board certified obstetrician gynecologists and other clinicians.

Clinical Goals and Management. Since it was founded, the website for PPMC 1 emphasized the provision of high quality care. However, starting in 2012 (and every year since), PPMC 1 published a "value report" which included a letter from the president, the company's mission and values, the physician's code of conduct, quality initiatives, company statistics (number of Ob-Gyns, number of procedures etc.), patient satisfaction, cost containment efforts, the names of all member physicians as well as their personal affiliations with hospitals. Importantly, the value reports also summarized clinical management goals and strategies. Each of these reports is over 40 pages long. Rather than provide screenshots, I distill the key information below and provide direct quotes whenever possible. Note that these strategic initiatives began before 2012, but the value reports are only available starting in 2012. Figure H.1 provides further information on the timeline on clinical initiatives specifically related to reducing the C-section rate.

- **Quality committees**
  - —Internal: PPMC 1 has several committees that Ob-Gyn members and their staff can volunteer to join. Committees include quality improvement, patient safety, and Electronic Health Records committee. The quality committee is the largest of the three, and its goal is "to engage a team of clinical and operational leaders who are willing to continuously champion quality, performance improvement, patient safety and patient satisfaction. They meet monthly to review and update current best practices and introduce new guidelines aimed at improving patient safety and quality. They proactively address critical quality and patient safety issues". In 2014, these were the goals of the committee:

    - "Standardization of clinical evidence based guidelines, order sets, and treatment consents.
    - Review of policies and procedures related to safety in minimally invasive/endoscopic surgery, in office surgery and safety in injection administration.
    - Review of recommendations for prenatal genetic counseling and testing.
    - Review of credentialing requirements for physicians and supporting staff.
    - Review of roles and responsibilities and scope of practice for clinical staff.
    - Electronic implementation of social history questionnaire within the electronic medical record.
    - Various staff trainings such as recognizing the signs of depression.
    - Development and implementation of an EHR data gathering tool that improves collection of perinatal information."
  - External: PPMC 1 encourages Ob-Gyns to participate on the Patient Safety and Quality Improvement Committee of the American Congress of Obstetrics and Gynecology (ACOG) District XII Florida as well as ACOG's national committee.
- **Community Building**
  - PPMC 1 has a yearly retreat "attended by our health care providers, senior management, clinical and clerical team. This retreat is used to welcome new members, discuss the mission, vision, values and goals of the organization, as well as create community between member physician practices."
- **Physician Code of Conduct**
  - The Physician Code of Conduct is written and signed by member physicians every year and published in the annual value report. The code starts by reiterating the mission of the organization: "Our Mission is to improve the health of our communities through a caring partnership with patients, physicians, and employees. Our goal is to offer quality services that set community standards and exceed expectations in a caring, convenient, affordable, and accessible manner." Then outlines how member physicians will meet conduct criteria when treating patients, and interacting with staff and interacting with other physicians.
- **Clinical Goals**
  - Increase well woman visits which includes age specific screening services and immunizations
  - "Reduction of the primary C-section rate by meeting safe, achievable, evidence-based targets. Based on a recent published study by Boyle et.al. of 228,000 deliveries from 12 centers across the country, [PPMC 1] has set a goal of reaching an overall primary C/S rate of 21.3% of total deliveries (excluding repeat C/Sections)." To meet this goal, PPMC 1 chose to:

    - "Develop and introduce appropriate clinical guidelines to decrease variation in care.
    - Develop a transparent internal data reporting process.
    - Create partnerships with hospitals and health insurance companies to align our goals.
    - Regular benchmarking and transparent reporting. C/S rates for all our physicians are published on a monthly basis.
- Increase appropriate use of antenatal steroids to reduce pre-term neonatal morbidity and mortality
- Cost reduction efforts
    - Increase generic prescribing
    - Refer patients to more affordable laboratories, radiology and ambulatory surgery centers.
    - Reduce unnecessary pap smears based on new evidence."

Value-Based Payments. In addition to the goals outlined above, PPMC 1 also pursued value-based payment contracts. In September 2013 they entered into "collaborative care" agreements with two insurers: in the 2013 value report, PPMC 1 states they are "proud to be selected to commence groundbreaking National Pilot programs with United Healthcare and Cigna to identify and reward value based behavior in OB/GYN." A publication from Cigna in 2015 reports the preliminary success of the program with PPMC 1 specifically (Figure B.5).

Figure B.5 Screenshot from Cigna's Press Release, May 4, 2015

Cigna Collaborative Care is a value-based initiative that uses incentives to engage health care professionals and help drive improved health, affordability and patient experience. It initially focused on large primary care physician groups but was expanded to include hospitals, small primary care practices and specialists, including OB/GYN practices.

Through collaboration between medical practices and Cigna, the OB/GYN program aims to reduce primary cesarean deliveries and inductions of labor prior to 39 weeks gestation for non-medical reasons, increase the use of generic drugs, and shift certain gynecologic surgical procedures to less-costly sites of service. The program also focuses on the identification and referral of at-risk pregnant women, safety certification for office-based procedures and maternal mental health screening.

The OB/GYN practices participating in the program are compensated with a patient care management payment that rewards them for meeting a comprehensive set of quality and cost efficiency targets. The payment varies based on how well the group performs. The expectation is that OB/GYN practices that meet their targets will have better quality scores and better cost efficiency than other OB/GYN practices in their markets.

After its first year participating in the program, [redacted] with offices in Tampa and Orlando, showed significant results:

- 15.2 percent improvement in its primary cesarean delivery rate
- 6.4 percent improvement in generic dispensing rate
- 3.7 percent rate for early elective deliveries, better than national rate of five percent

B.3. PPMC 2

History, Branding and Mission. PPMC 2 was formally founded in 2004, but the path to the creation of the PPMC began in 1998 when 31 Ob-Gyn practices entered into a partnership in the Miami Metropolitan Area. In 2004, the original company was dissolved; in its place, an MSO was set up as an incorporated company, and a separate group holding company was formed as the parent LLC and the practices then became subsidiary LLCs of PPMC 2. PPMC 2 originally focused exclusively on women's health, but in 2011 began acquiring practices in other relevant specialties such as maternal-fetal medicine, pediatrics, and urology.

Between 2004 and 2019, PPMC 2 operated two websites: one for the MSO and one for the physician group focused on recruitment. While the website for the MSO listed member practices, each practice still retained and managed their own independent websites and patient portals. Practices did not change their name or affiliation information after acquisition, which would make it unlikely that patients were aware of the acquisition. The recruitment website provided key details on the mission, vision and goals of the company over the sample period (Figure B.6).

Figure B.6 Screenshots Related to PPMC 2's Mission

(a) Home page, February 5, 2005

Our Mission

[redacted] provides ownership and management solutions that give physicians control over their practices while combining strength and skills to improve the quality of healthcare to their patients.

About Us

[redacted] was founded by an expert team of savvy physicians and business professionals to serve as the holding company for several medical practices. These physicians realized it was time to take back control of their practices.

[redacted] is an established group of leading Ob-Gyn medical practices in the South Florida area. We are the physician-managed leader in delivering high quality and comprehensive Ob-Gyn services to women in the South Florida area, with over 100 physicians at 63 practices seeing over 10,000 patients a day.

Our Vision

Maintaining a physician's autonomy is our utmost concern. Our goal is to support physicians in their role as medical providers. The physician members remain primarily responsible for their relationships with their patients and staff. The company's management, in turn, focuses its efforts on your practice. The Board of Managers, made up of other physician members of [redacted] provides direction to the administrative staff to continually address issues that are most important to the physician.

- Speak with one powerful voice to managed care organizations and advocate for improved women's healthcare.
- Improve operating margins
- Pass along expertise in billing, coding, collections, marketing and more
- Generate significant cost savings to each practice through economies of scale

In addition, [redacted] is a resource, creating new medical group practices in areas where demand is high. Membership is limited to physicians who have established reputations for providing high quality Ob-Gyn services in Florida, where the [redacted] idea was born, and beyond. Maintaining stringent admission policies, measuring outcomes and tracking healthcare trends ensures higher reimbursements from insurance companies who value high quality, responsible medicine.

(b) Home page, July 20, 2012

Are you prepared for the future of healthcare? Are you worried about the growing number of physician private practice being acquired by hospitals? Has running a successful practice required a tremendous amount of dedication, energy and resources?

We know how you feel. That's why now, more than ever, is the time to think about your future. At [redacted], we offer you a strong support system that allows you to enjoy the best of both worlds…the strength and accessibility of a group practice together with solo practice autonomy. Click here to learn more.

(c) Home page, April 6, 2016

Are you prepared for the future of healthcare? Has running a successful practice stretched you too thin?

We understand your situation. Now is the time to think about your future. At [redacted], we provide a strong support system that brings the best of both worlds together: solo practice autonomy with the resources of a group practice.

Financial and Clinical Goals. For PPMC 2, the financial goals are clear from their website: "Remember, our goal is to support you in any way that can improve your bottom line, while at the same time allowing you to retain control of the practice" (Figure B.7). In particular, PPMC 2 emphasizes its strength in negotiating higher-paying contracts by describing how "In today's medical profession, physicians face pressure from managed care organizations that impede the way they practice medicine. Most physician providers do not have the resources needed to negotiate with managed care plans. Consequently, their reimbursements fall below industry standard and may not cover their costs. At [PPMC 2], we have been successful in partnering with managed care companies to obtain better contract terms and higher reimbursements" (Figure B.1).

Figure B.7 Screenshots Related to PPMC 2's Financial Goals

(a) PPMC 2's "Services" page, May 27, 2007

As a [redacted] member, you will gain an array of management resources that support the business aspect of medicine. [redacted] has the experience and know-how to provide physicians with the tools and methods to help them achieve their professional goals.

With an experienced team that has up to 20 years of proven experience in managing group practices, our services enhance the practice so that physicians can focus on providing the best care for their patients.

Remember, our goal is to support you in any way that can improve your bottom line, while at the same time allowing you to retain control of the practice.

(b) PPMC 2 MSO's home page, December 4, 2014

Why [redacted]

The current healthcare environment is making it harder for independent physicians to survive by themselves. Aligning yourself with [redacted] is key. It's not only a proven strategy for gaining operational efficiencies, but also critical for increasing revenues year after year.

What do we do?

Our unique understanding of the complexities of operating a large physician group allows us to provide physicians with a rare, cost-effective partnership that allows them to efficiently and profitably run their practices. From early formation stages to on-going management, [redacted] is with you every step of the way.

(c) PPMC 2's home page, April 6, 2016

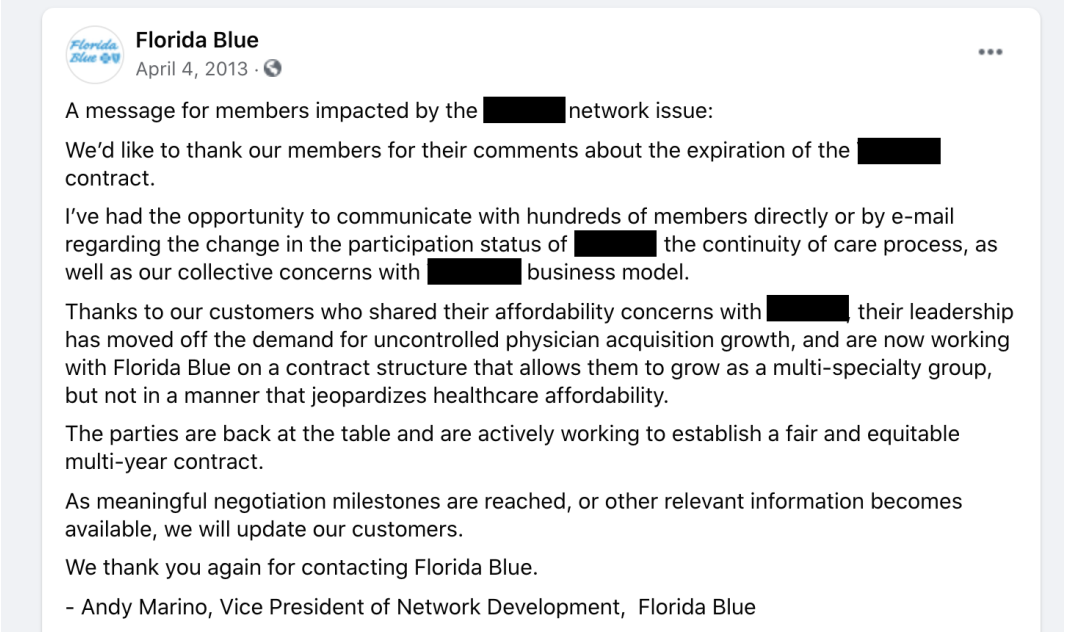
As the healthcare industry rapidly changes and government agencies implement new processes, [redacted] remains on top of its evolution by providing expert managed care services to providers statewide. The Managed Care Department oversees important tasks, formerly completed by the practice, which will allow physicians to concentrate on providing quality healthcare services to their patients. Also, physicians who have joined [redacted] have experienced significant practice growth and increased reimbursements.

More explicitly, "physicians who have joined [PPMC 2] have experienced significant practice growth and increased reimbursements", which is also supported by the language on the website of PPMC 2's MSO (Figure B.7). Overall, PPMC 2 markets itself as a strategic partner for physicians to increase their revenue, grow their practice, and get the support of a larger organization. While PPMC 2 does not explicitly state any clinical goals, they do state that "teaming up with us alleviates many of the challenges of running a practice, making it easier to prioritize patient care. We bring the best of both worlds together, so you can focus on what truly matters." Language focused on high-quality care is embedded throughout PPMC 2's website; however, the main channel is based on relieving the burden of practice administration, rather than clinical management services as described by PPMC 1.

Health Plan Disputes. PPMC 2 entered into several public contract disputes during and after the sample period. For example, Figure B.8 shows a press release on Florida Blue's Facebook page from 2013 raising affordability concerns with PPMC 2's business model. Similar concerns were raised by Aetna in 2014, and again by Florida Blue in 2017. Since PPMC 2 is the largest medical group in the Miami area, they likely have a large degree of negotiating leverage within that market. In fact, several large employers spoke out on behalf of PPMC 2, urging insurers like Aetna to keep PPMC 2 in network, as seen in Figure B.8, Panel (d).

Figure B.8 Screenshots Related to PPMC 2's Health Plan Disputes

(a) Florida Blue's Facebook page, April 4, 2013



Florida Blue
April 4, 2013 ·

A message for members impacted by the [redacted] network issue:

We'd like to thank our members for their comments about the expiration of the [redacted] contract.

I've had the opportunity to communicate with hundreds of members directly or by e-mail regarding the change in the participation status of [redacted] the continuity of care process, as well as our collective concerns with [redacted] business model.

Thanks to our customers who shared their affordability concerns with [redacted], their leadership has moved off the demand for uncontrolled physician acquisition growth, and are now working with Florida Blue on a contract structure that allows them to grow as a multi-specialty group, but not in a manner that jeopardizes healthcare affordability.

The parties are back at the table and are actively working to establish a fair and equitable multi-year contract.

As meaningful negotiation milestones are reached, or other relevant information becomes available, we will update our customers.

We thank you again for contacting Florida Blue.

- Andy Marino, Vice President of Network Development, Florida Blue

(b) Florida Blue press release, March 8, 2017

[redacted] is a group of providers, most of whom are in South Florida. Currently, Florida Blue and [redacted] are talking about a new contract that would start on April 1, 2017. Unfortunately, if we don't reach an agreement, all [redacted] providers will no longer be part of any Florida Blue network as of April 1.

It's important for our members to know that we are working hard to reach an agreement with [redacted] to keep rates affordable and similar to other doctors that provide these types of medical services. We value our relationship with the doctors in the [redacted] group, and we are hopeful that these providers will remain in our networks for our members.

(c) Aetna press release, November 17, 2014

[redacted], LLC with locations in Miami-Dade/Broward County & Palm Beach/Martin/St. Lucie Counties in FL terminated from our Aetna provider network effective November 15, 2014

Highlights

- [redacted] LLC sent Aetna 90 day termination letter expressing its intent to leave Aetna's network effective November 15, 2014.
- [redacted] LLC and Aetna were unable to reach an agreement and therefore [redacted] LLC terminated effective November 15, 2014.
- [redacted] is a physician organization in South Florida with offices in Miami-Dade, Broward and Palm Beach counties. They are the largest OB/GYN organization in the area and have been contracted with Aetna for several years.
- The [redacted] physicians are generally more costly to Aetna and our plan sponsors compared to some of their peer physicians.
- Negotiations continue between Aetna and [redacted] in hopes of reaching an agreement that is in the best financial interest of our members, customers and Aetna.
- All services provided by [redacted] physicians are available through alternate participating providers in the area.

(d) University of Miami HR-Benefits Communications, October 24, 2014

[redacted] is a large physician practice in Florida consisting primarily of ob-gyn and pediatric providers. The University recently learned that, after several months of negotiations, the contract between [redacted] and Aetna will be terminated on **November 15**. Negotiations are ongoing between Aetna and [redacted], and the University has expressed to Aetna its desire to retain [redacted] within the Aetna network. Although our hope is that an agreement will be reached prior to the stated termination date, it is also possible that an agreement will be reached after that deadline passes. Should that occur, UM will work with Aetna to process any claims incurred during the termination window. We will continue to provide updates each week.

B.4. PPMC 3

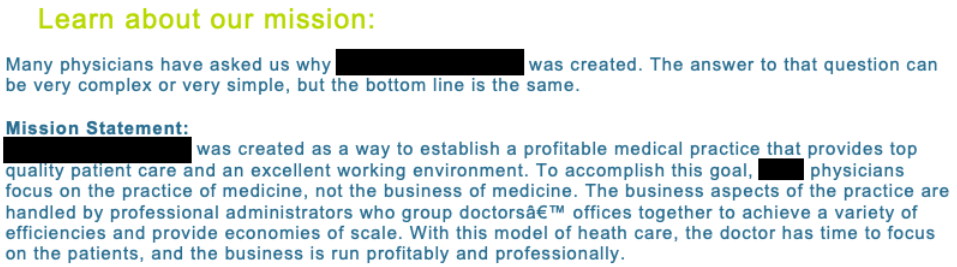
History, Branding and Mission. PPMC 3 was founded in 2009 by two Ob-Gyns in South Florida (the Miami Metropolitan Area). Initially, the physicians established a management company as an LLC that would manage their own practice. Once other practices were acquired, they renamed their practice to operate as the parent company (the PPMC). Similar to the other models, member

practices would become the subsidiary LLCs of the PPMC. Between 2013 and 2014, a private equity company began the process of acquiring PPMC 3 to provide the capital and expertise needed to expand into North Carolina and Georgia (and eventually other states). To undergo this expansion, the existing model was scaled up: each new state formed a new group practice as an LLC, with PPMC 3's management company converted into the management company across all states.

Until the private equity expansion, PPMC 3 operated a single dedicated website that focused on physician recruitment (though each acquired practice still retained and managed their own independent websites and patient portals). Practices did not change their name or affiliation information after acquisition, which would make it unlikely that patients were aware of the acquisition. The recruitment website provided key details on the mission, vision and goals of the company over the sample period (Figure B.9).

Figure B.9 Screenshots Related to PPMC 3's Mission

(a) PPMC 3's "Mission" page, January 8, 2010



Learn about our mission:

Many physicians have asked us why [redacted] was created. The answer to that question can be very complex or very simple, but the bottom line is the same.

Mission Statement:

[redacted] was created as a way to establish a profitable medical practice that provides top quality patient care and an excellent working environment. To accomplish this goal, [redacted] physicians focus on the practice of medicine, not the business of medicine. The business aspects of the practice are handled by professional administrators who group doctorsâ€™ offices together to achieve a variety of efficiencies and provide economies of scale. With this model of heath care, the doctor has time to focus on the patients, and the business is run profitably and professionally.

Focus on what you love:

When you trained to be a physician, how did you imagine your time would be spent? Did you expect to spend a portion of every week arguing with insurance providers about benefits and rates? Did you think you'd have to worry about billing and collection problems? Or spend precious hours figuring out cash flow issues and staffing problems? When you were completing your internship, learning the intricacies of your profession, did you think your daily focus would be on productivity? If you're like most physicians, the answer to these questions is a resounding "no."

(b) PPMC 3's "About Us" page, December 24, 2015

The Largest and Fastest Growing Doctor Owned Ob-Gyn Group

HOME | ABOUT US | OUR GROWTH | OUR PARTNERS | INFORMATIONAL SESSIONS | JOIN US | NEWS | CONTACT US

About [redacted]

[redacted] is the largest and fastest growing group of Ob-Gyn physicians in the nation. [redacted] is the only national, private practice women's health group with a singular vision and 100% physician governance.

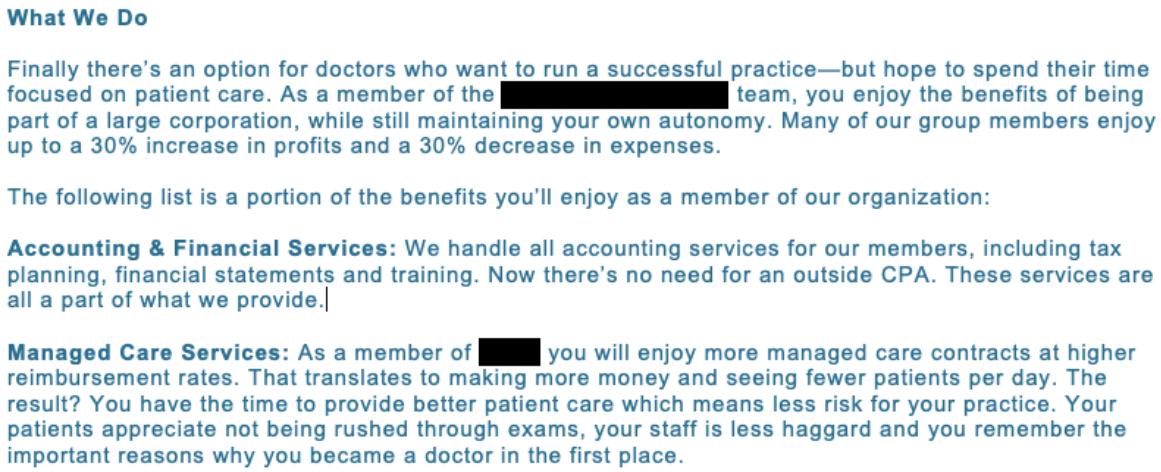
The mission of [redacted] is to preserve personalized healthcare and to be recognized as a premier thought leader in the field of women's health. [redacted] wants to protect the private practice of medicine and ensure the economic security of Ob-Gyns for the foreseeable future.

Established in 2009 and designed to provide a collaborative model for physicians, [redacted] is the first doctor-owned Ob-Gyn group to spread across state lines. Fueled by rapidly changing market dynamics and The Affordable Care Act, [redacted] provides a unique and promising approach for the future of medicine.

Financial and Clinical Goals. The mission statements of PPMC 3 focus on improving the financial health of medical practices. More explicitly, Figure B.10 shows the top reasons PPMC 3 gives physicians to join. Most reasons are related to income and productivity. More explicitly, PPMC 3 says "Many of our group members enjoy up to 30% increase in profits" and also provides a graph of revenue projection as seen in Figure B.10 Panel (c). PPMC 3 also explains that its key strategy to increasing practice profitability is through higher reimbursement: "you will enjoy more managed care contracts at higher reimbursement rates."

Figure B.10 Screenshots Related to PPMC 3's Financial Goals

(a) PPMC 3's "What We Do" page, January 8, 2010



What We Do

Finally there's an option for doctors who want to run a successful practice—but hope to spend their time focused on patient care. As a member of the [redacted] team, you enjoy the benefits of being part of a large corporation, while still maintaining your own autonomy. Many of our group members enjoy up to a 30% increase in profits and a 30% decrease in expenses.

The following list is a portion of the benefits you'll enjoy as a member of our organization:

Accounting & Financial Services: We handle all accounting services for our members, including tax planning, financial statements and training. Now there's no need for an outside CPA. These services are all a part of what we provide.

Managed Care Services: As a member of [redacted] you will enjoy more managed care contracts at higher reimbursement rates. That translates to making more money and seeing fewer patients per day. The result? You have the time to provide better patient care which means less risk for your practice. Your patients appreciate not being rushed through exams, your staff is less haggard and you remember the important reasons why you became a doctor in the first place.

(b) PPMC 3's "Why Us" page, January 22, 2013

Top Reasons

1. Increased income
2. Stabilization of income
3. Reduced costs
4. Preservation of independent practice model
5. Increased productivity
6. Platform for innovation, research, and clinical excellence
7. Superior support
8. Secure & encrypted web-based products with access from anywhere
9. Comprehensive solution
10. Utilizing best-of-breed technology
11. Led by proven leaders
12. Little upfront cost
13. Improved patient experience
14. Superior market clout
15. Improved market positioning/strategic planning
16. Reduced administration burden
17. Compliance and Q.I.

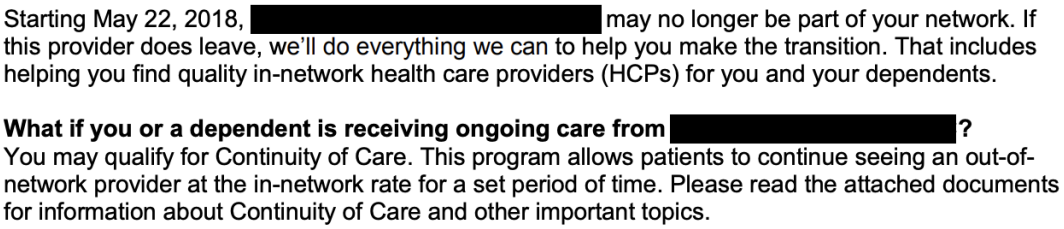
(c) PPMC 3's "Join Our Network" Page, January 24, 2015

Similar to PPMC 2, PPMC 3 stresses that through increased revenue and practice efficiency, physicians will have more time to spend on patient care. For example, as seen in Figure B.10 (a), PPMC 3 says "you have the time to provide better patient care which means less risk for your practice." Additionally, in their mission statement they emphasize their goal of establishing "a profitable medical practice that provides top quality patient care." However, they do no advertise specific clinical goals or clinical management services.

Health Plan and Legal Disputes. In comparison to PPMC 2, PPMC 3 had fewer documented disputes with health plans. I was not able to find evidence of contracting disputes in Florida until after 2014, but did find instances in other states following PPMC 3's expansion. For example, Figure B.11 shows a dispute in North Carolina in 2014, where United Healthcare said PPMC 3 was "seeking a 20 percent increase in reimbursements." A similar dispute occurred between PPMC 3 and Aetna in Texas in 2019. In Florida, Cigna sent a letter to plan members indicating they may drop PPMC 3 in 2018, but did not provide details on the reason behind this decision. PPMC 3's Florida-based urogynecology practice also settled a suit with the DOJ for fraudulently billing Medicare in 2018.

Figure B.11 Screenshots Related to PPMC 3's Health Plan and Legal Disputes

(a) Screenshot from letter to patients from Cigna, date unknown



(b) Screenshot from article by Triangle Business Journal, December 10, 2014

Between 12,000 and 20,000 patients might need to look for a new doctor after Jan. 1 if health insurer United Healthcare and a group of practices affiliated the [redacted] banner can't reach a contract agreement.

Piecing together exactly where negotiations broke down is difficult and neither the insurer nor the practice administrators will give specifics on negotiations. United, the insurer, says [redacted] is seeking a 20 percent increase in reimbursements. In response, [redacted] claims its proposal would actually cost the patients less.

If the two sides can't reach an agreement, 13 practices would be impacted for a total of 20,000 patients, of which about 12,000 have been seen by a [redacted] physician recently.

(c) Screenshot from statement given by Aetna to WFAA, a local news station in Dallas, June 27, 2019

"We remain in active negotiations with [redacted] and we hope to reach a new contract with the provider group prior to the termination date of August 15th," a spokesperson for Aetna said.

"Aetna has a dual responsibility to our customers. The first is to provide our members with access to comprehensive health benefits coverage that is both accessible and affordable. The second is to help contain rising health care costs, which threaten our plan sponsors' abilities to continue providing coverage for their employees," the spokesperson said. "If Aetna's contract with [redacted] terminates on August 15th, our members will be able to receive care from other providers in our network."

(d) Screenshot from post by SFMS Attorneys at Law, July 3, 2018

Florida Health Care Group Pays $1.7 Million Settlement in Medicare False Claims Suit

Posted on July 3rd, 2018

The U.S. Department of Justice ("DOJ") announced on July 2, 2018, that [redacted], a network of urogynecologists in Florida, has agreed to pay $1.7 million to settle claims that it violated the False Claims Act ("FCA"). The United States notified the court of its intent to intervene and prosecute the suit on May 16, 2018.

The government accused [redacted] of intentionally billing Medicare for services never performed and for unnecessarily large amounts. The DOJ alleged the network of practitioners included modifier 25 on their billing submissions, which indicates the doctor completed separate, additional services during an appointment. The doctors, however, did not actually perform these additional services, but the modifier allowed them to receive extra Medicare reimbursements.

Appendix C: Background on Obstetricians and Gynecologists (Ob-Gyns)

C.1. Clinical Role

Physicians trained in Ob-Gyn specialize in both obstetrics and gynecology, which center around women's health. Obstetrics is "a branch of medical science that deals with pregnancy, childbirth, and the postpartum period" and gynecology is "a branch of medicine that deals with the diseases and routine physical care of the reproductive system of women" (Miriam-Webster 2020). Therefore, Ob-Gyns can perform procedures such as cesarean sections, hysterectomies, removal of ovarian cysts, and uterine fibroids, and surgery to repair pelvic organ injuries. They can also perform preventative care services akin to primary care physicians, such as yearly check-ups, pap smears, STI testing, pelvic exams, ultrasounds, and blood work.

C.2. Payments and Contracting

In my analysis, I focus on physicians who deliver at least 100 babies over the sample period. This identifies Ob-Gyns (rather than family practice or emergency room physicians who can also deliver babies) and homogenizes comparisons to Ob-Gyns that predominantly focus on labor and delivery. Before acquisition by a PPMC, each practice would negotiate payments for all procedures and services with insurance companies directly, including global birth payments. Note this section provides an example of status quo contracting; actual negotiations likely differ across physician practices. These payments typically include all services associated with prenatal, intrapartum (during labor and delivery), and postpartum care for the mother (infant care is separate). Ob-Gyns receive a single payment for all phases of care associated with a single birth, which often differs between vaginal and cesarean delivery. Hospitals separately negotiate birth payments with insurers, but would negotiate on behalf of employed physicians. See Foo, Lee and Fong (2017) for more information on payments in childbirth.

Post-acquisition, the PPMC negotiates payment rates with insurers for procedures and services. I do not have data on these negotiated rates. National claims data from 2004-2010 indicate that total maternal care payments (including all hospital and physician fees) is $12,520 for vaginal births and $16,673 for C-section (Truven Health Analytics 2013). Of this amount, physicians on average, receive $2,887 for vaginal delivery and $3,350 for cesarean delivery, representing 23% and 20% of the total maternal care payments, respectively. More recent state by state claims data from FairHealth can provide insights into Florida payments. Based on claims data between 2016-2017, the average commercial insurance payments for maternal care was $11,917 in Florida ($10,328 US average) for C-sections and $7,745 in Florida ($6,963 US average) for vaginal births (Hoffower and Borden 2019). Note that the reported data does not provide a clear description of included or excluded payments, making it difficult to draw comparisons to the claims data used by Truven.

Still, using the estimate that physicians receive 23% of total maternal care payments for vaginal births and 20% for C-sections suggests payments of $1,781 and $2,383 for Florida physicians. These estimates are likely a lower bound since they are substantially below the amounts reported from Truven's earlier time frame.

C.3. Income Calculation

An assumption in this paper is that payments from labor and delivery make up the majority of an Ob-Gyn's income for those who deliver at least 100 babies a year. Other researchers have made similar assumptions: for example, Dranove, Ramanarayanan, and Sfekas (2011) state "obstetricians derive the lion's share of their revenues from deliveries." Given that C-sections typically result in larger payments than vaginal births, one way for an Ob-Gyn to increase revenue is to substitute towards C-sections. To formalize the assumption, I will provide a back of the envelope calculation of how much an Ob-Gyn's income is based on childbirth using summary statistics for the sample of Florida Ob-Gyns.

Table C.1 Back of the Envelope Calculation: Ob-Gyn Yearly Birth Revenue

	Vaginal	C-section	Total
Private Insurance			
Number of Births	48	33	
Avg. Payment	$1,781	$2,383	
Total	$85,488	$78,639	$164,127
Medicaid			
Number of Births	43	31	
Avg. Payment	$1,456	$1,456	
Total	$62,608	$45,136	$107,744
Yearly Birth Revenue			$271,871

In my sample, Ob-Gyns perform on average of 155 births a year. Table C.1 provides an approximate break down of those births by insurance type and delivery method. For this illustration, births by other payers (VA, TriCare, etc.) will be assigned the Medicaid payment. Medicaid payment data was retrieved from Alexander (2015), where payment rates for vaginal birth and C-sections were consistently $1,456 for my sample period. Overall, this calculation suggests revenue of $271,871 from childbirth. Removing 60% of this revenue for overhead expenses leaves Ob-Gyns with $163,123 in take-home pay (Tinsley 2010). In 2014, an Ob-Gyn's average self-reported income was $243,000 (Medscape Compensation Reports). Applying these numbers to my example, labor and delivery accounts for approximately 67% of an Ob-Gyn's income.

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Appendix D: Empirical Data Collection and Sample Construction

D.1. Patient Data

Patient-level data is available from hospital discharge records (also referred to as inpatient data) purchased from the Florida Agency for Health Care Administration. This data is de-identified and includes all recorded inpatient episodes in the state of Florida between 2006 and 2014. This section provides information on how key birth variables were coded.

Classification of Delivery Method. The hospital discharge records associated with each delivery identify whether the delivery was vaginal or C-section. ICD-9-CM Delivery MS-DRG/DRG codes 370, 371, 765 and 766 identify C-sections and codes 372, 373, 374, 375, 767, 768, 774, and 775 identify vaginal births. To classify whether a birth was planned or unplanned I follow the methods of Henry et al. 1995 and Gregory et al. 2002. This methodology uses diagnosis codes that indicate a trial of labor, and defines a planned C-section as a C-section with no indication of a trial of labor. For example, if a women is recorded as having "failed to progress to labor" then she was allowed to have labored before a C-section, so it was not scheduled in advance.

Classification of Maternal Risk Factors and Morbidity. I code maternal risk factors using a combination of ICD-9-CM diagnosis and procedure codes. I follow the coding methodology defined by Agency for Healthcare Research and Quality (AHRQ), Inpatient Quality Indicators #33 to determine low-risk births: https://www.qualityindicators.ahrq.gov/Downloads/Modules/IQI/V60/TechSpecs/IQI_33_Primary_Cesarean_Delivery_Rate_Uncomplicated.pdf. Following AHRQ, I include births by women with previous vaginal births because this is not a path dependent decision – women who had a previous vaginal birth can have a C-section or vaginal birth in the subsequent birth. In contrast, women who have a C-section, have a C-section in 95% of all subsequent births.

For analysis using the low-risk C-section rate, I code for maternal comorbidities and other risk factors observable to the physician before the onset of labor. These risk factors can be associated with an increased risk of C-section, but captures higher risk pregnancies in general. These risk factors have been used in previous research on C-sections (Henry et al. 1995; Gregory et al. 2002; Xu et al. 2015; Johnson and Rehavi 2016; Currie and MacLeod 2017). The list includes: Advanced maternal age (35 years of age or older), asthma, anemia, obesity, diabetes or abnormal glucose tolerance, thyroid abnormaility, bone or joint disorder, abnormality of organs and soft tissues of pelvis, hypertension complicating pregnancy (includes pre-eclampsia), maternal congenital and other heart disease, coagulation defects complicating pregnancy (blood clotting), infective and parasitic conditions, substance abuse and smoking, antepartum hemorrhage, abruptio placentae and placenta previa, intrauterine fetal growth restriction, premature rupture of membrane, polyhydramnios, oligohydramnios, isoimmunization, excessive fetal growth, uterine size

date discrepancy, cervical shortening, known or suspected fetal or placenta abnormalities affecting the management of the mother, such as hereditary disease, antepartum fetal distress, evidence of insufficient prenatal care or maternal malnutrition, excessive vomiting in pregnancy, previous pregnancy, and other conditions and risks (includes excessive weight gain during pregnancy, habitual aborter, renal disease, liver disorders, nerve disorders, and severe urinary tract infection.) In the sample for all births, I also control for pre-term birth, fetal malposition, multiple gestation and previous C-section. Note that some variables are combined into a single control variable in the regression analysis as seen in Table E.1.

In ICD 9 codes there is no uniform method to account for previous vaginal delivery. Instead, "previous pregnancy" captures any instance of previous pregnancy not resulting in a C-section, including any indication the patient had a previous birth (multigravida or grand multiparity), had a previous ectopic pregnancy or a pregnancy resulting in stillbirth.

Classification of Maternal Morbidity. I code instances of maternal morbidity following CDC guidelines for severe maternal morbidity (https://www.cdc.gov/reproductivehealth/maternalnfanthealth/smm/severe-morbidity-ICD.htm). This includes any instance of acute myocardial infarction, acute renal failure, amniotic fluid embolism, aneurysm, cardiac arrest/ventricular fibrillation, disseminated intravascular coagulation, eclampsia, heart failure/arrest during surgery or procedure, puerperal cerebrovascular disorders, pulmonary edema/acute heart failure, severe anesthesia complications, sepsis, shock, sickle cell disease with crisis, air and thrombotic embolism, adult respiratory distress syndrome, blood transfusion, conversion of cardiac rhythm, hysterectomy, temporary tracheostomy, and ventilation. I also account for other instances of maternal morbidity, such as postpartum hemorrhage, pelvic trauma, maternal infection and deep vein thrombosis, as in Lyndon et al. (2015).

Classification of Infant Morbidity. To determine infant complications and outcomes, I use ICD-9-CM Codes compiled by the California Maternal Quality Care Collaborative (https://www.cmqcc.org/research/quality-measures/unexpected-complications-term-newborns). Any of the following diagnoses would be considered an indicator of infant morbidity: birth trauma, hypoxia asphyxia, shock and resuscitation, respiratory complication, infection (such as sepsis), and neurological complications.

Clinical Justifications for C-section. While there are many risk factors which could lead to the decision to perform a C-section, the two most commonly cited diagnosis for first-time C-section include failure to progress to labor and non-reassuring fetal heart rate (often referred to as fetal distress) (Cunningham et. al. 2010). Failure to progress is a highly subjective diagnosis with no uniform coding practices. In this analysis, I follow the coding guidelines of

the Joint Commission Performance Measurement System (https://manual.jointcommission.org/releases/TJC2013A/AppendixATJC.html), where failure to progress includes any diagnoses of abnormality of forces of labor, long labor, or failed induction of labor. Note that a C-section can be scheduled in advanced for reasons such as breech births and prior C-section, which have been removed for the sample of low-risk mothers. Similarly, non-reassuring fetal heart rate does not have a uniform code and can refer to any instance of fetal distress affecting management of mother, abnormality in fetal heart rate or rhythm, and fetal distress during labor and delivery or unspecified as to time of onset. Other diagnosis leading to a C-section include obstructed labor, maternal distress, umbilical cord complications, and no mention of indication. Note that these codes are not used in isolation, and often there are multiple factors concurrently affecting the mother or fetus which would lead an Ob-Gyn to either schedule or perform a C-section.

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D.2. Physician Data

This section provides more details on the data sets used to identify physician practice information and explains how I identify when a medical practice was acquired by a PPMC and whether and when a physician was part of an acquired practice.

Physician Practice Data Sets and Sample Selection. The primary data source used to identify physician practice information over time is the SK&A Physician Survey (which has since rebranded to OneKey by IQVIA). The SK&A includes information on location, specialty, and medical practice group of office-based physicians in the United States. SK&A has a research center that verifies physician information through telephone surveys every six months, but information is also gathered through physician websites, state licensing information, mergers and acquisitions data, professional associations, and government agencies. I use the following process to merge SK&A with inpatient data and other data sets:

- First, I use the Florida inpatient data to identify the National Provider Identification (NPI) number and Medical License Number of the delivering provider for each birth, which are needed to link with the other data sets.
- Second, I merge the inpatient data with publicly available Florida Licensure data to collect additional information including a physician's age and education. This data is available at the following website: https://appsmqa.doh.state.fl.us/downloadnet/Profile.aspx.
- Third, I merge the inpatient sample to Medicare Physician Compare Data from 2014 available from https://data.medicare.gov/data/physician-compare. This is the earliest year available for my sample period. The Physician Compare data contains each physician's practice name and address as well as the name of the group practice that the physician belonged to in 2014. Importantly, this data set identifies the PPMC as the group practice instead of the name of the subsidiary group, allowing for checks on membership to the PPMC. Note that not all Ob-Gyns are in this Medicare file.
- Fourth, I merge the physician data (Florida inpatient, Florida licensure and Physician Compare data) to SK&A. 145 physicians never matched to the SK&A data or matched to too few years of data to properly clean or analyze their practice information. These physicians are still included in the group of non-PPMC physicians, but in analyses using practice location data, they are not included since I can not verify their practice location.
- Fifth, I limit the sample to MDs and DOs that deliver at least 100 babies between 2006 and 2014, totaling 1,693 unique physicians delivering 1,770,722 babies (this number also excludes births from patients that are under age 13 and over age 55, and births from patients residing outside the US or that have no documented residence).

Acquisition Date. When a practice is acquired by a PPMC, they must file with the Division of Corporations in Florida. Using Florida's "SunBiz" Corporation Look-up tool (https://dos.myflorida.com/sunbiz/search/), I am able to search for the name of each PPMC, MSO, or subsidiary group practice to find the date of practice registration to become part of the PPMC. The PPMCs often use different names and acronyms than their actual company names. Therefore, I also search the address and name of each practice ever listed on a PPMC website using the Wayback Machine. Through the corporate registry, I hand-collect information on the practice name, the address of the practice (and any change to either over time), the date of filing, and the effective date of filing. I use the effective date as the acquisition date when available, and if not, I use the date of filing. The effective date is used to identify early filers – a practice could have filed a year before acquisition, but did not effectively join until one year. In contrast, a practice could file and join at the same time. To account for potential lags in the time of acquisition, the empirical analysis includes the year of join as a control variable.

PPMC Physicians. To identify PPMC physicians I create a data set that includes every iteration of a practice name or address corresponding to the acquired practice in the corporate registry. I use PPMC websites to identify all addresses associated with a practice and search for all versions of these addresses in the matched physician data file. I then assign all physician's reporting those addresses the single practice name provided in the corporate registry. At the end of this process, all physicians who ever listed their address as the one associated with a PPMC practice address would be linked to that practice. To account for potential bad matches, I use PPMC and physician websites to verify that every single physician was part of that practice at a given point in time.

If SK&A practice information is missing or incorrect there would not be match, resulting in under-counting the number of PPMC physicians. To check for missed matches, I search SK&A for the name of each PPMC in the "group practice" field. That is, SK&A provides the name of the group practice each physician belongs to. However, this reporting was inconsistent and sometimes inaccurate, which is why it was not my primary mode of identifying PPMC membership. Additionally, for physicians who were in Medicare's Physician Compare, I am able to identify the name of the PPMC they were part of in 2014. For all physicians who matched with these searches, I manually cleaned the name of their practice and address for years in which the data was missing or incorrect in SK&A. I also used information from physician and PPMC websites to both clean the data and identify further physicians that may have missing information in SK&A. In total, I was unable to identify the location in all years of data for three physicians who joined PPMC 1, and five who joined PPMC 3 for a given year. For example, I identified a physician's practice name and location from 2009-2014, but was unable to find their practice location in 2006-2008,

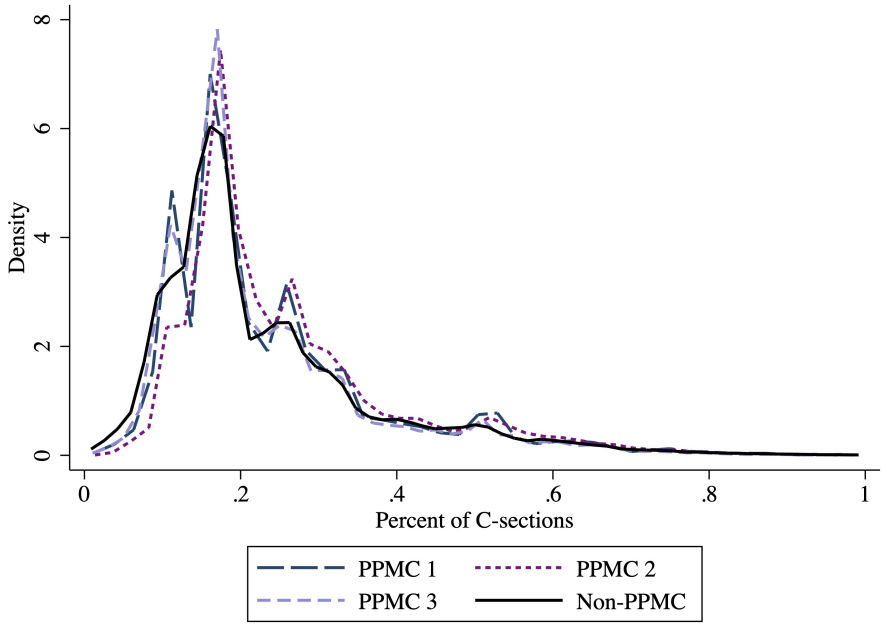
even though they were delivering babies in Florida. For these physicians, I assign a random unique practice name for the unidentified years.

I homogenize practice names and addresses in SK&A to accurately group physicians (both PPMC and non-PPMC physicians) into a single practice. In the case of a practice reporting multiple office locations, I use the address of the practice with the greatest number of physicians listing that address in SK&A. However, in the patient exposure analysis, I consider a patient's distance from a physician's reported office location in SK&A. For example, there may be a single practice with 3 different locations, and some physicians work predominantly at one address and others at a different address despite being in the same practice.

Appendix E: Additional Descriptive Statistics

This appendix provides additional summary statistics of the data and sample. Figure E.1 shows the risk-adjusted C-section distribution between PPMC and non-PPMC physicians before the acquisition, Figure E.2 provides maps of the growth of PPMCs, Table E.1 provides information on physician and practice characteristics between PPMC and non-PPMC physicians, Table E.2 provides unadjusted mean values for patient risk factors for the sample of low-risk births, and Table E.3 provides summary statistics for the sample of all births.

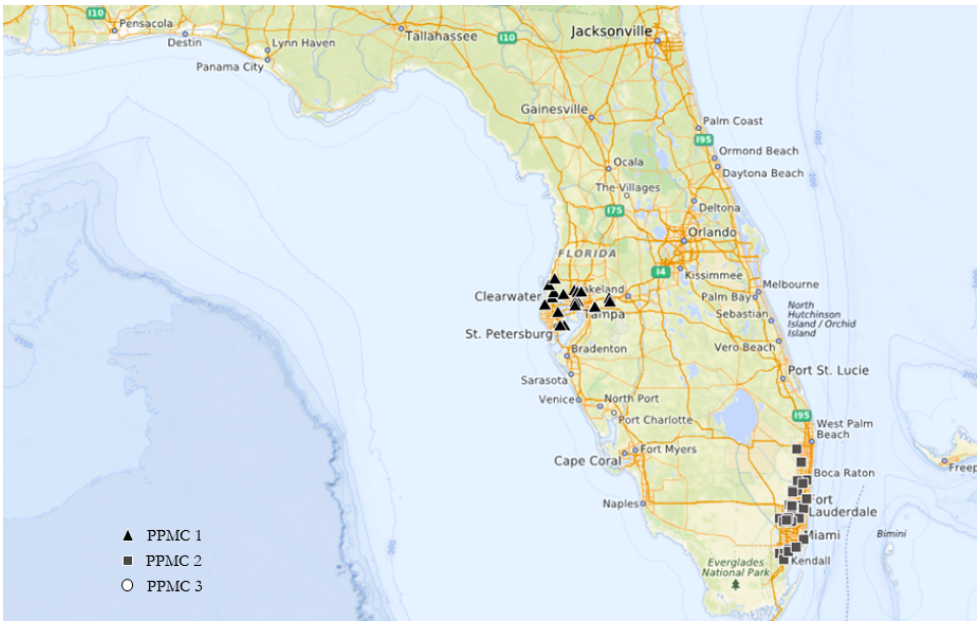
Figure E.1 Distribution of the Risk-Adjusted Pre-Acquisition C-section Rate by PPMC Compared to Non-PPMC Physicians, Low-Risk Births



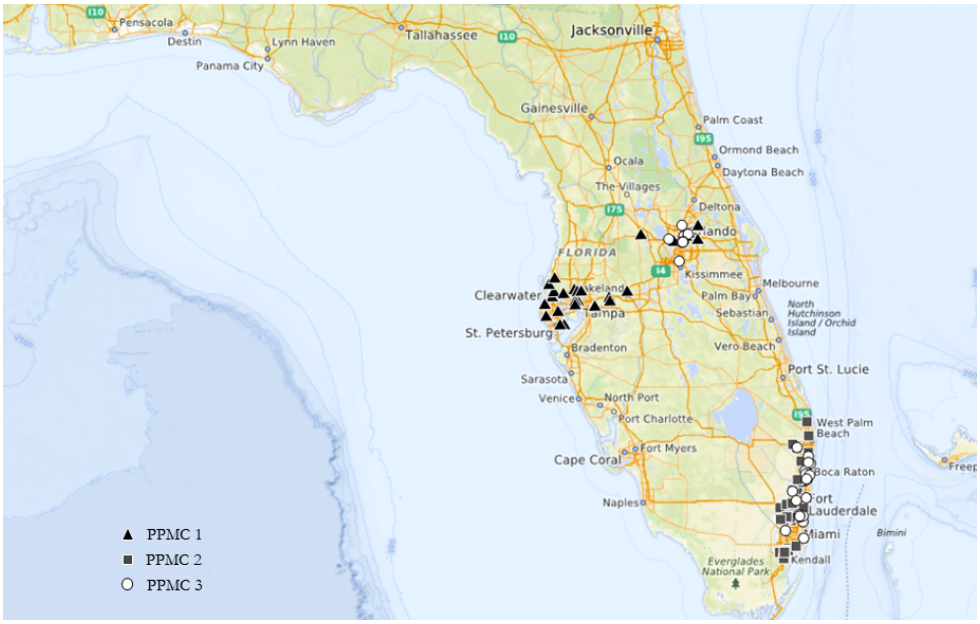
Note: The histogram shows the distribution of the low-risk C-section rate per physician-year in the pre-acquisition period for each PPMC compared to the C-section distribution for Ob-Gyns who never joined a PPMC (the non-PPMC sample). The risk-adjusted mean C-section rates are as follows: 24.25% for PPMC 1, 25.94% for PPMC 2, 22.93% for PPMC 3, and 22.27% for non-PPMC physicians. The regression includes patient controls and year fixed effects, with robust standard errors clustered at the practice-level.

Figure E.2 PPMC Growth from 2006-2014, Selected Years

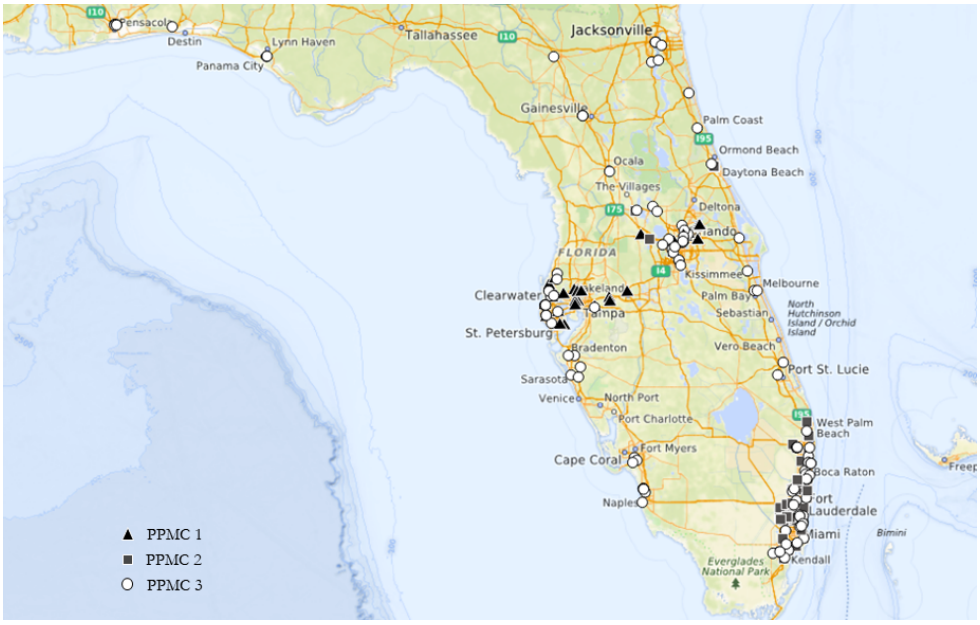
(a) Year - 2007



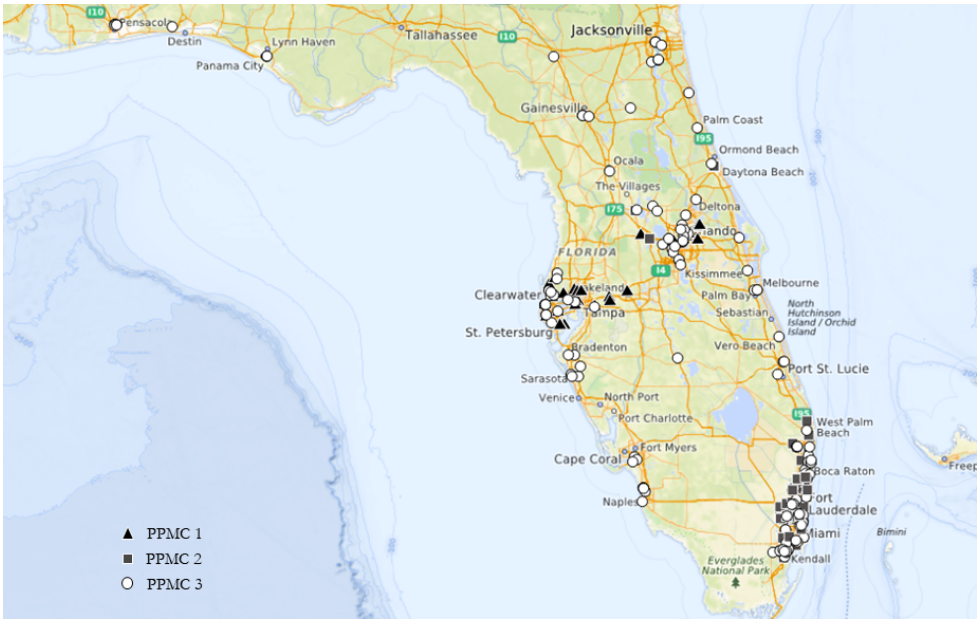
(b) Year - 2009



(c) Year - 2011



(d) Year - 2013



Note: Each point represents a single practice location. Many physicians offices are in the same building or adjacent buildings, resulting in points overlapping though they are in distinct offices. This map uses the data on all practices that were part of a PPMC for the indicated years.

Table E.1 Practice Characteristics, All Births

	Non-PPMC	PPMC 1			PPMC 2			PPMC 3		
		Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff
Practice Size	2.62[a]	4.93	4.73	-0.20	2.10	2.32	0.22	1.81	1.87	0.06
Physician Age	47.98	42.9	45.72	2.82***	41.79	45.36	3.57***	47.11	50.23	3.12***
Physician Sex (% Male)	0.64	0.43	0.40	-0.03	0.64	0.61	-0.03	0.69	0.66	-0.03
Hospital Affiliations	1.13	1.00	1.01	0.01	1.34	1.35	0.01	1.17	1.16	-0.01
Total Births	1,125,394	15,398	26,518		33,253	67,390		147,334	114,138	

Notes: Unadjusted mean values are shown before and after acquisition by a PPMC for the full birth sample. Practice size is calculated for full Ob-Gyn sample to account for those always in the PPMC and those who switch later in the sample. Only physicians who perform at least 100 births between 2006 and 2014 are included in the sample. Significance levels: *p<0.1, **p< .05, ***p< 0.01.
[a] Practice size excludes information on 145 Ob-Gyns who did not match to the SK&A data.

Table E.2 Patient Risk Factors by PPMC, Low-Risk Births

	PPMC 1		PPMC 2		PPMC 3		Non-PPMC
	Pre	Post	Pre	Post	Pre	Post	
Advanced maternal age	17.41	17.11	18.10	19.98	12.69	14.01	11.42
Anemia	4.44	6.69	9.15	8.52	8.27	10.17	9.74
Antepartum fetal distress	0.77	1.55	0.34	0.47	0.40	0.50	0.66
Asthma	3.15	3.86	2.38	1.95	2.33	2.19	3.16
Blood disorders	1.70	2.52	1.59	2.26	1.58	2.36	2.12
Diabetes	6.35	5.99	5.37	5.07	5.01	5.87	6.08
Fetal size issue	7.45	6.88	7.39	7.57	6.02	6.98	6.02
Heart disease	1.95	0.99	1.62	0.83	1.00	0.50	0.79
Hypertension	8.31	9.44	8.09	7.66	7.96	9.10	9.57
Infectious and parasitic conditions	3.53	4.37	2.91	3.62	3.17	3.64	3.64
Isoimmunization	3.48	3.54	2.84	3.16	2.12	2.59	2.09
Known fetal abnormality	1.43	1.81	1.05	1.37	0.86	1.40	1.76
Maternal physical abnormality	6.60	7.14	5.20	6.18	4.17	4.81	4.61
Nutritional deficiency	6.35	8.85	2.30	1.76	4.34	4.52	5.92
Obesity	1.23	2.81	1.82	2.25	1.77	3.27	2.84
Other conditions/risks	1.29	1.54	1.22	1.28	1.49	1.54	2.01
Poly- & Oligo- hydramnios	2.39	3.16	4.82	4.46	3.34	3.72	3.73
Previous pregnancy	40.54	34.83	32.41	41.05	36.66	38.21	31.29
Ruptured membrane	3.99	3.91	2.17	2.58	2.27	2.17	3.02
Substance abuse	5.21	6.95	4.21	3.26	6.96	7.05	8.19
Uterine size issue	0.20	0.35	0.54	0.64	0.27	0.36	0.31
Total births	11,041	19,206	22,923	47,853	108,561	82,182	796,859

Notes: Unadjusted mean values (%) are shown for the switcher subsample and non-PPMC physicians. The sample is restricted to Ob-Gyns performing 100 yearly deliveries between 2006 and 2014. See Appendix D for more information on risk factors.

Table E.3 Descriptive Statistics by PPMC, All Births

	PPMC 1		PPMC 2		PPMC 3		Non-PPMC
	Pre	Post	Pre	Post	Pre	Post	
Birth Type (%)							
All C-Sections	41.27	40.61	45.88	45.66	38.61	40.92	39.92
Planned	30.35	30.23	34.89	34.96	28.48	30.94	29.93
Unplanned	10.91	10.37	10.98	10.69	10.12	9.98	10.00
Birth Volume							
Yearly Births per Ob-Gyn	138.72	118.38	139.72	112.88	189.86	151.58	164.00
Total births	15,398	26,518	33,253	67,390	147,334	114,138	1,125,394
Patient Demographics							
Age*	29.34	29.55	29.43	30.20	27.58	28.38	27.12
Insurance (%)							
Private	77.39	75.35	62.02	65.59	48.40	45.87	32.21
Medicaid	14.35	17.38	27.41	23.69	39.98	38.98	48.75
Medicaid Managed	2.10	3.58	4.37	4.34	5.07	8.50	10.67
Self pay	3.63	1.86	3.62	3.80	3.19	2.43	4.39
Other insurance	2.53	1.83	2.58	2.59	3.36	4.21	3.99
Race (%)							
Black	12.40	11.86	17.09	14.63	15.78	15.82	25.31
Hispanic/Latina	11.04	10.29	31.19	33.60	19.18	25.83	22.63
White	68.71	69.76	42.90	43.48	56.98	51.58	44.50
Other race	7.85	8.10	8.82	8.28	8.06	6.78	7.57
Patient Risk Factors (%)							
Advanced maternal age	19.74	19.33	21.63	23.42	14.85	16.50	13.48
Anemia	5.75	7.69	10.30	9.25	9.02	10.96	10.81
Antepartum fetal distress	0.66	1.26	0.29	0.40	0.35	0.43	0.57
Asthma	3.13	3.96	2.57	2.08	2.40	2.26	3.35
Blood disorders	2.16	3.24	2.22	2.90	2.19	2.95	3.01
Diabetes	6.97	6.59	6.35	5.70	5.68	6.62	6.99
Fetal malposition	5.55	5.37	5.40	5.23	4.36	4.39	4.73
Fetal size issue	6.25	6.29	6.56	6.64	5.47	6.28	5.66
Heart disease	1.99	1.06	1.66	0.90	1.02	0.57	0.87
Hypertension	9.07	10.28	9.35	8.37	8.54	9.64	10.49
Infective and parasitic conditions	3.30	4.14	2.75	3.31	2.99	3.47	3.64
Isoimmunization	3.58	3.53	2.71	3.02	2.09	2.58	2.09
Known fetal abnormality	1.49	1.86	1.19	1.42	0.94	1.38	1.95
Maternal physical abnormality	7.16	7.97	7.11	7.98	5.36	6.02	6.14
Multiple gestation	1.92	2.09	2.25	2.19	1.52	1.69	1.78
Nutritional deficiency	5.72	7.50	2.33	1.56	4.02	4.01	5.65
Obesity	1.36	3.33	2.30	2.70	2.10	3.77	3.51
Other conditions/risks	1.56	1.63	1.58	1.37	1.62	1.59	1.27
Poly- & Oligo- hydramnios	2.59	3.34	4.84	4.61	3.60	3.82	3.95
Preterm labor	7.69	6.98	8.50	6.29	6.79	5.66	8.02
Previous C-section	17.11	17.15	20.04	19.66	17.02	19.59	18.85
Previous pregnancy	32.98	28.39	25.46	32.37	29.73	30.03	24.92
Ruptured membrane	4.71	4.94	3.28	3.44	3.03	2.96	4.00
Substance abuse	5.70	7.67	4.41	3.47	7.07	7.24	8.78
Uterine size issue	0.23	0.50	0.65	0.81	0.27	0.45	0.43

Notes: Unadjusted mean values are shown for the switcher subsample and for non-PPMC physicians. The sample is restricted to Ob-Gyns performing 100 yearly deliveries between 2006 and 2014. *Regressions only include "Advanced Maternal Age" (a mother 35 years or older) as a control. See Appendix D for more information on risk factors.

Appendix F: Robustness Checks for Patient and Physician Selection

This appendix provides additional sensitivity analyses and tests to the primary difference-in-differences analysis as presented in Equation 1 and the patient exposure analysis as presented in Equation 2. Table F.1 shows results for different samples and control variables that help mitigate patient selection concerns, Table F.2 shows the results of the patient exposure analysis using the address of the hospital that the physician delivered the most babies in a given year rather than the physician's practice location, Table F.3 shows robustness to the inclusion of a non-PPMC control group, Table F.4 shows robustness of the use of different sample periods and Figures F.1-F.3 provide the event study graphs with alternative sample criteria following the recommendations suggested in Borusyak and Jaravel 2016.

Table F.1 Role of Patient Selection: Robustness

	Low-Risk Births						All Births
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
β^{PPMC1}	-0.039**	-0.054***	-0.057***	-0.057***	-0.054***	-0.056***	-0.039**
	(0.017)	(0.020)	(0.017)	(0.017)	(0.016)	(0.017)	(0.016)
β^{PPMC2}	0.021	0.027*	0.029**	0.032**	0.030**	0.029**	0.023**
	(0.016)	(0.014)	(0.013)	(0.013)	(0.013)	(0.013)	(0.011)
β^{PPMC3}	0.022**	0.024**	0.026***	0.029***	0.025***	0.026***	0.022***
	(0.009)	(0.009)	(0.008)	(0.009)	(0.009)	(0.009)	(0.007)
Patient Controls							
Maternal Comorbidities		X					
Full Set			X	X	X	X	X
Post-Acquisition Interactions				X			
Fixed Effects							
Physician FE	X	X	X	X	X	X	X
Year x PPMC FE	X	X	X	X	X	X	X
Patient Zip FE					X		
Sample							
Florida						X	
All Births							X
Observations	291,766	291,766	291,766	291,766	290,845	290,275	404,031
R^2	0.050	0.110	0.172	0.172	0.177	0.172	0.443

Notes: This table helps address concerns of patient selection by presenting robustness to different samples and control variables. Each cell presents the β^j obtained by estimating Equation 1 and an observation is a patient-year. The dependent variable is a C-section (1 for C-section, 0 otherwise) for low-risk births in columns 1-5, and all births in column 6. "Maternal Comorbidities" includes controls for patient insurance, race and pre-existing maternal conditions: advanced maternal age, anemia, asthma, physical abnormalities (ex. bone and joint disorders, thyroid abnormalities), obesity, diabetes, infectious and parasitic conditions, heart disease, previous pregnancy, and hypertension. "Full set" includes all patient controls listed in Appendix Table 2. Since Column 6 includes all births, additional patient controls are included as listed in Appendix Table E.3. "Post-Acquisition Interactions" includes selected patient risk factors (obesity, anemia, nutritional deficiency and infectious and parasitic conditions) interacted with the post-PPMC indicators for each PPMC. "Florida Only" refers to a birth delivered by a patient whose zip code of residence is in the state of Florida (patients may deliver in Florida who provide a zip code of a different state, most commonly in neighboring states Georgia and Alabama). Standard errors are clustered at the practice level. Significance levels: *p<0.1, **p< .05, ***p< 0.01

Table F.2 Role of Patient Exposure to a PPMC on C-sections: Hospital Location, Low-Risk Births

	(1) 10mi radius	(2) 15mi radius	(3) 10mi if urban, 20mi otherwise	(4) Sample-based cutoffs
δ^{PPMC1}	-0.023***	-0.037***	-0.022***	-0.040***
	(0.008)	(0.009)	(0.007)	(0.008)
δ^{PPMC2}	0.026***	0.043***	0.026***	0.026***
	(0.007)	(0.010)	(0.007)	(0.009)
δ^{PPMC3}	0.011*	0.011*	0.012**	0.011*
	(0.006)	(0.006)	(0.005)	(0.005)
Observations	1,052,833	1,145,729	1,100,299	1,188,758
R^2	0.166	0.165	0.166	0.164

Notes: The dependent variable is a C-section (1 for C-section, 0 otherwise). Each cell presents the δ obtained from Equation 2 and an observation is a patient-year. A physician's location is the address of the hospital where the physician delivered the most babies in a year. All regressions adjust for patient controls, and include physician and year fixed effects. Standard errors are clustered at the patient zip code level. Significance levels: *p<0.1, **p< .05, ***p< 0.01

Table F.3 Comparison to Non-PPMC: Matched Sample, Low-Risk Births

	(1)	(2)	(3)	(4)
β^{PPMC1}	-0.056***	-0.023***	-0.034***	-0.025***
	(0.017)	(0.008)	(0.010)	(0.008)
β^{PPMC2}	0.022*	0.015*	0.017	0.019**
	(0.013)	(0.008)	(0.011)	(0.009)
β^{PPMC3}	0.026***	0.021***	0.022***	0.011**
	(0.008)	(0.005)	(0.006)	(0.005)
Patient Controls	X	X	X	X
Physician FE	X	X	X	X
Year x PPMC FE	X			
Year x Hospital FE		X		
Year x Patient Zip FE			X	
Year FE				X
Observations	698,452	698,445	694,958	698,452
R^2	0.167	0.173	0.170	0.167

Notes: This table presents robustness to the inclusion of a non-PPMC control group. Each cell presents the β^j obtained by estimating Equation 1 and an observation is a patient-year. The dependent variable is a C-section (1 for C-section, 0 otherwise). The pre-acquisition unadjusted C-section rate is 25.5% in PPMC 1, 28.2% in PPMC 2, 22.8% in PPMC 3 and 25.6% for the matched sample. The matched sample matches each PPMC physician (in the switcher subsample) to three non-PPMC physicians based on patient panel risk factors in the year prior to acquisition. The observations for the matched sample refers to those receiving nonzero weights. The same non-PPMC physicians are allowed to match to multiple PPMC physicians. Standard errors are clustered at the practice level. In total, there were 756 Ob-Gyns in the matched sample and 337 Ob-Gyns in the PPMC sample. Significance levels: *p<0.1, **p< .05, ***p< 0.01.

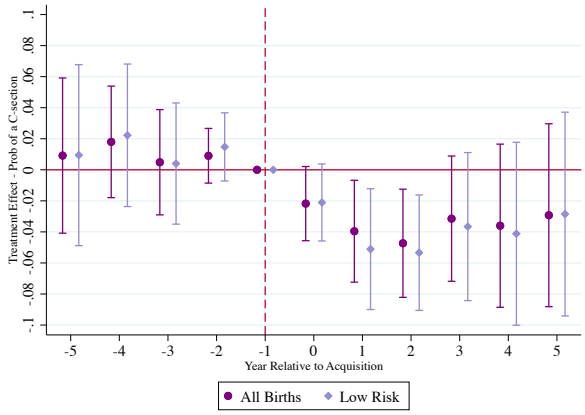
Table F.4 Robustness to Sample Time Period, Low-Risk Births

	(1)	(2)	(3)	(4)	(5)	(6)
Years =	2006-2009	2006-2010	2006-2011	2006-2012	2006-2013	2006-2014
β^{PPMC1}	-0.042**	-0.046***	-0.042**	-0.046***	-0.055***	-0.057***
	(0.019)	(0.015)	(0.017)	(0.016)	(0.016)	(0.017)
β^{PPMC2}	0.039**	0.033*	0.030**	0.031**	0.022*	0.029**
	(0.020)	(0.018)	(0.014)	(0.013)	(0.011)	(0.013)
β^{PPMC3}	–	0.031**	0.040***	0.034***	0.030***	0.026***
	–	(0.015)	(0.011)	(0.009)	(0.009)	(0.008)
Observations	136,081	168,933	201,386	232,204	262,013	291,766
R^2	0.172	0.173	0.172	0.172	0.173	0.172

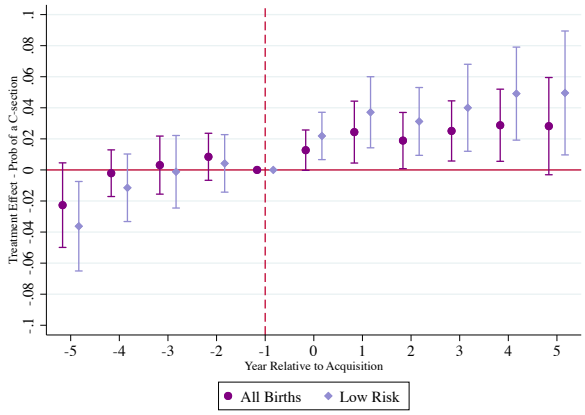
Notes: This table presents robustness to exclusion of years of data. Each cell presents the β^j obtained by estimating Equation 1 and an observation is a patient-year. The dependent variable is a C-section (1 for C-section, 0 otherwise). PPMC 3 did not start acquiring practices until 2009, so Column 1 does not estimate results for PPMC 3. The pre-acquisition unadjusted C-section rate is 25.5% in PPMC 1, 28.2% in PPMC 2, and 22.8% in PPMC 3. All regressions adjust for patient controls, and physician and year × PPMC fixed effects. Standard errors are clustered at the practice level. Significance levels: *p<0.1, **p< .05, ***p< 0.01.

Figure F.1 Event Study Results with Balanced Panel

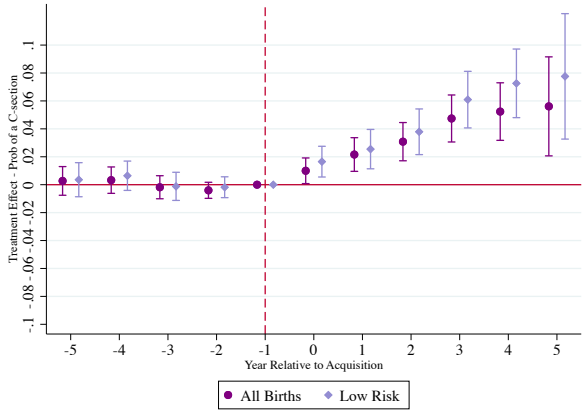
(a) PPMC 1



(b) PPMC 2



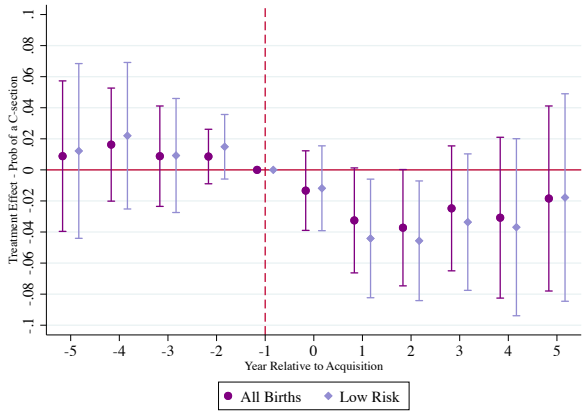
(c) PPMC 3



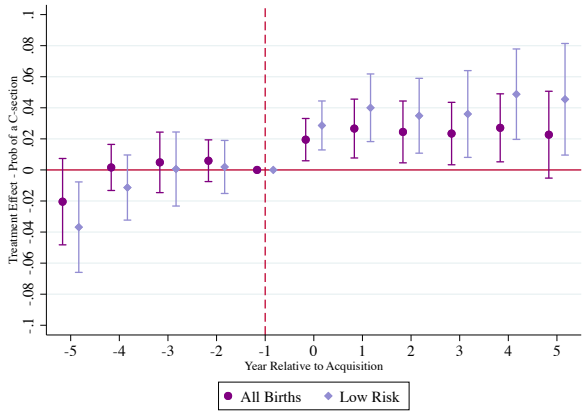
Note: The dependent variable is a C-section (1 for C-section, 0 otherwise). The balanced sample only includes physicians observed in each year of the sample period (2006 to 2014). Bands indicate 95% confidence intervals constructed from practice level clustered standard errors. Regressions adjust for patient controls, and physician and year × PPMC fixed effects. Base period of t = -1 normalized to zero.

Figure F.2 Event Study Results including Non-PPMC Control Group

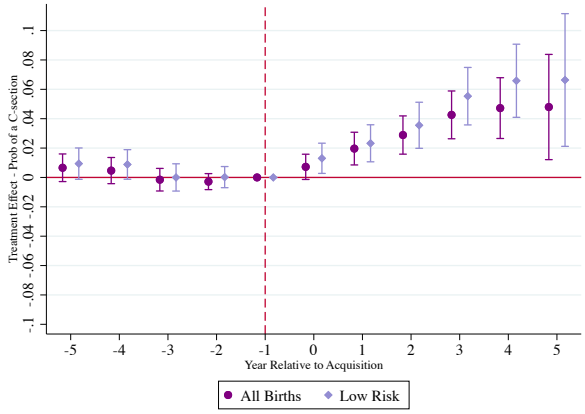
(a) PPMC 1



(b) PPMC 2



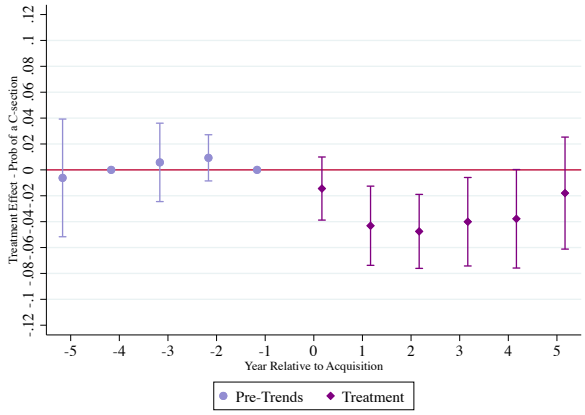
(c) PPMC 3



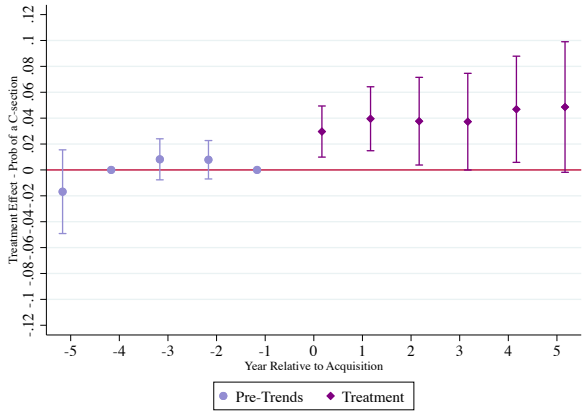
Note: The dependent variable is a C-section (1 for C-section, 0 otherwise). The switcher subsample of physicians is pooled with physicians who never join a PPMC during the sample period. Bands indicate 95% confidence intervals constructed from practice level clustered standard errors. Regressions adjust for patient controls, and physician and year × PPMC fixed effects. Base period of t = -1 normalized to zero.

Figure F.3 Event Study Results with Restricted Pre-Trends, Low-Risk Births

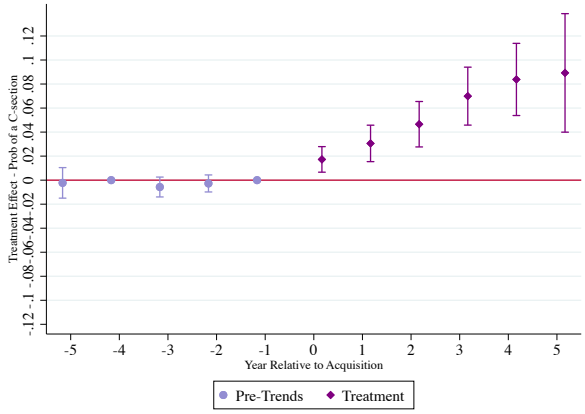
(a) PPMC 1



(b) PPMC 2



(c) PPMC 3



Note: The dependent variable is a C-section (1 for C-section, 0 otherwise). The pre-trend regression sets t = -1 and t= -4 equal to zero. The post-acquisition regression sets all pre-trend years equal to zero. In each model, the joint F-test suggests the pre-trends are not statistically different from zero. Bands indicate 95% confidence intervals constructed from practice level clustered standard errors. Regressions adjust for patient controls, and physician and year × PPMC fixed effects.

Appendix G: Market Concentration Robustness and Additional Analyses

This appendix examines the robustness of the patient exposure analysis to the inclusion of controls for market concentration and examines whether there was heterogeneity in the effect of PPMCs on C-sections in markets that became more concentrated as a result of acquisition.

G.1. Patient Exposure Analysis

Table 4 shows that a patient's probability of a C-section changes as the share of PPMC physicians they are are exposed to increases. A potential concern is that patients are also being exposed to broad changes in market structure, such as provider consolidation or entry and exit, that could influence their probability of a C-section. To account for this possibility, I calculate the Herfindahl-Hirschman Index (HHI) using the share of total births by year for each parent organization (the owner of the practice) for the same patient radii specified in Table 4. The HHI is a commonly accepted measure of market concentration that "approaches zero when a market is occupied by a large number of firms of relatively equal size and reaches its maximum of 10,000 points when a market is controlled by a single firm" (See https://www.justice.gov/atr/herfindahl-hirschman-index). For the 15-mile radius around a patient zip code centroid, the mean HHI in the sample is 2648 and the standard deviation is 1996 for the first year in a market, and 5130 and 2131 for the last year.

I provide two robustness checks to account for changes in HHI. First, I include controls for terciles of initial HHI (based on the HHI in the first year in the market) interacted with terciles of the change in HHI between year t and $t-1$ (Table G.1). Second, I include controls for whether markets became moderately concentrated by interacting an indicator for whether HHI was greater than 1500 in year t with an indicator for whether HHI increased by more than 100 points between year t and $t-1$ (Table G.2). These thresholds are typically used for reviews of specific mergers, but in this setting, capture whether patients were exposed to more concentrated markets. Note that for these controls the change in HHI is based on the previous year, therefore, the first year of data is not included in the estimation. As seen in Table G.1 and Table G.2, the results are quantitatively similar to Table 4 (patient exposure results without market controls) after including controls for changes in HHI.

Table G.1 Role of Patient Exposure to a PPMC on C-sections: Adjusting for Initial HHI and Changes in HHI, Low-Risk Births

	(1) 10mi radius	(2) 15mi radius	(3) 10mi if urban, 20mi otherwise	(4) Sample-based cutoffs
δ^{PPMC1}	-0.0234***	-0.0279***	-0.0220***	-0.0240***
	(0.0060)	(0.0076)	(0.0060)	(0.0085)
δ^{PPMC2}	0.0256***	0.0339***	0.0251***	0.0209**
	(0.0077)	(0.0096)	(0.0075)	(0.0084)
δ^{PPMC3}	0.0050	0.0193***	0.0082*	0.0128**
	(0.0049)	(0.0063)	(0.0048)	(0.0055)
1(Initial HHI=Med)	-0.0046*	0.0007	-0.0038	-0.0001
	(0.0026)	(0.0028)	(0.0026)	(0.0028)
1(ΔHHI=Med)	0.0011	-0.0015	0.0015	-0.0032
	(0.0023)	(0.0023)	(0.0023)	(0.0020)
1(Initial HHI=High)	-0.0055**	-0.0026	-0.0049**	-0.0021
	(0.0024)	(0.0026)	(0.0024)	(0.0029)
1(ΔHHI=High)	0.0004	-0.0018	0.0004	-0.0012
	(0.0022)	(0.0023)	(0.0021)	(0.0021)
1(Initial HHI=Med)*1(ΔHHI=Med)	-0.0001	0.0033	-0.0001	0.0063**
	(0.0030)	(0.0030)	(0.0030)	(0.0028)
1(Initial HHI=High)*1(ΔHHI=Med)	-0.0024	0.0017	-0.0014	0.0016
	(0.0030)	(0.0031)	(0.0029)	(0.0029)
1(Initial HHI=Med)*1(ΔHHI=High)	0.0025	0.0034	0.0024	0.0056**
	(0.0029)	(0.0030)	(0.0029)	(0.0028)
1(Initial HHI=High)*1(ΔHHI=High)	-0.0035	0.0016	-0.0034	0.0007
	(0.0029)	(0.0030)	(0.0028)	(0.0028)
Observations	959,647	1,018,810	1,001,044	1,043,227
R^2	0.167	0.166	0.167	0.166

Notes: The dependent variable is a C-section (1 for C-section, 0 otherwise). The δ represent the share of PPMC providers as specified in Equation 2 and an observation is a patient-year. The additional variables are as follows: **1**(Initial HHI=Med) is an indicator for whether HHI in the first year in a market was in the second tercile and **1**(Initial HHI=High) for the third tercile; **1**(Δ HHI=Med) is an indicator for whether the change in HHI from the previous year is in the second tercile and **1**(Δ HHI=High) for the third tercile. HHI is calculated for the patient radius indicated in each column. All regressions adjust for patient controls, and include physician and year fixed effects. Standard errors are clustered at the patient zip code level. Significance levels: *p<0.1, **p< .05, ***p< 0.01

Table G.2 Role of Patient Exposure to a PPMC on C-sections: Adjusting for Increases in HHI, Low-Risk Births

	(1) 10mi radius	(2) 15mi radius	(3) 10mi if urban, 20mi otherwise	(4) Sample-based cutoffs
δ^{PPMC1}	-0.0223***	-0.0265***	-0.0211***	-0.0247***
	(0.0060)	(0.0077)	(0.0060)	(0.0085)
δ^{PPMC2}	0.0222***	0.0363***	0.0225***	0.0178**
	(0.0078)	(0.0093)	(0.0076)	(0.0084)
δ^{PPMC3}	0.0069	0.0200***	0.0099**	0.0125**
	(0.0050)	(0.0063)	(0.0048)	(0.0056)
$\mathbf{1}$(HHI>1500)	-0.0159***	-0.0034	-0.0127***	-0.0029
	(0.0039)	(0.0027)	(0.0037)	(0.0033)
$\mathbf{1}(\Delta$HHI>100)	-0.0126**	0.0010	-0.0085	0.0014
	(0.0053)	(0.0033)	(0.0052)	(0.0039)
$\mathbf{1}$(HHI>1500)*$\mathbf{1}(\Delta$HHI>100)	0.0132**	-0.0012	0.0092*	-0.0009
	(0.0053)	(0.0035)	(0.0052)	(0.0040)
Observations	959,647	1,018,810	1,001,044	1,043,227
R^2	0.167	0.166	0.167	0.166

Notes: The dependent variable is a C-section (1 for C-section, 0 otherwise). The δ represent the share of PPMC providers as specified in Equation 2 and an observation is a patient-year. The additional variables are as follows: $\mathbf{1}$(HHI>1500) is an indicator for whether HHI in year t is over 1500 points and $\mathbf{1}(\Delta$HHI>100) is an indicator for whether HHI increased by over 100 points relative to the previous year. HHI is calculated for the patient radius indicated in each column. All regressions adjust for patient controls, and include physician and year fixed effects. Standard errors are clustered at the patient zip code level. Significance levels: *p<0.1, **p< .05, ***p< 0.01

G.2. Acquisition-Induced Changes in Market Concentration

This section uncovers whether there was heterogeneity in the effect of PPMCs on C-sections in markets that became more concentrated as a result of acquisition.

G.2.1. Do PPMCs Possess Market Power? Figure G.1 shows the share of PPMC births in the zip codes where the PPMCs operate. Because zip codes often represent very small regions in the urban areas where the PPMCs are located, I use 4-digit zip codes (there are 125 4-digit practice zip codes in the sample) to capture the contiguous geographies in which they operate. Based on this definition, PPMCs appear to have significant market share: by 2014, PPMC 1's share of births is 50%, PPMC 2's share is 35% and PPMC 3's share is 25%.

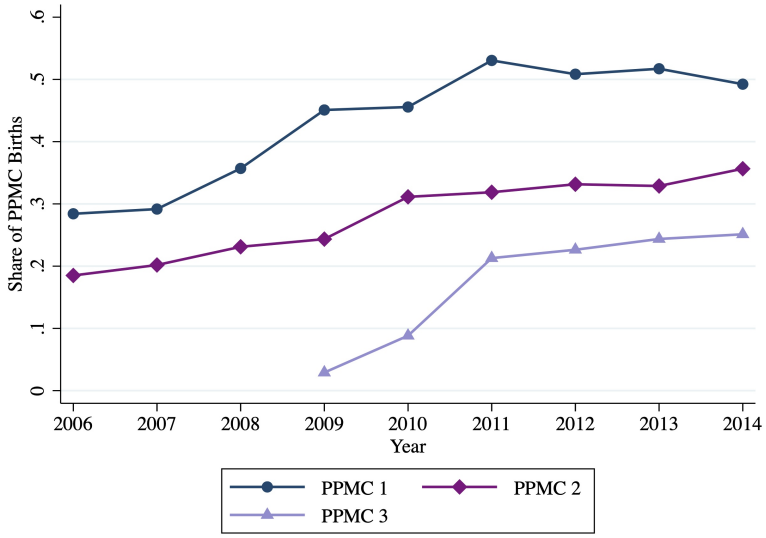
Next I examine how the acquisition of practices by PPMCs affects market concentration. Defining a market using a practice's 4-digit zip code, I locate market-years where an acquisition will occur in the following year. I calculate the Herfindahl-Hirschman Index (HHI) based on the share of total births by year for each parent organization (the owner of the practice) for each market. I

then calculate a counterfactual HHI based on each PPMC's pre-acquisition birth shares but post-acquisition ownership within a market. This counterfactual HHI represents the post-acquisition change in HHI only driven by PPMC practice acquisitions in that market. To account for multiple acquisitions by the same PPMC in the same market, I use pre-acquisition shares before any acquisition occurs in the market. This relies on the simplifying assumption that the effect of successive acquisitions is additively separable. For PPMC 1, 3 out of 9 market-years have multiple acquisitions, for PPMC 2, 9 out of 25 market-years have multiple acquisitions and for PPMC 3, 31 of out 79 market-years have multiple acquisitions.

Figure G.2 shows a scatterplot of pre- and post-acquisition HHI for each market-year where an acquisition occurs. Acquisitions that lead to potentially worrisome increases in HHI occur in 44% of market-years for PPMC 1, 64% for PPMC 2 and 39% for PPMC 3. Following 2010 U.S. Horizontal Merger Guidelines a potentially worrisome acquisition results in an HHI of greater than 1500 and an increase in HHI of more than 100 points. These types of acquisitions "potentially raise significant competitive concerns and often warrant scrutiny."

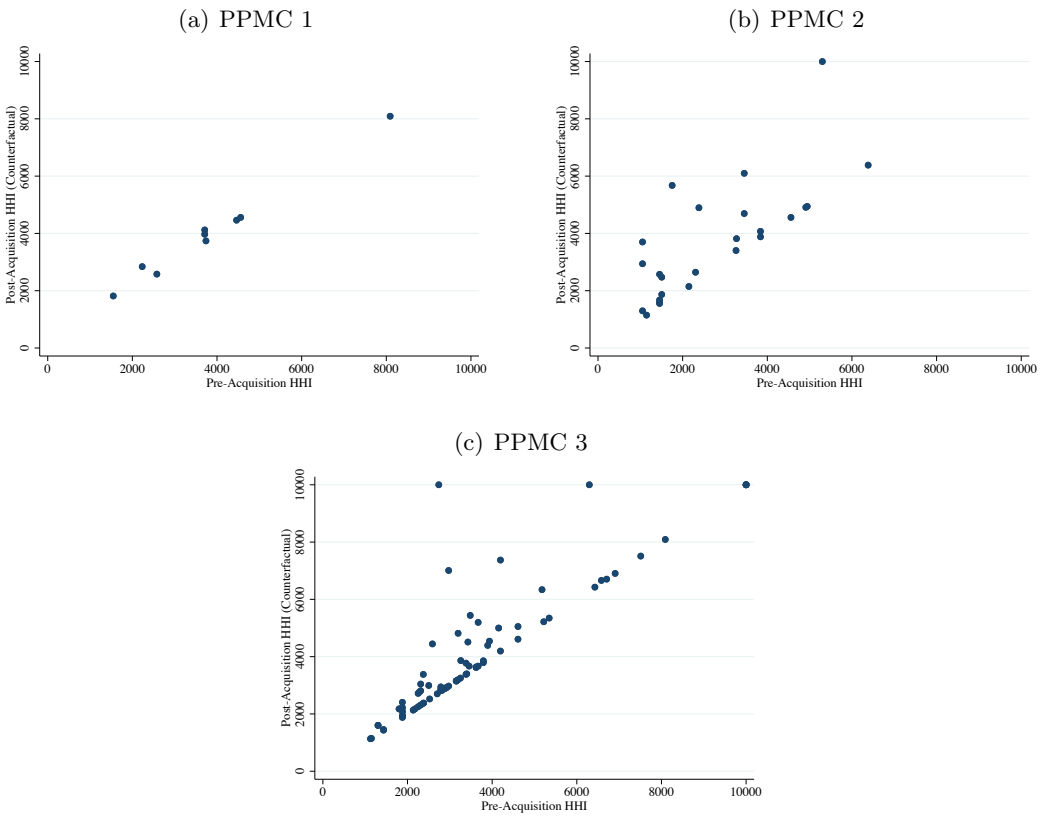
In addition to 4-digit zip codes, I also construct markets using the 4, 6 and 10-mile radius around each practice based on the coordinates of the office location. In this case, each physician's practice location denotes a separate market made up of offices within X-miles of that practice. Figures G.3-G.5 show the pre- and post-acquisition HHI for all market definitions. Additionally, Table G.3 shows the mean HHI and increase in HHI pre- and post-acquisition for all market definitions. This table confirms that the average market was already moderately concentrated before acquisition and that the average increases in HHI appear large enough to increase PPMC market power.

Figure G.1 PPMC Share of Births, All Births



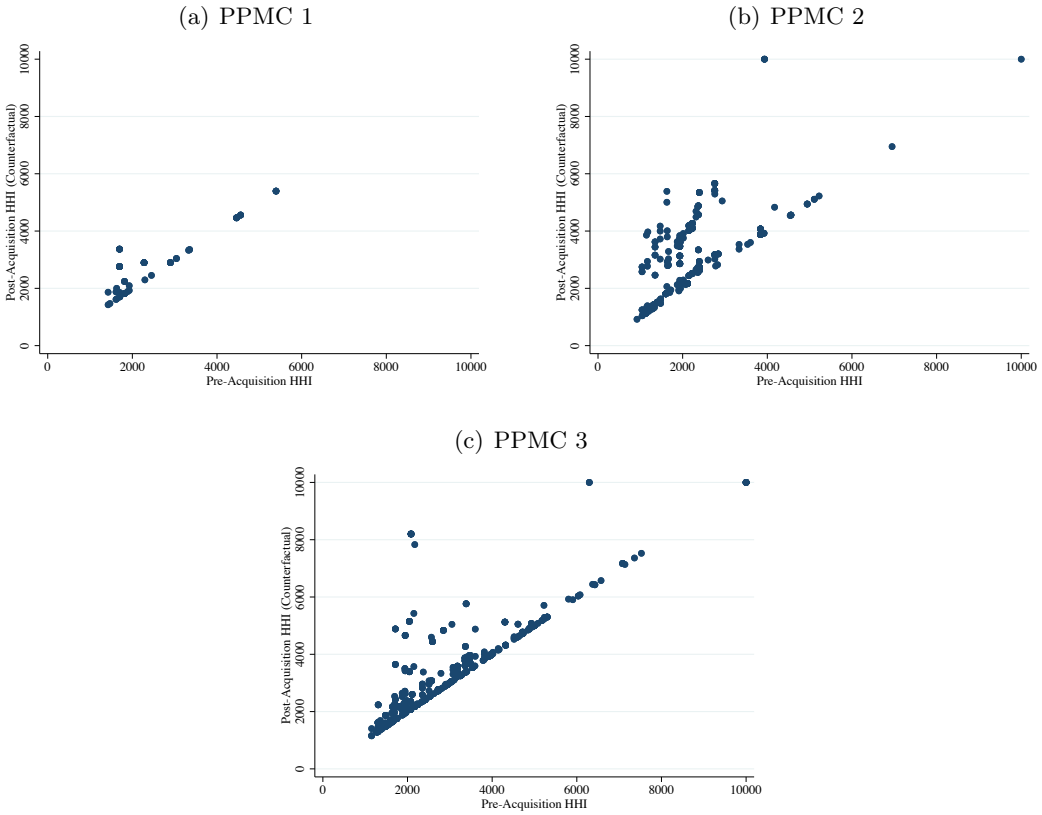
Note: The figure shows each PPMC's share of births in the 4-digit zip codes where the PPMCs operate between 2006 and 2014. Birth shares are calculated using all births and the full sample of physicians (1,692 physicians and 1,770,722 births).

Figure G.2 Changes in Concentration by PPMC, 4-digit Zip Code Markets



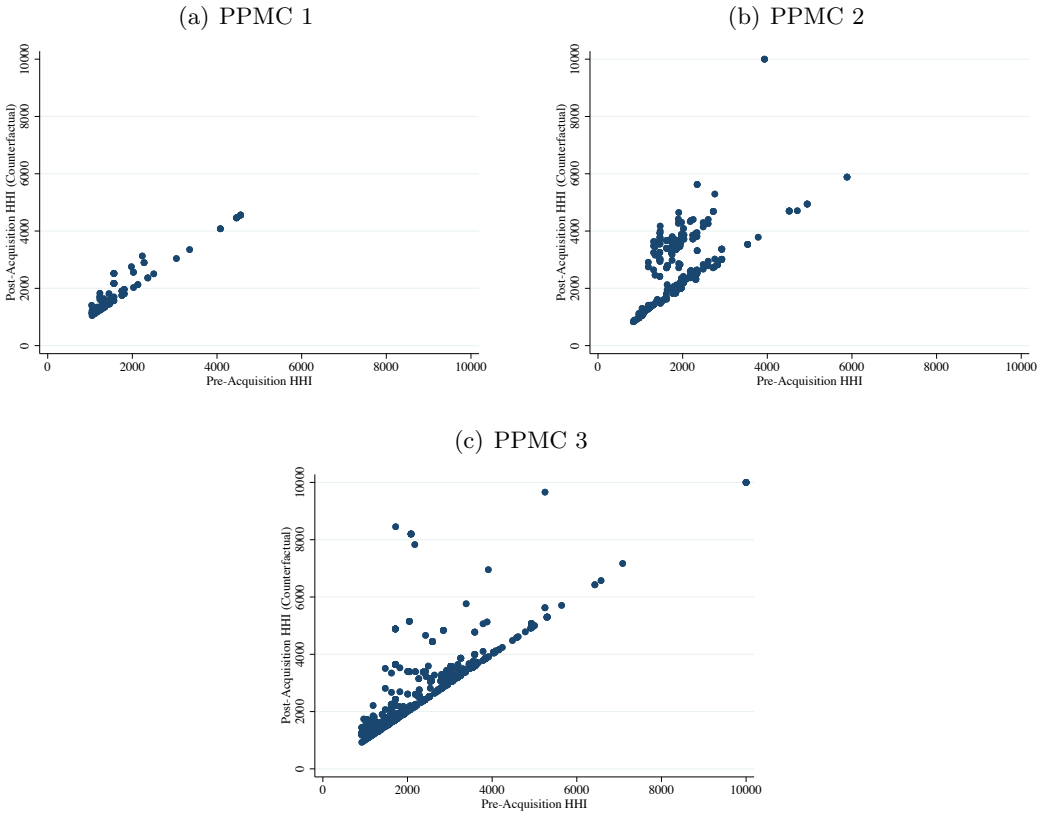
Note: The horizontal axis depicts the HHI before acquisition (baseline). The vertical axis depicts the acquisition-induced HHI using a PPMC's pre-acquisition birth shares but post-acquisition ownership (counterfactual). Each observation denotes a practice acquisition within a 4-digit zip code market-year.

Figure G.3 Changes in Concentration by PPMC, 4-Mile Radius Markets



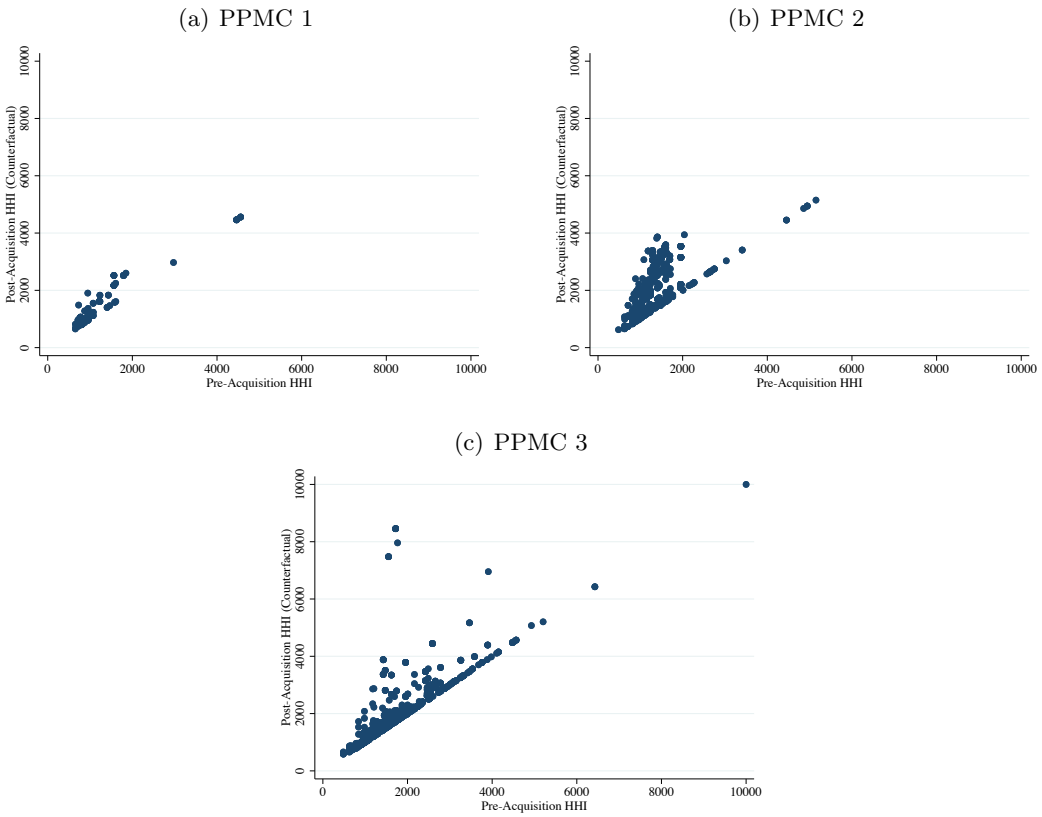
Note: The horizontal axis depicts the HHI before acquisition (baseline). The vertical axis depicts the acquisition-induced HHI using a PPMC's pre-acquisition birth shares but post-acquisition ownership (counterfactual). HHI is practice specific. Each physician's practice location denotes a separate market made up of practices within 4 miles of that practice.

Figure G.4 Changes in Concentration by PPMC, 6-Mile Radius Markets



Note: The horizontal axis depicts the HHI before acquisition (baseline). The vertical axis depicts the acquisition-induced HHI using a PPMC's pre-acquisition birth shares but post-acquisition ownership (counterfactual). HHI is practice specific. Each physician's practice location denotes a separate market made up of practices within 6 miles of that practice.

Figure G.5 Changes in Concentration by PPMC, 10-Mile Radius Markets



Note: The horizontal axis depicts the HHI before acquisition (baseline). The vertical axis depicts the acquisition-induced HHI using a PPMC's pre-acquisition birth shares but post-acquisition ownership (counterfactual). HHI is practice specific. Each physician's practice location denotes a separate market made up of practices within 10 miles of that practice.

Table G.3 Summary Statistics for Acquisition-Induced Changes in HHI

	4-digit Zip Code			4-Mile Radius			6- Mile Radius			10- Mile Radius		
	Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff
PPMC 1	3529	3784	255	2450	2833	383	1917	2136	218	1225	1438	213
PPMC 2	2054	2768	714	2433	3453	1020	1950	2783	833	1376	1938	562
PPMC 3	2824	3182	358	3144	3526	382	2497	2849	352	1715	2003	288

Notes: This table shows the mean values of pre-acquisition HHI (baseline) and post-acquisition HHI (counterfactual) for the market-years where an acquisition occurs. "Diff" represents the difference between the mean pre-acquisition and post-acquisition HHI. There are 12 total practice acquisitions for PPMC 1, 57 practice acquisitions for PPMC 2 and 104 practice acquisitions for PPMC 3. Note that a single practice can have multiple office locations in different areas.

G.2.2. Do Acquisitions That Increase HHI Have Similar Effects? This section conducts analyses to understand whether C-sections differed when an acquisition by a PPMC increased concentration. Using "ΔHHI" to denote the change in HHI, I make indicators for whether an acquisition leads to a change in HHI in the "green zone" (ΔHHI<100 points and post-acquisition HHI<1500), "yellow zone" (ΔHHI>100 points and post-acquisition HHI>1500) or "red zone" (ΔHHI>200 points and post-acquisition HHI>2500). Note that most "green zone" acquisitions lead to no change in HHI. These categories are constructed to be mutually exclusive and are based on 2010 U.S. Horizontal Merger Guidelines (see Nocke and Whinston 2021): acquisitions in the green zone are almost never scrutinized, acquisitions in the yellow zone often warrant scrutiny and acquisitions in the red zone are presumed to enhance market power and typically warrant scrutiny. Following Equation G.1, I interact these terms with the post-PPMC indicator and transition period indicator for each PPMC. This strategy decomposes the overall effect of PPMC acquisitions on C-sections between acquisitions that would or would not warrant scrutiny according to the aforementioned thresholds.

$$\begin{aligned} Csection_{ipy} = \sum_{j=1}^{3} [\alpha_g^j (D^t * HHIgreen_{pj}) + \alpha_y^j (D^t * HHIyellow_{pj}) + \alpha_r^j (D^t * HHIred_{pj}) \\ + \beta_g^j (D^{post} * HHIgreen_{pj}) + \beta_y^j (D^{post} * HHIyellow_{pj}) + \beta_r^j (D^{post} * HHIred_{pj})] \\ + \gamma \mathbf{X}_{iy} + \theta_p + \theta_{yj} + \epsilon_{ipy} \end{aligned} \tag{G.1}$$

For simplicity, D^t is equivalent to the indicator $\mathbf{1}\{y = t_{pj}\}$ for the year of transition and D^{post} is equivalent to the indicator $\mathbf{1}\{y > t_{pj}\}$ for the post-acquisition period from Equation 1. The terms $HHIgreen_{pj}$, $HHIyellow_{pj}$ and $HHIred_{pj}$ are dummy variables indicating if the acquisition of physician p's practice by PPMC j was in the green, yellow or red zone, respectively. For each physician, these indicators are equal to zero in all years before the physician was in a practice that was acquired. By interacting these indicators with the post-acquisition indicator (D^{post}), the β^j coefficients capture the effect of acquisition on C-sections depending on how the acquisition influenced market concentration.

The results of estimating Equation G.1 are presented in Table G.4. Focusing on 4-digit zip code markets, the interpretation of the coefficients is as follows: 1) for PPMC 1, acquisitions in the green, yellow and red zone decrease C-sections, by 6.3, 5.0 and 3.9 percentage points respectively; 2) for PPMC 2, acquisitions in the green, yellow and red zone increase C-sections, by 4.6, 3.7 and 2.4 percentage points, respectively; and 3) for PPMC 3, acquisitions in the green, yellow and red zone increase C-sections, by 4.0, 2.5 and 1.3 percentage points, respectively. For PPMC 1, the results suggest C-sections would have decreased even more if the effect was not dampened by the increase

in market power (i.e., the decrease in C-sections was less pronounced for acquisitions in the yellow and red zone). This is a fairly consistent finding across the different market definitions.

For PPMC 2, results vary by market definition. For example, based on 4-digit zip code markets, while all acquisitions lead to an increase in C-sections, the largest magnitude is for green zone acquisitions that are likely not leading to increases in market power. However, for markets defined as the 4 and 6-mile radius around a practice, acquisitions in the yellow and red zone have larger effects on C-sections. The point estimates on the green zone acquisitions are of similar magnitude to the primary difference-in-differences results (Table 3), but are not statistically significant. A potential reason is that in these markets, most acquisitions lead to increases in HHI outside the green zone (73% for 4-mile radius and 70% for 6-mile radius), meaning there are fewer green zone observations and, therefore, less precise estimates.

For PPMC 3, results suggest that acquisitions in both the green and yellow zone lead to similar increases in C-sections. Results for red zone acquisitions are positive but statistically insignificant, likely because there are not many acquisitions that qualify as red zone acquisitions. One reason effect sizes may be similar is that PPMC 3 was only established in 2009 and so had yet to amass market share and/or exercise their market power over much of this period. Therefore, the increase in C-sections observed after an acquisition by PPMC 3 may more readily capture the PPMC-specific rather than the market power driven effect of an acquisition.

These results suggest that PPMCs have similar effects on C-sections whether or not the acquisition led to an increase in HHI that would warrant scrutiny. While PPMCs do gain market power through their acquisitions, the changes in C-sections do not appear to be predominantly driven by this channel. These results do not preclude the higher payment channel since physicians may still change their behavior because of higher payment after acquisition not directly driven by increased market power. For example, PPMCs may be more skilled negotiators. Overall, the argument that changes in PPMC management influence C-sections after acquisition still appear to be consistent with observed results.

Robustness of Competition Results I also conduct two additional analyses for robustness. First, I make indicators for whether pre-acquisition HHI was above or below median, and indicators for whether the change in HHI was above or below median for each PPMC (Table G.5). Similar to Equation G.1, these terms are interacted with the post-PPMC and transition period indicators. I only run this regression using PPMC 2 and 3 because there is not enough variation to identify the effects for PPMC 1 (note that some terms also drop out or are imprecisely estimated for PPMC 2 and 3 because of insufficient observations). Table G.5 suggests that both PPMC 2 and 3 acquisitions with below median pre-acquisition HHI ($preHHIabove = 0$) and below median changes

in HHI ($\Delta above = 0$) positively influence C-sections, though effects vary in size and significance. Acquisitions that occur in markets that already had above median HHI but below median changes in HHI also positively influence C-sections as did acquisitions that occur in markets with below median HHI but above median changes in HHI. However, the estimates for acquisitions that occur in markets with both above median HHI and changes in HHI vary widely and are not statistically significant, likely because there are few acquisitions that meet this criteria.

Second, I interact the post-PPMC and transition period indicators with a continuous measure of the change in HHI after acquisition (Table G.6). The β^j capture the effect of acquisition on C-sections when Δ HHI=0, and the ϕ^j represent the coefficient on the interaction term. The results in Table G.6 suggest that acquisitions that lead to no change in HHI significantly decrease C-sections for PPMC 1 and significantly increase C-sections for PPMC 2 and 3. Point estimates are also quantitatively similar to the primary difference-in-differences results (Table 3).

Table G.4 Role of Market Concentration: PPMC Effects on C-sections by Screening Threshold Zones, Low-Risk Births

	(1) Practice 4-digit Zip Code	(2) Practice 4-mile Radius	(3) Practice 6-mile Radius	(4) Practice 10-mile Radius
β_{green}^{PPMC1}	-0.063***	-0.062***	-0.061***	-0.051***
	(0.017)	(0.018)	(0.015)	(0.014)
β_{yellow}^{PPMC1}	-0.050***	-0.062***	-0.036	-0.061***
	(0.016)	(0.022)	(0.041)	(0.020)
β_{red}^{PPMC1}	-0.039**	-0.039**	-0.040***	-0.026**
	(0.017)	(0.018)	(0.015)	(0.013)
β_{green}^{PPMC2}	0.046***	0.025	0.026	0.034**
	(0.017)	(0.018)	(0.017)	(0.017)
β_{yellow}^{PPMC2}	0.037*	0.047*	0.035*	0.028*
	(0.022)	(0.027)	(0.021)	(0.016)
β_{red}^{PPMC2}	0.024*	0.030**	0.029**	0.025*
	(0.013)	(0.014)	(0.014)	(0.014)
β_{green}^{PPMC3}	0.040***	0.035***	0.037***	0.036***
	(0.009)	(0.009)	(0.009)	(0.010)
β_{yellow}^{PPMC3}	0.025**	0.031***	0.034***	0.038***
	(0.011)	(0.011)	(0.010)	(0.011)
β_{red}^{PPMC3}	0.013	0.013	0.011	0.014
	(0.010)	(0.011)	(0.010)	(0.010)
Observations	291,766	291,766	291,766	291,766
R^2	0.172	0.172	0.172	0.172

Notes: The dependent variable is a C-section (1 for C-section, 0 otherwise). Each cell presents the β^j obtained by estimating Equation G.1 and an observation is a patient-year. HHI is calculated using the location of a physician's practice as indicated in each column. All regressions adjust for patient controls, and include physician and year × PPMC fixed effects. Standard errors are clustered at the practice level. Significance levels: *p<0.1, **p< .05, ***p< 0.01

Table G.5 Role of Market Concentration: PPMC Effects on C-sections by Categories of Pre-Acquisition HHI and Change in HHI, Low-Risk Births

	(1) Practice 4-digit Zip Code	(2) Practice 4-mile Radius	(3) Practice 6-mile Radius	(4) Practice 10-mile Radius
$\beta^{PPMC2}_{preHHIabove=0,\Delta above=0}$	0.051	0.033	0.046**	0.010
	(0.033)	(0.028)	(0.020)	(0.044)
$\beta^{PPMC2}_{preHHIabove=0,\Delta above=1}$	0.049**	0.051**	0.035	0.070***
	(0.024)	(0.024)	(0.026)	(0.021)
$\beta^{PPMC2}_{preHHIabove=1,\Delta above=0}$	-0.026	0.080**	0.022	0.161***
	(0.052)	(0.035)	(0.057)	(0.039)
$\beta^{PPMC2}_{preHHIabove=1,\Delta above=1}$	–	0.050	0.034	0.022
	–	(0.049)	(0.079)	(0.025)
$\beta^{PPMC3}_{preHHIabove=0,\Delta above=0}$	0.024**	0.032***	0.013	0.085***
	(0.011)	(0.011)	(0.012)	(0.012)
$\beta^{PPMC3}_{preHHIabove=0,\Delta above=1}$	0.045**	0.039*	0.035**	0.046***
	(0.021)	(0.023)	(0.017)	(0.016)
$\beta^{PPMC3}_{preHHIabove=1,\Delta above=0}$	0.056*	0.041	0.094**	0.013
	(0.031)	(0.029)	(0.046)	(0.027)
$\beta^{PPMC3}_{preHHIabove=1,\Delta above=1}$	–	0.049	0.099*	0.003
	–	(0.036)	(0.052)	(0.028)
Observations	261,519	261,519	261,519	261,519
R^2	0.175	0.175	0.175	0.175

Notes: The dependent variable is a C-section (1 for C-section, 0 otherwise). The β^j capture the effect of acquisition on C-sections for different categories of pre-acquisition HHI and acquisition-induced changes in HHI. "$preHHIabove$" is equal to 1 when pre-acquisition HHI is above median and 0 when it is below median and "$\Delta above$" is equal to 1 when the change in HHI is above median and 0 when it is below median for each PPMC. An observation is a patient-year. HHI is calculated using the location of a physician's practice as indicated in each column. All regressions adjust for patient controls, and include physician and year × PPMC fixed effects. Standard errors are clustered at the practice level. Significance levels: *p<0.1, **p< .05, ***p< 0.01

Table G.6 Role of Market Concentration: PPMC Effects on C-sections by Continuous Change in HHI, Low-Risk Births

	(1) Practice 4-digit Zip Code	(2) Practice 4-mile Radius	(3) Practice 6-mile Radius	(4) Practice 10-mile Radius
β^{PPMC1}	-0.06429***	-0.06909***	-0.07041***	-0.06675***
	(0.01605)	(0.01618)	(0.01589)	(0.01742)
β^{PPMC2}	0.05325***	0.03840***	0.03885***	0.02784*
	(0.01269)	(0.01398)	(0.01363)	(0.01576)
β^{PPMC3}	0.02908***	0.02045**	0.02333***	0.02470***
	(0.00859)	(0.00816)	(0.00794)	(0.00815)
ϕ^{PPMC1}	0.00007	0.00003	0.00005**	0.00004*
	(0.00004)	(0.00002)	(0.00002)	(0.00002)
ϕ^{PPMC2}	-0.00002**	0.00001	-0.00000	0.00001
	(0.00001)	(0.00001)	(0.00001)	(0.00002)
ϕ^{PPMC3}	0.00004	0.00004***	0.00004**	0.00001
	(0.00003)	(0.00001)	(0.00002)	(0.00001)
Observations	291,766	291,766	291,766	291,766
R^2	0.172	0.172	0.172	0.172

Notes: The dependent variable is a C-section (1 for C-section, 0 otherwise). The β^j represent the PPMC acquisition effect when Δ HHI=0, and the ϕ^j represent the interaction effect between the post-PPMC indicator and a continuous measure of the acquisition-induced change in HHI for each PPMC. An observation is a patient-year. HHI is calculated using the location of a physician's practice as indicated in each column. All regressions adjust for patient controls, and include physician and year $\times$ PPMC fixed effects. Standard errors are clustered at the practice level. Significance levels: *p<0.1, **p< .05, ***p< 0.01

Appendix H: Clinical Initiatives and Quality Outcomes

This appendix provides empirical support for the impact of clinical management on patient health outcomes. Table H.1 provides regression output for Figure 6, Table H.2 presents the results of a logistic regression for a patient's probability of a C-section, and Figure H.1 shows that the clinical initiatives in PPMC 1 also reduced C-sections among Ob-Gyns always in the PPMC.

I adapt methodology from Baicker, Buckles, and Chandra 2006 to determine whether intensive treatment (C-section) was medically appropriate. Specifically, the logistic regression estimates a patient's probability of receiving a C-section using data on all births delivered by a physician (MD or DO) or a nurse (RN or ARNP):

$$Pr(Csection_{ip}) = F(\beta^r \mathbf{X}_i^r) \tag{H.1}$$

where $\mathbf{X_i^r}$ includes all antepartum patient risk factors. This prediction identifies an individual patient's need for a C-section only based on observable clinical factors aggregated over the entire sample of births. Therefore, any individual provider would have little influence on the predicted probability. To estimate whether the appropriateness of care changed after a practice acquisition, I run Equation 1 (the difference-in-differences specification) with the fitted values from Equation H.1 as the outcome variable and restrict the sample to patients who received a C-section. This estimation captures the medical appropriateness of the C-section for patients receiving a C-section.

Table H.1 PPMC Effects on Clinical Outcomes and Diagnoses, Low-Risk Births

Outcome =	(1) Planned C-Section	(2) Unplanned C-Section	(3) C-section Appropriateness	(4) Patient Morbidity	(5) C-section, no indication	(6) C-section, failure to progress
β^{PPMC1}	-0.016	-0.041***	0.023***	-0.021*	0.000	-0.070**
	(0.016)	(0.009)	(0.009)	(0.012)	(0.018)	(0.030)
β^{PPMC2}	0.024***	0.004	-0.005	0.018**	0.060***	-0.041**
	(0.009)	(0.009)	(0.010)	(0.008)	(0.018)	(0.018)
β^{PPMC3}	0.007	0.018***	-0.013**	-0.001	0.026	0.036**
	(0.006)	(0.006)	(0.005)	(0.005)	(0.029)	(0.018)
Observations	291,766	291,766	71,650	147,676	71,650	71,650
R^2	0.163	0.053	0.055	0.018	0.158	0.120

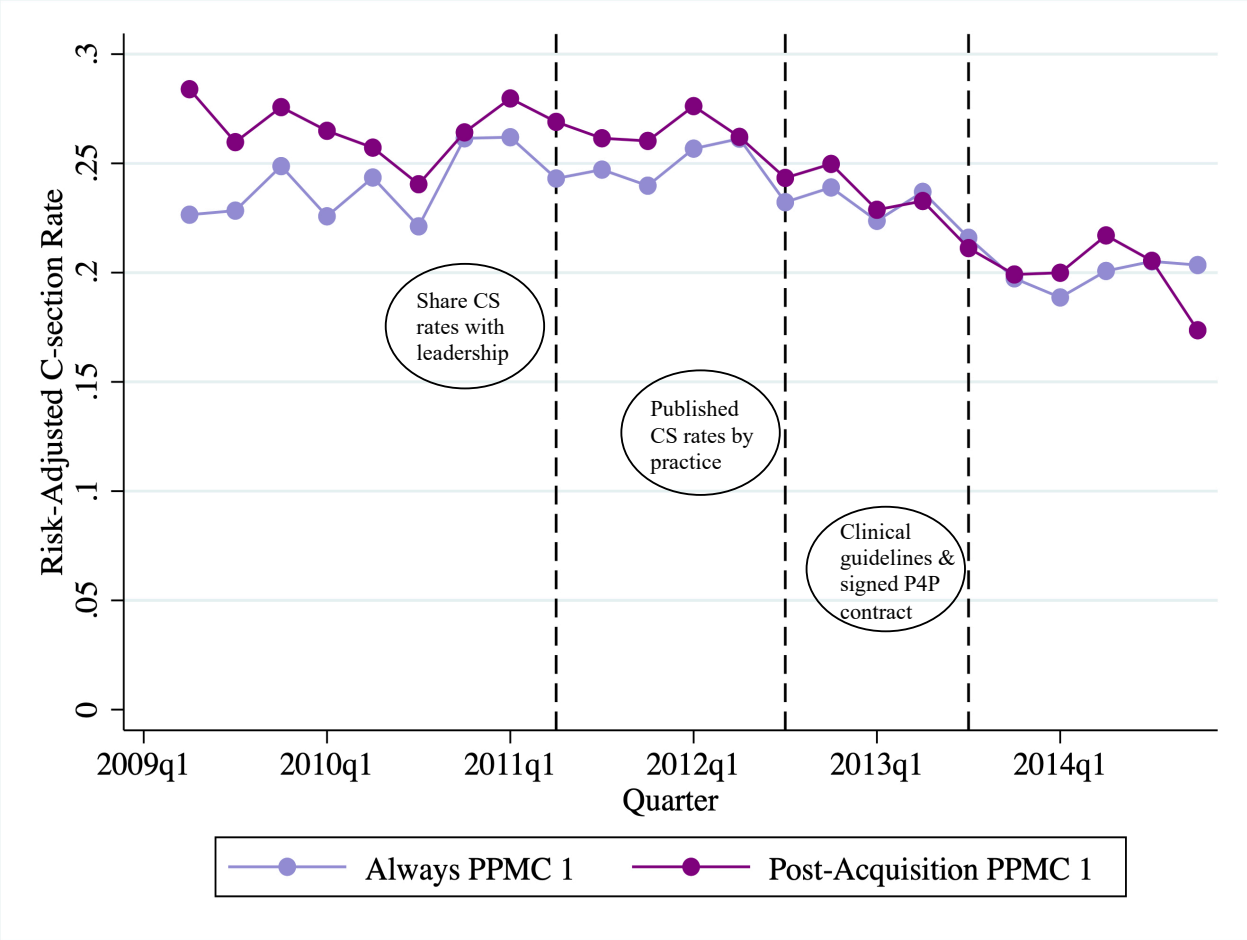
Notes: This table shows the impact of PPMCs on several additional clinical variables and use of diagnosis codes. Each cell presents the β^j obtained by estimating Equation 1. The dependent variables are as follows: Column (1) - Planned C-section (1 for planned C-section, 0 otherwise); Column (2) - Unplanned C-section (1 for unplanned C-section, 0 otherwise); Column (3) - Appropriateness of the C-section conditional on receiving a C-section (continuous variable from 0, least appropriate, to 1, most appropriate); Column (4) - Infant or maternal morbidity (dummy variable equal to 1 in case of morbidity, 0 otherwise) for those below median appropriateness for a C-section; Column (5) - Clinical justification for the C-section is failure to progress to labor (0 did not fail, 1 failed to progress) conditional on receiving a C-section; and Column (6) - Clinical justification for the C-section is C-section delivery without mention of indication (1 if no indication, 0 otherwise) conditional on receiving a C-section. "Failure to progress" accounts for dystocia, slow progress in labor, and dysfunctional labor which do not result in sufficient cervical dilation in either the first or second stage of labor. "No indication" refers to a C-section without mention of indication for mode of delivery. I observe no statistically significant or economically meaningful changes in other clinical indications such as umbilical cord complications, obstetrical trauma, fetal distress and pelvic disproportion for any of the PPMCs. All regressions adjust for patient controls, and physician and year × PPMC fixed effects. Standard errors are clustered at the practice level. See Figure 6 for pre-acquisition averages. Significance levels: *p<0.1, **p< .05, ***p< 0.01.

Table H.2 Logistic Regression of C-section Risk

	Low-Risk		All Births	
	Odds Ratio	S.E.	Odds Ratio	S.E.
Advanced maternal age	1.591***	-0.0106	1.549***	-0.00931
Anemia	1.368***	-0.00939	1.366***	-0.00856
Antepartum fetal distress	5.059***	-0.119	4.996***	-0.113
Asthma	1.006	-0.0128	0.988	-0.0114
Blood disorders	3.534***	-0.0454	3.327***	-0.0364
Diabetes	1.575***	-0.0134	1.521***	-0.0119
Fetal malposition			42.37***	-0.635
Fetal size issue	5.570***	-0.0427	5.284***	-0.0389
Heart disease	1.363***	-0.0294	1.398***	-0.0274
Hypertension	2.335***	-0.0157	2.461***	-0.015
Infectious and parasitic conditions	1.779***	-0.0186	1.674***	-0.0165
Isoimmunization	0.893***	-0.0132	0.891***	-0.012
Known fetal abnormality	1.509***	-0.0238	1.418***	-0.0202
Maternal physical abnormality	2.242***	-0.0199	2.100***	-0.0168
Multiple gestation			4.056***	-0.0727
Nutritional deficiency	0.617***	-0.00682	0.593***	-0.00593
Obesity	1.924***	-0.0229	1.828***	-0.0202
Other conditions/risks	1.294***	-0.0197	1.192***	-0.0162
Poly- & Oligo- hydramnios	1.933***	-0.0196	1.918***	-0.018
Preterm labor			0.955***	-0.0077
Previous C-section			72.29***	-0.619
Previous pregnancy	0.655***	-0.00336	0.671***	-0.00323
Ruptured membrane	1.388***	-0.0169	1.164***	-0.012
Substance abuse	0.836***	-0.00716	0.839***	-0.00642
Uterine size issue	6.601***	-0.217	3.984***	-0.108
Observations	1,393,620		1,923,295	
R^2	.10		.36	

Notes: This table shows a patient's propensity for receiving a C-section only based on their risk factors. Each cell presents the β^r obtained by estimating Equation H.1. The dependent variable is a C-section (1 for C-section, 0 otherwise). The regression includes all births in the inpatient sample so that any individual provider would have little influence on the predicted probability. Regressions include no controls except for patient risk factors. Note that the total number of births are slightly lower than full sample of data (1,930,033 for all births and 1,400,412 for low-risk births) because only births by physicians (MD or DO) or nurses (RN or ARNP) are included (i.e., births by residents, physician assistants, or providers with an unknown license type are removed). Baicker, Buckles, and Chandra 2006 estimate an R^2 of .32 and .37 for low birth weight and normal birth weight babies for all birth types, while Currie and Macleod 2017 estimate an R^2 of .32 for all births. No comparable estimates for low-risk births exist to my knowledge.

Figure H.1 Clinical Initiatives in PPMC 1 Also Reduced C-sections Among Ob-Gyns Always in the PPMC



Notes: The figure plots the risk-adjusted low-risk C-section rate for physicians who switched into PPMC 1 and physicians always observed in PPMC 1. Starting in 2011, PPMC 1 instituted several additional initiatives meant to specifically reduce unnecessary C-sections as listed. This information was retrieved from a report prepared by PPMC 1.

Appendix I: Financial Incentives and Productivity Outcomes

This appendix provides empirical support that the financial motivation, pressure, or incentives created by PPMCs 2 and 3 led to other revenue-increasing behavior (beyond increasing C-sections). Table I.1 provides regression output for Figure 7, and Table I.2 shows the impact of PPMCs on productivity and other outcomes that approximate or influence provider payment.

Table I.1 PPMC Effects by Patient Insurance, Low-Risk Births

Outcome=	(1) C-section	(2) C-section	(3) C-section	(4) Pr(Medicaid)	(5) Pr(Private)
β^{PPMC1}	-0.079	-0.052***	-0.027	-0.001	0.013
	(0.051)	(0.019)	(0.039)	(0.025)	(0.027)
β^{PPMC2}	0.034**	0.023	0.016	-0.063***	0.085**
	(0.016)	(0.015)	(0.015)	(0.018)	(0.037)
β^{PPMC3}	0.017	0.034***	0.017*	-0.020	0.021
	(0.014)	(0.010)	(0.010)	(0.021)	(0.019)
$\beta^{PPMC1}_{Private}$			-0.037		
			(0.048)		
$\beta^{PPMC2}_{Private}$			0.015**		
			(0.007)		
$\beta^{PPMC3}_{Private}$			0.020***		
			(0.005)		
Patient Controls	X	X	X		
Physician FE	X	X	X	X	X
Year x PPMC FE	X	X	X	X	X
Sample	Medicaid Only	Private Only	Medicaid & Private	All Types	All Types
Observations	98,354	159,269	257,624	291,766	291,766
R^2	0.188	0.172	0.173	0.214	0.255

Notes: This table shows the impact of PPMCs on C-sections depending on patient insurance, and changes to patient insurance mix. Each cell presents the β^j obtained by estimating Equation 1, including the addition of an interaction term between the post-PPMC indicator and an indicator equal to 1 if the patient is privately insured and 0 if the patient is on Medicaid ($\beta^j_{Private}$). The dependent variables are as follows: Column (1) - Probability of a C-section for patients on Medicaid (1 for C-section, 0 otherwise); Column (2) - Probability of a C-section for privately insured patients (1 for C-section, 0 otherwise); Column (3) - Probability of a C-section for the sample of both Medicaid and privately insured patients (1 for C-section, 0 otherwise); Column (4) - Probability a patient is on Medicaid (1 for Medicaid, 0 otherwise); and Column (5) - Probability a patient is privately insured (1 for private insurance, 0 otherwise). Standard errors are clustered at the practice level. See Figure 7 for pre-acquisition averages. Significance levels: *p<0.1, **p< .05, ***p< 0.01.

Table I.2 Effect of PPMCs on Productivity and Reimbursement Outcomes

	Low-Risk Births			All Births
Outcome=	(1) Length of Stay (Days)	(2) Total Charges ($)	(3) Birth Volume	(4) Birth Volume
β^{PPMC1}	-0.048	353.079	-1.552	-4.338
	(0.054)	(442.866)	(8.004)	(12.699)
β^{PPMC2}	0.043**	1608.797***	3.438	3.198
	(0.021)	(407.151)	(5.952)	(7.668)
β^{PPMC3}	0.040***	1263.560***	-10.322	-14.641
	(0.015)	(345.003)	(6.726)	(9.237)
Patient Controls	X	X		
Physician FE	X	X	X	X
Year x PPMC FE	X	X	X	X
Observations	291,766	291,766	2,698	2,698
R^2	0.194	0.420	0.804	0.815

Notes: This table shows the impact of PPMCs on productivity and other outcomes that approximate or influence provider payment. Each cell presents the β^j obtained by estimating Equation 1. The dependent variables are as follows: Column (1) - Total patient length of stay in days, winsorized at the 99th percentile; Column (2) - Total gross charges ($) for mother and infant from time of admission to discharge, winsorized at the 99th percentile; Column (3) - Total number of low-risk births performed by a physician per year; and Column (4) - Total number of low-risk births performed by a physician per year . The pre-acquisition averages are as follows: Length of stay (2.5 in PPMC 1, 2.7 in PPMC, and 2.5 in PPMC 3); Charges ($11,465 in PPMC 1, $12,643 in PPMC, and $12,387 in PPMC 3); Low-risk birth volume (99.5 in PPMC 1, 96.3 in PPMC, and 139.9 in PPMC 3); and all birth volume (138.7 in PPMC 1, 139.7 in PPMC, and 189.9 in PPMC 3). Standard errors are clustered at the practice level. Significance levels: *p<0.1, **p< .05, ***p< 0.01.