HOSPITAL MERGERS AND ANTITRUST IMMUNITY: THE ACQUISITION OF PALMYRA MEDICAL CENTER BY PHOEBE PUTNEY HEALTH

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Abstract: On December 15, 2011, Phoebe Putney Health acquired the only other hospital in Albany, Georgia—Palmyra Medical Center—despite the Federal Trade Commission's challenge of the merger as anticompetitive. The acquisition was consummated after the district and appellate courts ruled that Phoebe Putney had antitrust immunity due to its regulation by the local Hospital Authority of Albany-Dougherty County. In February 2013, the Supreme Court reversed these rulings and remanded the case back to the lower courts, after Palmyra Medical Center had become part of Phoebe Putney Memorial Hospital, making a divestiture infeasible. The acquisition of Palmyra Medical Center by Phoebe Putney provides a natural experiment to study the effects of an otherwise anticompetitive hospital merger subject to local regulation. We found that, after a large price spike in the first post-merger year, the commercial price of inpatient hospital services in Albany, Georgia moderated toward the control group price in subsequent post-merger years. Regarding quality, we found a significant post-merger reduction in inpatient hospital quality relative to controls across many quality metrics. We discuss the implications of these findings for recent initiatives that grant hospitals antitrust immunity in exchange for local regulation.

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Throughout the United States, various regulatory and quasi-regulatory systems are replacing competition and antitrust enforcement for the control of price, cost, and quality in the provision of health care services. For example, West Virginia recently enacted a law giving merging health care providers antitrust immunity conditional on approval by the West Virginia Health Care Authority.[2] Tennessee and Virginia health officials recently granted antitrust immunity to merging hospital systems in east Tennessee and southwest Virginia through a Certificate of Public Advantage regulatory system that mandates pricing limits and quality reporting.[3] New York recently passed a law giving a specific provider antitrust immunity to form collaborations regardless of their impact on competition.[4] Along with these specific grants of antitrust immunity, many states are expanding the use of regulation to control health care spending and improve quality. Maryland, which has long had a system of all-payer hospital rate-setting, recently transitioned to a global budget regulatory system in which each hospital's spending growth is capped.[5] Vermont recently initiated an all-payer accountable care organization with the goal of covering 70 percent of the state's population by 2022 and restricting the growth of per capita health expenditures to 3.5 percent or less.[6] The governor of Massachusetts recently proposed capping health care provider prices, including those charged to commercial health plans.[7] Numerous health policy experts have recently advocated for provider rate setting to control costs and promote quality.[8]

In this environment, it is important to understand the effect of health care consolidation on price, cost, and quality when antitrust enforcement is replaced by local regulatory control. The acquisition of Palmyra Medical Center by the Phoebe Putney Health System provides an opportunity to study this dynamic. On December 15, 2011, Phoebe Putney Health System (Phoebe Putney), which leases Phoebe Putney Memorial Hospital (PPMH) from the local Hospital Authority of Albany-Dougherty County (Authority), used the Authority to acquire and lease the only other hospital in Albany, Georgia—Palmyra Medical Center (Palmyra)—despite the Federal Trade Commission's (FTC) challenge of the merger. The acquisition was consummated after the district and appellate courts ruled that Phoebe Putney had antitrust

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[2] https://www.law360.com/articles/774171/w-va-gov-signs-bill-with-antitrust-exemptions-for-hospitals (accessed on February 22, 2017)

[3] http://www.johnsoncitypress.com/Health-Care/2017/09/19/Merger-approved-State-allows-Mountain-States-Wellmont-merger (accessed on September 21, 2017)

[4] https://www.nysenate.gov/legislation/bills/2015/s2647/amendment/original (accessed on March 6, 2017);

[5] https://www.healthaffairs.org/action/showDoPubSecure?doi=10.1377%2Fhblog20171214.96251&format=full (accessed December 20, 2017)

[6] http://healthaffairs.org/blog/2016/11/22/the-all-payer-accountable-care-organization-model-an-opportunity-for-vermont-and-an-exemplar-for-the-nation/ (accessed on March 6, 2017)

[7] http://www.wbur.org/commonhealth/2017/01/17/baker-medicaid-assessment-growth-caps (accessed March 6, 2017)

[8] For instance, Murray and Bereson (2015); Frakt, A., "How to Get Public Option Benefits Without a Public Option," JAMA Forum, October 5, 2016, https://newsatjama.jama.com/2016/10/05/jama-forum-how-to-get-public-option-benefits-without-a-public-option/ (accessed March 21, 2017); Frankford, D. and Rosenbaum, S., "Taming Health Care Spending: Could Rate Setting Work?" Health Affairs Blog, March 20, 2017 http://healthaffairs.org/blog/2017/03/20/taming-health-care-spending-could-state-rate-setting-work/ (accessed March 21, 2017)

immunity due to its regulation by the Authority. Specifically, these courts held that Phoebe Putney had antitrust immunity because it was foreseeable that the Georgia Hospital Authority Law would result in acquisitions that were anticompetitive. The FTC appealed these rulings to the Supreme Court, arguing that the Georgia Hospital Authority Law did not clearly articulate that regulation should displace competition and that, even if it did, the Authority was not an effective regulator.[9] In February 2013, the Supreme Court reversed the lower courts' rulings because it found that the Georgia Hospital Authority Law did not clearly articulate a policy to displace competition, and remanded the case back to the lower courts without opining on the sufficiency of the Authority's regulation of the hospitals. However, by this time, Phoebe Putney had converted Palmyra into a campus of PPMH, effectively precluding the divestiture of Palmyra due to Georgia Certificate of Need (CON) regulations. Eventually, the FTC and Phoebe Putney settled out of court with Phoebe Putney agreeing to notify the FTC of any future acquisitions and to refrain from opposing future CON applications of potential entrants.

Thus, the acquisition of Palmyra by Phoebe Putney provides a natural experiment to study the effects of a likely anticompetitive hospital merger that was allowed to consummate due to antitrust immunity and local government regulation. The FTC claimed that the Authority's regulation was ineffective and that the acquisition likely would lead to higher prices and reduced quality of care. The defendants claimed that the Authority would prevent the merged system from charging unreasonable prices and that the acquisition would allow Phoebe Putney to expand capacity in a manner "less disruptive to existing patient care" than the construction of new facilities.[10] Using available data from before and after the acquisition, we evaluated these opposing claims. Unlike previous retrospective analyses of hospital mergers that primarily focus on price effects, we studied the effect of the acquisition on both price and quality. We found that, after a large post-merger price spike possibly reflecting the elimination of the lower-priced Palmyra, the post-merger commercial price of inpatient hospital services in Albany, Georgia moderated toward the control group price in subsequent post-merger years. Regarding quality, we found a significant post-merger reduction in inpatient hospital quality relative to controls across many quality metrics.

These findings should give pause to state and local governments considering the replacement of antitrust enforcement with local price and quality regulation for their health care providers. While careful regulation of provider prices might control health care costs, the experience of the Phoebe Putney/Palmyra merger suggests that regulators may have difficulty adjusting to a provider merger, particularly one between providers with different prices. Furthermore, when prices are capped, a reduction in competition typically leads to a strong incentive to reduce investments to maintain and improve quality. The decline in measurable quality after the Phoebe Putney/Palmyra merger is consistent with the hospital system responding to these incentives. Overall, the experience of the Phoebe Putney/Palmyra merger

[9] https://www.ftc.gov/system/files/documents/cases/120820phoebeputneybrief.pdf (Accessed March 20, 2017)

[10] FTC v. Phoebe Putney Health System, Inc., No. 11-1160, US Supreme Court, Brief for Respondents, October 2012, available at https://www.ftc.gov/system/files/documents/cases/121001phoebeputneybrief.pdf (accessed on July 10, 2017)

highlights the problems that can occur when competition is reduced in a regulated environment.

Georgia Hospital Authorities and the Phoebe Putney/Palmyra Merger

In 1941, the Georgia Legislature enacted the Hospital Authorities Law "to provide a mechanism for the operation and maintenance of needed health care facilities in the several counties and municipalities of the state."[11] The Hospital Authorities Law authorized local Georgia governments to create local governmental agencies called "Hospital Authorities" with broad powers to regulate the provision of health care in their jurisdictions. For instance, an established Hospital Authority can purchase health care facilities and has the power of eminent domain. Hospital Authorities can issue tax-advantaged bonds to finance improvements to owned health care facilities. Importantly, a Hospital Authority can regulate the prices charged by health care facilities under its ownership, as long as the prices are set "only to cover operating expenses and create reasonable reserves."[12] In 2014, 37 short-term general acute care hospitals in Georgia were owned by a local Hospital Authority and 13 of these were managed by a private, multi-hospital health system.[13]

Immediately after the enactment of the Hospital Authorities Law in 1941, Dougherty County and the City of Albany (Georgia) created the Hospital Authority of Albany-Dougherty County (Authority), which purchased Phoebe Putney Memorial Hospital (PPMH) in Albany. In 1990, the Authority restructured the management of PPMH by creating a private non-profit corporation, Phoebe Putney Health System (Phoebe Putney), which then leased PPMH from the Authority, while the Authority maintained its power to regulate PPMH's prices.

Palmyra Medical Center (Palmyra) was built two miles north of PPMH in 1971 and was subsequently purchased by the for-profit Hospital Corporation of America (HCA). Prior to its acquisition by Phoebe Putney, Palmyra was a profitable hospital with plans to introduce additional services, such as inpatient obstetric care.[14]

On December 21, 2010, the Authority and Phoebe Putney announced that the Authority would acquire Palmyra for $195 million. Under the terms of the deal, the Authority would become the sole owner of Palmyra and would enter into a management agreement with Phoebe Putney to run Palmyra as Phoebe North, a campus of PPMH.[15] The plan was presented

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[11] FTC v. Phoebe Putney Health System, Inc., No. 11-1160, US Supreme Court, Opinion, February 2013, available at https://www.ftc.gov/sites/default/files/documents/cases/2013/02/130219phoebeopinion.pdf (accessed on March 15, 2017)
[12] 241 Georgia Code Ann. ʃ31-7-77
[13] American Hospital Association Annual Survey, 2014
[14] http://www.nashvillepost.com/business/health-care/article/20454236/hca-selling-georgia-hospital (accessed on July 11, 2017)
[15] Smith, Romney, (21 December 2010), Phoebe Putney to buy Palmyra Medical Center, WFXL Fox 31, http://wfxl.com/news/local/phoebe-putney-to-buy-palmyra-medical-center (accessed on March 14, 2017)

to the Authority by Phoebe Putney and the funding was provided by Phoebe Putney. Local press reports at the time of the announcement characterized the acquisition as the end of "years of fierce competition" between Phoebe Putney and Palmyra.[16]

The Federal Trade Commission (FTC) voted unanimously to challenge the acquisition in April 2011. The FTC began administrative proceedings to determine the legality of the merger and filed for a preliminary injunction in federal district court to enjoin the acquisition until the conclusion of the administrative proceedings. In the complaint, the FTC argued that the acquisition violated Section 5 of the FTC Act and Section 7 of the Clayton Act and would "eliminate the robust competitive rivalry between Phoebe Putney and Palmyra … that has benefited consumers for decades" by creating a virtual monopoly for inpatient general acute care hospital services in Dougherty County. Specifically, the complaint alleged that the acquisition would "enhance Phoebe Putney's ability and incentive to increase reimbursement rates for commercial health plans and their membership" and would "reduce the quality and breadth of services available in the Albany area." The complaint alleged that Phoebe Putney would have an 86% market share of commercial discharges in a six-county area surrounding Albany, Georgia.[17]

The Authority, Phoebe Putney, and Palmyra argued that Palmyra was being acquired by the Authority, which was protected by Georgia's Hospital Authority Law and therefore immune from federal antitrust laws under the state-action doctrine. The defendants argued that the Authority would control the merged entity's pricing "to ensure that the lessee [Phoebe Putney] will not in any event obtain more than a reasonable rate of return." The defendants also argued that the acquisition benefited the local community as the quickest, most efficient, and least disruptive method for expanding PPMH's capacity. They argued that "compared to the most reasonable construction plan, purchase of the existing Palmyra facility would provide [PPMH] with more than three times the number of additional beds at less than half the average cost per bed, and would be less disruptive to existing patient care."[18] After a hearing on June 13, 2011, the district court denied the FTC's request for a preliminary injunction and granted the defendant's motion to dismiss the case later that month.

The FTC appealed the ruling of the district court to the Eleventh Circuit, where the appeals court "agree[d] with the [Federal Trade] Commission that, on the facts alleged, the joint operation of [Phoebe Putney] Memorial [Hospital] and Palmyra would substantially lessen competition or tend to create, if not create, a monopoly." But the Eleventh Circuit ultimately

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[16] http://www.walb.com/story/13723226/phoebe-putney-hospital-authority-buys-palmyra-hospital (accessed on July 10, 2017)

[17] FTC Complaint filed in FTC v. Phoebe Putney Health System, No. 1:11-cv-58, Middle District of Georgia, available at https://www.ftc.gov/sites/default/files/documents/cases/2011/04/110426phoebeputneycmpt.pdf (accessed on March 14, 2017)

[18] FTC v. Phoebe Putney Health System, Inc., No. 11-1160, US Supreme Court, Brief for Respondents, October 2012, available at https://www.ftc.gov/system/files/documents/cases/121001phoebeputneybrief.pdf (accessed on July 10, 2017)

concluded that state-action immunity applied to the acquisition and affirmed the decision of the lower court in December 2011.[19] As a result, the acquisition of Palmyra was consummated on December 15, 2011. Following the consummation, Phoebe Putney applied to the Georgia Department of Community Health (DCH) for a single license covering both the PPMH and Phoebe North campuses. The request was granted and the new license went into effect on August 1, 2012.

In March 2012, the Solicitor General of the United States, on behalf of the FTC, petitioned the U.S. Supreme Court to review the ruling of the Eleventh Circuit. The U.S. Supreme Court heard oral arguments on November 26, 2012. On February 12, 2013, the U.S. Supreme Court ruled that "state-action immunity does not apply" because the Hospital Authority Law had not clearly articulated an intent to displace competition, and remanded the case to the district court for further proceedings. [20]

In April 2013, the FTC filed motions that would prevent further integration of the two hospitals and require Phoebe Putney to maintain the assets of Palmyra until the resolution of renewed administrative proceedings. The district court granted a temporary restraining order in May and on June 5, 2013, the district court issued a Stipulated Preliminary Injunction Order wherein the Authority and Phoebe Putney agreed to continue to operate under those terms.

In August 2013, the Authority and Phoebe Putney agreed to settle with the FTC and the proposed Agreement Containing Consent Order ("Consent Agreement") was released for public comment. At the time, the FTC believed that Georgia's Certificate of Need (CON) regulations would not allow the FTC to require the divestiture of one of the hospitals. Since the merged entity was operating under a single license, a potential buyer of the divested hospital would need to apply for a new license and obtain a CON. However, it would not be able to prove the need for additional hospital beds using the Georgia DCH's mandatory bed formulas.

However, based on public comments received on the proposed Consent Agreement and additional investigation, the FTC learned that the CON laws may not preclude a divestiture and rejected the proposed Consent Agreement in September 2014. The statement from the FTC cited North Albany Medical Center's interest in acquiring and operating Palmyra as a competing hospital in Albany and a June 3, 2014, staff determination from the Georgia DCH that "returning Phoebe North to its status as a separately licensed … hospital for divestiture would not require prior CON review and approval."[21]

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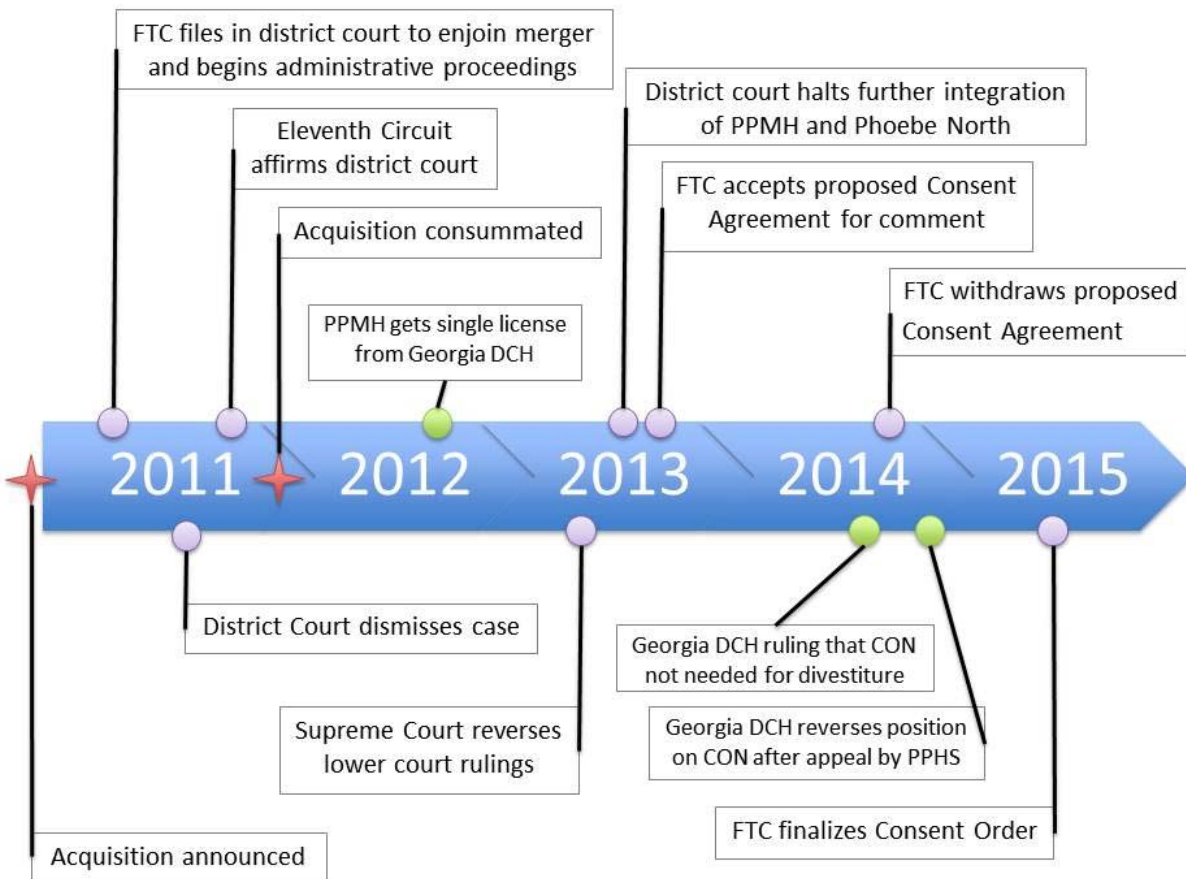
[19] FTC v. Phoebe Putney Health System, No. 11-12906, Eleventh Circuit Court of Appeals, 9 December 2011, available at https://www.ftc.gov/sites/default/files/documents/cases/2011/12/111214phoebeputneyorder.pdf (accessed on March 14, 2017)

[20] FTC v. Phoebe Putney Health System, Inc., No. 11-1160, US Supreme Court, 19 February 2013, available at https://www.ftc.gov/sites/default/files/documents/cases/2013/02/130219phoebeopinion.pdf (accessed on March 15, 2017)

[21] Statement of the Federal Trade Commission in the Matter of Phoebe Putney Health Services, Inc., et al., Docket No. 9348, 4 September 2014, available at

The Georgia DCH staff determination was appealed by Phoebe Putney and the Authority and in October 2014, a DCH Hearing Officer determined that the CON laws would apply to a divestiture of Palmyra. The determination of the Hearing Officer could have been appealed to the DCH Commissioner for a final decision, but the Georgia DCH released a statement saying, "Department of Community Health Commissioner Clyde L. Reese III is in support of and in agreement with the hearing officer decision."[22]



Ultimately, the FTC determined that the CON laws would not allow for a divestiture and accepted a Consent Agreement on March 31, 2015. The Consent Agreement requires the Authority and Phoebe Putney to provide prior notice to the FTC of plans to acquire certain types of healthcare providers in the six-county area for ten years. It also prohibits the Authority and Phoebe Putney from opposing a CON application for a general acute care hospital in the six-county area for five years. The FTC stated:

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https://www.ftc.gov/system/files/documents/public_statements/581041/140905phoebeputneystatement.pdf (accessed on March 15, 2017)

[22] Parks, Jennifer, (6 October 2014), Hearing officer determines Certificate of Need law applies to any divestiture of Phoebe North, Albany Herald, http://www.albanyherald.com/news/hearing-officer-determines-certificate-of-need-law-applies-to-any/article_3b8a78e8-9168-5a88-8475-a78e03cdb244.html (accessed on March 17, 2017)

While it would have been the most appropriate and effective remedy to restore the lost competition in Albany and the surrounding six-county area from this merger to monopoly, Georgia's certificate of need ("CON") laws and regulations unfortunately render a divestiture in this case virtually impossible, leading us to accept this less-than-ideal remedy.[23]

In addition to PPMH and the former Palmyra, Phoebe Putney currently controls three other hospitals in southwest Georgia, including the only other general acute care hospital in the Albany Metropolitan Statistical Area, Phoebe Worth Medical Center, located about 20 miles to the east of Albany in Sylvester. Recently, the Georgia DCH approved a CON for a new hospital in Lee County, north of Albany, but this CON is currently under appeal.[24]

Literature Review

A number of articles have analyzed hospital mergers retrospectively. Most focus on the price effects of the mergers. One branch of this literature has analyzed samples of hospital mergers and these papers generally find large average post-merger price increases (Krishnan (2001), Capps and Dranove (2004), Dafny (2009), Garmon (2017)). Other papers in this literature focus on the price effects of particular consummated mergers and obtain mixed results (Vita and Sacher (2001), Haas-Wilson and Garmon (2011), Tenn (2011), Thompson (2011)). In addition, there is a large literature analyzing the cross-sectional relationship between hospital competition and price, which generally finds that competition leads to lower prices.

There is also a large literature analyzing the relationship between hospital competition and quality. The findings of these papers are more equivocal than those of the price competition literature, but the majority of papers find that hospital competition improves quality. However, relatively few papers have analyzed the effect of mergers on hospital quality. Ho and Hamilton (2000) find no effect of hospital mergers on quality of care when analyzing a sample of California hospital mergers. Romano and Balan (2011) analyze the effect of the Evanston Northwestern Healthcare/Highland Park Hospital merger (one of the mergers studied in Haas-Wilson and Garmon (2011)) on clinical quality outcomes and find inconclusive results. Noether and May (2017) analyze a nationwide sample of hospital mergers and find no statistically significant impact of mergers on quality. Apart from the Evanston Northwestern Healthcare/Highland Park Hospital merger analyzed by Haas-Wilson and Garmon (2011) and Romano and Balan (2011), there are no analyses of the price and quality effects of a hospital

[23] Statement of the Federal Trade Commission in the Matter of Phoebe Putney Health Services, Inc., et al., Docket No. 9348, 31 March 2015, available at https://www.ftc.gov/system/files/documents/public_statements/634181/150331phoebeputneycommstmt.pdf (accessed on March 17, 2017)

[24] http://www.walb.com/story/37078504/2-groups-request-appeal-of-lee-co-hospital-con-approval (accessed on December 20, 2017)

merger of which we are aware. Furthermore, we are aware of no studies analyzing the price and quality effects of private hospital mergers in the context of price regulation.[25] For a detailed review of the hospital competition literature, see Vogt and Town (2006) and Gaynor and Town (2012).

When prices are fixed above marginal cost, a reduction of competition (e.g., as a result of a merger of competitors) leads to reduced incentives to invest in maintaining or improving quality. This is generally true in any market subject to fixed prices, not just health care markets (Gaynor, Ho, and Town (2015)). To see this, consider the benefits to a firm of investing in quality improvements to its product or service. Making a higher quality product or service can benefit a firm in one of three ways: (1) by allowing it to charge a higher price for its service, (2) by stealing customers from its competitors, and/or (3) by convincing customers who would otherwise not purchase the service at all to purchase it (or purchase more of it). For hospital care, the last factor is largely irrelevant, as most insured patients receive hospital care when it is necessary. Thus, a hospital benefits from investments in quality by charging a higher price or by enticing the patients of its competitors to switch. However, when prices are fixed, a hospital can only benefit by gaining patients from competitors. A hospital will invest in quality improvements if the profits it expects to receive by serving patients enticed from its rivals exceed the costs of the quality improvements. Since its competitors are improving the quality of their services, the hospital also invests in quality to prevent its current patients from switching to its competitors. In this way, when prices are fixed, competition leads to higher quality, as it gives the hospital an incentive to improve its quality to entice patients from its competitors and prevent its competitors from stealing its customers.

When competition is reduced (e.g., through a merger of competitors), this incentive to improve quality is also reduced, as there is less benefit from enticing customers. In the extreme, a monopoly hospital facing fixed prices would have little incentive to improve quality. The monopolist could not charge a higher price for the higher quality service and the monopolist could not convince customers to switch from competitors to its higher quality service because it has no competitors. Thus, when a merger of competing hospitals occurs in the context of price regulation, it is reasonable to expect a reduction in quality relative to the non-merger counterfactual.

Data

To measure the price change associated with the Phoebe Putney/Palmyra merger, we made calculations based on 2006-2014 revenue and discharge data from the Centers for Medicare and Medicaid Services' (CMS) Healthcare Cost Report Information System (HCRIS)[26] along with 2006-2014 discharge data from the Georgia Hospital Association (GHA). To measure

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[25] Gaynor, Laudicella, and Propper (2012) study the effects of mergers of public hospitals in the context of the UK's National Health Service and find limited impacts.

[26] https://www.cms.gov/research-statistics-data-and-systems/downloadable-public-use-files/cost-reports/

the change in quality associated with the merger, we made calculations based on two foundational data sources: 2009-2014 GHA discharge data and data from CMS's Hospital Compare web site, which lists various hospital quality measures calculated from Medicare administrative data.[27] From the 2009-2014 GHA data, we calculated various Inpatient Quality Indicators (IQIs) and Patient Safety Indicators (PSIs) developed by the Agency for Healthcare Research and Quality (AHRQ). From Hospital Compare, we use 2010 and 2015 data for the pre-merger and post-merger periods, respectively. The risk-adjusted mortality and readmission rates in the 2010 Hospital Compare data reflect July 1, 2007 through December 31, 2010. The patient satisfaction scores in the 2010 Hospital Compare data reflect January 1, 2010 through December 31, 2010. The risk-adjusted mortality and readmission rates in the 2015 Hospital Compare data reflect July 1, 2012 through June 30, 2015. The patient satisfaction scores in the 2015 Hospital Compare data reflect January 1, 2015 through December 31, 2015.

Our data and information are limited to that which is publicly available, so we are limited in the inferences we can draw from the data. For instance, we cannot disclose whether Phoebe Putney renegotiated any commercial contracts after the acquisition, so we cannot draw definitive conclusions about the cause of the post-merger price trajectory. Despite these limitations, we feel it is important to describe the post-merger price and quality outcomes, given the importance of this merger in the context of recent debates on regulatory initiatives involving antitrust immunity.

Prices and Price Change Estimation

To estimate the price change associated with the acquisition of Palmyra by Phoebe Putney, we must estimate the difference between the actual post-merger price change and the price change that would have occurred if the acquisition had not happened. This requires overcoming two obstacles. First, what is the best method to use to estimate a hospital's price? Second, what is the best proxy for the price change that would have occurred if the acquisition had not happened? Hospitals serve patients with a variety of conditions who are covered by a variety of health plans. Some health plans (e.g., Medicare, Medicaid, Tricare) are subject to hospital reimbursement rates administratively set by the state or federal government, which are unlikely to change in response to a merger. Other types of health plans (e.g., Medicare Advantage, Managed Medicaid) have hospital reimbursement rates that hue closely to administratively determined rates. (Baker et al. (2016)) The only hospital prices that might change in response to a merger of competitors are those that are not administratively set (or constrained by administratively set rates), but negotiated between hospitals and private commercial health plans.

To estimate each hospital's case-mix-adjusted commercial price, we use the method developed by Dafny (2009), which incorporates estimates of commercial revenue and

[27] We did not use the 2006-2008 GHA data for the AHRQ quality measures due to a problem with the WinQI software's treatment of old data that produces expected rates for all series (treatment and control) and measures that are too low to be credible. https://www.medicare.gov/hospitalcompare;

discharges taken from the HCRIS data and an adjustment to reflect the hospital's average patient severity (i.e., the case-mix index). Specifically, each hospital's estimated price is:

$$p_h^d = \frac{(IPSC_h + IPIC_h + IPANC_h)\left(1 - \frac{CONTDISC_h}{GROSSREV_h}\right) - MCPRIM_h - MCAP_h}{(DISCH_h - MDISCH_h)CMI_h} \tag{1}$$

where $IPSC_h$ is the hospital's inpatient routine service charges, $IPIC_h$ is intensive care charges, $IPANC_h$ is inpatient ancillary charges, $CONTDISC_h$ is contractual discounts, $GROSSREV_h$ is gross revenues, $MCPRIM_h$ is the hospital's Medicare primary payer amounts, $MCAP_h$ is the Medicare total amount payable,[28] $DISCH_h$ is the hospital's total inpatient discharges, $MDISCH_h$ is Medicare inpatient discharges, and CMI_h is the hospital's case-mix index (i.e., the average Diagnosis Related Group (DRG) weight for its inpatients). The only change we make to the Dafny (2009) formula in (1) is to substitute the hospital's case-mix index for commercial inpatients calculated from the GHA data for the CMS Impact File case-mix index, which reflects the hospital's Medicare population.

While the Dafny (2009) price described in (1) has been used in many recent papers that have analyzed the price effects of hospital mergers (e.g., Lewis and Pflum (2017), Dafny, Ho, and Lee (2016), Garmon (Forthcoming)), it is not an ideal measure of price. The Dafny (2009) price excludes Medicare revenue and discharges from its estimate of the hospital's commercial inpatient price, but it does not exclude revenues and discharges from other non-commercial payers, particularly those from Medicaid and uninsured patients. This could lead to bias in the estimate of the price change at PPMH and Palmyra if the share of Medicaid and uninsured patients at PPMH/Palmyra is changing at a different rate than at hospitals in the control group.[29] Figure 1 plots the Medicaid and uninsured share of patients at the combined PPMH/Palmyra from 2007 through 2014 and compares this with the average share of Medicaid and uninsured patients across all Georgia hospitals during the same time period.[30] Overall, the share of PPMH/Palmyra's patients that are covered by Medicaid or uninsured is relatively stable over time. Likewise, the average share of Medicaid or uninsured patients across all Georgia hospitals is relatively stable over time. This suggests that the use of the Dafny (2009) price estimation method is unlikely to lead to a biased estimate of the relative price change associated with the PPMH/Palmyra merger.

To estimate the price change that would have occurred had the acquisition not happened, we use the synthetic control method of Abadie, Diamond, and Hainmueller (2010), in which a "synthetic" control hospital is constructed as a weighted average of non-merging Georgia hospitals so that the synthetic control is similar to the combined PPMH/Palmyra in the

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[28] MCPRIM+MCAP is the total reimbursement to the hospital for Medicare inpatients.
[29] This is because Medicaid reimbursement policy is state-specific, so it is unlikely that Medicaid reimbursement rate changes would differ across hospitals in Georgia.
[30] 2006 is excluded from this figure because GHA grouped Managed Medicaid plans with commercial plans in 2006.

pre-merger period with regard to price and predictors of price.[31] The weights are constructed (according to the algorithm described in Abadie, Diamond, and Hainmueller (2010)) by matching potential controls to the merging hospitals based on pre-merger prices and the following predictors of price: operating cost per adjusted admission (a measure of average variable cost), residents and interns per bed (a measure of teaching intensity), and occupancy rate (a measure of excess capacity). Before matching on these characteristics, hospitals specializing in the treatment of children, hospitals with fewer than 200 commercial admissions in any year, and critical access hospitals are excluded. Following the recommendation of Kaul et al. (2016), we use only a subset of the pre-merger prices (2006, 2008, and 2010) in the synthetic matching algorithm.[32] Table 1 lists the pre-merger characteristics of PPMH/Palmyra and the synthetic control.

The post-merger price change relative to the synthetic control is calculated by estimating the following equation using least squares estimation:

$$P_{ht} = \alpha + \beta_1 POST_{ht} + \beta_2 POSTM_{ht} + \delta_h + \varepsilon_{ht} \tag{2}$$

where POST_{ht} is an indicator for the post-merger period, $POSTM_{ht}$ is an indicator for PPMH/Palmyra in the post-merger period, and δ_h is a synthetic control indicator. For PPMH/Palmyra, P_{ht} is the log of the weighted average commercial price across PPMH and Palmyra (and the log of the commercial price for PPMH after PPMH absorbed Palmyra in 2012). For the synthetic control, P_{ht} is the log of the weighted average commercial price for control hospitals with positive matching weights. The relative post-merger price change is calculated as:

$$\Delta P = e^{\widehat{\beta_2}} - 1 \tag{3}$$

The statistical significance of the relative price change is evaluated using an inference procedure similar to that described in Abadie, Diamond, and Hainmueller (2010), in which the relative price change is compared to the distribution of "placebo" effects. The price change relative to a synthetic control is calculated for each hospital in the potential controls as if it were the merging hospitals. The estimated price change for PPMH/Palmyra relative to the synthetic control is then compared to the distribution of analogous price change estimates for the placebos to determine the probability that the relative post-merger price change is due to chance.

As a robustness check, we also calculate the post-merger price change relative to a non-synthetic control group consisting of other Hospital Authority hospitals in Georgia that were not involved in mergers, excluding critical access hospitals, hospitals lacking emergency

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[31] Other hospitals controlled by PPHS are excluded from this calculation.

[32] Kaul at al. (2016) show that matching on all pre-treatment outcomes makes the non-outcome predictors irrelevant for matching. As a robustness check, we also match on the 2007 and 2009 prices and the predictors of price.

departments, and hospitals serving fewer than 200 commercial inpatients in any year. In this case, the relative post-merger price change is calculated as in (2) and (3), except that δ_h is replaced by a vector of control indicators. Statistical inference is evaluated using the distribution of control price changes.

Quality Measurement

To analyze the change in quality after the merger, we use various quality metrics from two sources. First, we use mortality and readmission rates and patient satisfaction scores from CMS's Hospital Compare web site. For mortality, we use Hospital Compare's 30-day, all-cause, risk-adjusted mortality rates for heart attack (acute myocardial infarction (AMI)), heart failure, and pneumonia. Each rate reflects the percentage of Medicare inpatients (age 65 and above) who die within 30 days of their inpatient admission for the condition. The rates reflect deaths regardless of location (in or out of the hospital) and regardless of cause (whether related to the condition or not). The rates are also risk-adjusted to account for mortality rate differences based on age, past medical history, and comorbidities. For readmissions, we use Hospital Compare's 30-day risk-adjusted readmission rates for heart attack, heart failure, and pneumonia. Each rate reflects the percentage of Medicare inpatients (age 65 and above, excluding those who die in their initial admission or leave against medical advice) who are readmitted within 30 days of their inpatient admission for the condition. The rates reflect admissions to any hospital within the 30-day period and count admissions for any reason (whether related to the initial admitting condition or not). Like the mortality rates, the readmission rates are risk-adjusted to account for readmission rate differences based on age, past medical history, and comorbidities. For patient satisfaction, we use responses to the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) Survey. We focus on the responses to the question: "How do you rate the hospital overall?" Patients are asked to pick a number between 0 and 10 as a response, with 10 being the best response. Hospital Compare reports the percentage of survey respondents choosing 0 through 6, 7 or 8, and 9 or 10. Patients are sampled to take the survey regardless of insurance coverage and the responses are adjusted to account for differences in case-mix across hospitals. We restrict our analysis to hospitals with at least 300 respondents in both the pre and post-merger periods.

Hospital Compare lists many quality metrics beyond mortality and readmission rates and patient satisfaction scores. We focus on the metrics described above because these are the only metrics that were defined identically in the pre and post-merger periods. Furthermore, these measures form the basis of Medicare quality incentive payments. The three Hospital Compare mortality rates (heart attack, heart failure, and pneumonia) account for 25 percent of the score used to determine quality incentive payments under Medicare's Hospital Value-Based Purchasing (HVBP) program. Responses from the HCAHPS survey account

for an additional 25 percent of this score.[33] Medicare's Hospital Readmission Reduction Program is based on the three Hospital Compare readmission rates described above.[34]

For each Hospital Compare metric described above, we compare PPMH's post-merger change to that across a control group consisting of other Hospital Authority hospitals in Georgia that were not involved in mergers, excluding critical access hospitals and hospitals lacking emergency departments.[35] We also provide a snapshot of PPMH's current Hospital Compare quality scores, which include additional measures added recently.

The Agency for Healthcare Research and Quality (AHRQ) offers Quality Indicator software that evaluates the quality of inpatient care. We start with the GHA inpatient discharge data and calculate AHRQ Inpatient Quality Indicators (IQIs) and Patient Safety Indicators (PSIs). The IQIs provide mortality rates for selected inpatient procedures and conditions and the PSIs provide incidence rates related to complications, errors, and other potentially preventable adverse outcomes. For all of the AHRQ Quality Indicators, PPMH and Palmyra are pooled in both the pre and post-merger periods.

We use the GHA data to calculate the observed rate of in-hospital mortality and in-hospital injury for PPMH, the control group of Georgia Hospital Authority hospitals, and the state. The software identifies the actual number of relevant adverse outcomes (death or injury) that occurred as well as the eligible population of discharges that qualify as the denominator for each indicator. For example, when doing calculations related to IQI 15 (Acute Myocardial Infarction Mortality) based on information in each patient's record, the AHRQ Quality Indicator software determines the number of patients who died from a heart attack as well as the eligible population, which for IQI 15 is the number of patients who were treated for a heart attack.

The AHRQ Quality Indicator software uses State Inpatient Databases from AHRQ's Healthcare Cost and Utilization Project (HCUP) to provide a reference population rate for each indicator. The reference population is based on the inpatient discharge data from 45 states and accounts for more than 95% of discharges in the U.S.[36]

The AHRQ Quality Indicator software also calculates an expected rate. The expected rate accounts for the hospital's actual case mix, including age, sex, DRG, and comorbidities, and

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[33] https://www.medicare.gov/hospitalcompare/data/total-performance-scores.html and https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/hospital-value-based-purchasing/index.html

[34] https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Readmissions-Reduction-Program.html

[35] This is the same control group used for the price change robustness check described above. A synthetic control is not used for the quality analysis because only one pre-merger time period is available in each data set used to measure quality.

[36] See AHRQ Quality Indicators Benchmark Data Tables for Version 5.0, available at https://www.qualityindicators.ahrq.gov/Downloads/Modules/PQI/V50/Version_50_Benchmark_Tables_PQI.pdf.

represents the rate a hospital would have if it had average performance as compared to the reference population, given its actual case mix.[37] For each indicator, the expected rate takes into account the case mix and characteristics of the eligible population of the hospital. An observed to expected rate ratio of 1 indicates that the hospital or group of hospitals is performing equal to the benchmark, a ratio less than 1 indicates that the hospital or group of hospitals is outperforming the benchmark, and a ratio greater than 1 indicates that the hospital or group of hospitals is performing worse than the benchmark.

Finally, the AHRQ software adjusts the case mix (including age, sex, DRG, and comorbidities) for each hospital (or group of hospitals) to calculate a risk-adjusted rate, which is an estimate of how the hospital would perform based on an average case mix of patients (specifically, the same case mix as the reference population), rather than its own case mix of patients. The risk-adjusted rate is the ratio of the observed rate to the expected rate multiplied by the reference population rate. For each AHRQ Quality Indicator, we compare the risk-adjusted rate for PPMH, the control group of Georgia Hospital Authority hospitals, the state, and the national benchmark.[38] Unlike the Hospital Compare mortality rates, the IQI mortality rates only reflect deaths that occur in the hospital.

For the AHRQ Quality Indicators, we focus our analysis on the IQI and PSI individual indicators that have been endorsed by the National Quality Forum (NQF), as long as the numerators are greater than or equal to fifteen to ensure the reliability of the reported rates.[39] The AHRQ Quality Indicators also offer the option of computing IQI and PSI composite measures, which are intended to reflect the overall quality of a hospital by incorporating multiple individual IQI and PSI metrics. We are not reporting the IQI and PSI composite scores because, for some Quality Indicators included in the composite, the number of observed cases at PPMH was under the AHRQ recommended reporting threshold and may produce observed rates that are unreliable.

Results

Price:

Figure 2 plots the case-mix adjusted weighted average commercial price at PPMH and Palmyra (as calculated in equation (1)) against the weighted average "synthetic" control price from 2006 through 2014. Immediately after the merger, in 2012, the PPMH/Palmyra price spiked to over $12,000 per admission. Relative to the synthetic control, this 2012 price spike represents a 43% post-merger price increase (which is statistically significant). Although the cause of this price spike is unclear, the most likely explanation for most of this price spike is the inclusion of the Palmyra patient volume on the higher-priced PPMH commercial contracts. In 2011, PPMH's commercial price was over $11,000, while Palmyra's was $6,700. After the

[37] See AHRQ Toolkit for full details, https://www.ahrq.gov/professionals/systems/hospital/qitoolkit/index.html.
[38] National Benchmark Comparative Data are available in the AHRQ Archives at https://www.qualityindicators.ahrq.gov/Archive/default.aspx#iqi.
[39] See https://www.qualityindicators.ahrq.gov/modules/list_ahrq_qi.aspx for the full list of indicators endorsed by NQF.

acquisition of Palmyra in December 2011, it is possible that Palmyra's patient volume was reimbursed at the higher PPMH commercial rates. In particular, after Palmyra was subsumed within PPMH in August 2012—ceasing to be a separately licensed hospital and becoming a campus of PPMH—it would have been impossible to reimburse Phoebe Putney a different amount for a patient treated at the former Palmyra than a similar patient treated at PPMH.

In 2013, the case-mix adjusted commercial price at PPMH/Palmyra fell back to its pre-merger level and closer to the synthetic control price. (Relative to the synthetic control, the post-merger price increase in 2013 alone was 3 percent, which is not statistically significant). It is not clear why this happened. The price decrease may have been in response to or in anticipation of actions by the Authority to correct the price spike of the previous year. It is also possible that the price decrease was in response to the Supreme Court's ruling in early 2013 remanding the FTC's challenge of the acquisition to the lower courts. However, PPMH/Palmyra's price remained virtually unchanged in 2014 after the initial settlement with the FTC was announced, although the settlement was rescinded by the FTC for a portion of 2014. (As in 2013, the post-merger price increase in 2014 relative to the synthetic control was roughly 3 percent.) It is not clear whether Phoebe Putney renegotiated any commercial contracts during this three year period. Thus, if the Authority's regulation of Phoebe Putney was ineffective, as the FTC claimed, the initial price spike in 2012 and subsequent decline in 2013-14 may not reflect any change in market power associated with the merger.

Across all three post-merger years (2012-2014), the average post-merger price increase relative to the synthetic control was 15 percent, which is statistically significant.[40] Most of this price increase was due to the price spike in 2012, as the PPMH/Palmyra price was much closer to the synthetic control price in subsequent years. If, instead, the price increase is estimated relative to a control group of non-merging Georgia Hospital Authority hospitals, the relative price increase was 9 percent, which is not statistically significant ($p = 0.14$).[41] While we believe the price change measured relative to a synthetic control is more accurate, this highlights that the price change estimate is not robust across control groups and estimation techniques.

Quality:

Table 2 describes PPMH's current composite quality scores according to Hospital Compare. Apart from effectiveness of care and the efficient use of medical imaging, PPMH is worse than the national average in all of the other composite measures (mortality, readmission, safety, patient experience, and timeliness). Overall, CMS rates PPMH a one star hospital (out of five possible stars).

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[40] If the 2007 and 2009 prices are used instead of the 2006, 2008, and 2010 prices to match control hospitals to PPMH/Palmyra, the average post-merger price increase relative to the synthetic control across all three post-merger years was 26 percent, which is statistically significant.

[41] A graph of PPMH/Palmyra's price and the control group mean price over time is included in the Appendix.

Even though PPMH is currently a low quality hospital (at least according to Hospital Compare), that does not necessarily imply that the merger led to a reduction in quality. To investigate the change in quality associated with the merger, we calculate the change in PPMH's mortality and readmission rates and patient satisfaction scores after the merger and compare them to changes across a control group of non-merging Georgia Hospital Authority hospitals, as well as changes across Georgia and the nation overall. It is important to note that PPMH's pre-merger rates do not include Palmyra, whereas PPMH's post-merger rates do include Palmyra. For this reason, we list Palmyra's pre-merger rates alongside PPMH's pre-merger rates. Because the Hospital Compare metrics are risk-adjusted, it is not possible to combine mortality or readmission rates.

Table 3 summarizes the changes in the Hospital Compare measures for PPMH and the control hospitals. Apart from heart attack and heart failure mortality, all of the other Hospital Compare quality measures for PPMH declined relative to controls after the merger with Palmyra.

Tables 4 and 5 list the heart attack mortality and readmission rates for PPMH, Palmyra, and the controls, respectively. PPMH's heart attack mortality and readmission rates both fell after the merger, but not as much as the decline across the control group, Georgia, or the nation overall. PPMH's mortality decline is within the distribution of control mortality reductions (as seen in the heart attack mortality histogram in the Appendix), but PPMH's readmission rate decline is not. All of the non-merging Hospital Authority hospitals in Georgia reduced their heart attack readmission rates more than PPMH between 2010 and 2015.

Tables 6 and 7 list the heart failure mortality and readmission rates for PPMH, Palmyra, and the controls, respectively. Although PPMH's risk-adjusted heart failure mortality rate was higher than the control group, Georgia, and national rates in both 2010 and 2015, PPMH's rate declined slightly while the control group, Georgia, and national rates increased. However, PPMH's heart failure readmission rate increased slightly, while the control group, Georgia, and national rates all fell by more than two percentage points. PPMH's readmission rate increase may have been caused by Palmyra's higher pre-merger rate. Furthermore, PPMH's post-merger rate is in line with the control group, Georgia, and national rates.

Tables 8 and 9 list the pneumonia mortality and readmission rates for PPMH, Palmyra, and the controls, respectively. PPMH's risk-adjusted pneumonia mortality rate increased substantially from 11.9 percent in 2010 to over 20 percent in 2015, far exceeding the control, Georgia, or national increases. In other words, during the post-merger period of July 1, 2012 through June 30, 2015, over 20 percent of the Medicare patients over the age of 65 admitted to PPMH (including the former Palmyra) for pneumonia died within 30 days. Only one other Hospital Authority hospital in Georgia had a pneumonia mortality rate increase greater than PPMH's between the pre and post-merger periods. In addition, PPMH's pneumonia readmission rate increased slightly between 2010 and 2015, while most hospitals, including most in the control group, experienced a decline in readmission rates.

Finally, the Hospital Compare data indicate that PPMH experienced a significant decline in patient satisfaction after the acquisition of Palmyra, as seen in tables 10 and 11. The percentage of survey respondents rating PPMH 0 to 6 increased from 10 to 13 percent after the merger, whereas most other Georgia Hospital Authority hospitals saw no change or a decline in this percentage. Likewise, the percentage of respondents rating PPMH 9 or 10 in overall satisfaction fell from 65 to 60 percent after the merger, while most other hospitals improved the share of patients who were highly satisfied. In fact, no other Georgia Hospital Authority hospital had a decline in this percentage as large as PPMH's.

Overall, the Hospital Compare quality metrics (with the possible exception of heart failure) indicate a significant decline in quality at PPMH after the acquisition of Palmyra. While these metrics have the advantage of being risk-adjusted, all-cause, 30-day mortality and readmission rates, they are pooled across three year periods, so they make it difficult to determine trends within the post-merger period. Furthermore, the Hospital Compare metrics do not allow an analysis of the change in preventable complications and errors at PPMH/Palmyra after the merger. Therefore, we supplement the Hospital Compare metrics with the AHRQ IQIs and PSIs.

For the AHRQ Quality Indicators, the risk-adjusted rate is the ratio of the observed rate to the expected rate multiplied by the reference population rate. The risk-adjusted rate is the rate of the adverse outcome a hospital or group of hospitals would have for an average case mix, specifically the case mix in the reference population. AHRQ recommends using the risk-adjusted rate for comparisons across hospitals and comparisons over time because it controls for the case mix (age, sex, DRG, and comorbidity) of patients.

Figures 3-6 depict the risk-adjusted rate of mortality for heart attack (acute myocardial infarction) (IQI 15), acute stroke (IQI 17), pneumonia (IQI 20), and heart failure (IQI 16), respectively. These graphs indicate that PPMH performed worse than expected for treating heart attack, acute stroke, and pneumonia patients in 2011, 2012, and 2013, and worse than the control group and state counterparts since 2010. While the heart failure IQI is worse than the control and state ratios in all years, its trend is similar to the control group and Georgia trends.

The heart attack, heart failure, and pneumonia IQIs are trending toward the control benchmark in 2013, which is the last period for which we have sufficient data to generate reliable mortality rates for these conditions. In addition, the rates for PPMH, the control group, and Georgia are all converging toward the national benchmark by 2013. By 2014, PPMH/Palmyra's risk-adjusted rate for acute stroke is similar to the control, Georgia, and national rates.

Figure 7 shows the risk-adjusted rate for accidental punctures and lacerations (PSI 15). There has been a marked increase in the rate of preventable patient injuries at PPMH since 2011 and, unlike the IQIs, the accidental puncture and laceration rate at PPMH is diverging from the control group and Georgia rates by 2014.

As measured by the AHRQ risk-adjusted mortality rates, the decline in quality at PPMH and Palmyra seems to begin in 2011, after the announcement of the merger in December 2010 and mostly before the consummation of the merger in December 2011. In addition, the mortality rates seem to be converging to the benchmark rates by the end of the data period. This suggests that the reduction in quality may have been caused by the distraction of merger-related activities, such as litigation and the integration of the hospitals. In particular, this may conflict with the defendants' stated justification for the merger as a way to expand capacity that is less disruptive to patient care than construction.

The pattern of quality reductions is also consistent with the expectation of reduced competition from Palmyra. The convergence of the mortality rates, but not the rate of accidental punctures and lacerations, to the national rates may result from the use of these measures in Medicare's Hospital Value-Based Purchasing (HVBP) Program. The heart attack, heart failure, and pneumonia risk-adjusted mortality rates each enter into the VBP performance measure directly, whereas the accidental puncture and laceration rate enters indirectly through the Complication and Patient Safety Composite. Even with reduced incentives to maintain and improve quality after the acquisition of Palmyra, Phoebe Putney may have more incentive to improve its heart attack, heart failure, and pneumonia mortality rates than other aspects of quality due to the HVBP program.

Overall, the AHRQ Quality Indicator results are consistent with the Hospital Compare quality metrics and indicate a post-merger reduction in quality at PPMH/Palmyra relative to controls (with the possible exception of heart failure). The AHRQ risk-adjusted mortality rates suggest that most of the reduction in quality occurred at the time of the merger or shortly thereafter.

Discussion

After the acquisition of Palmyra, the commercial inpatient price at PPMH increased significantly. Although the cause of this price spike is unclear, it may be due (at least in part) to the assignment of Palmyra's commercial patient volume to the higher PPMH prices. The price subsequently declined and again the cause is unknown. It is possible that Phoebe Putney reduced prices in response to or anticipation of actions of the Authority. It is also possible that Phoebe Putney reduced prices in anticipation of renewed antitrust litigation with the FTC before the final settlement in 2015. Overall, the effect of the merger on hospital prices is mixed and unclear. At best, these findings suggest that regulators like the Authority may have difficulty adapting to mergers, particularly when the merging parties have different prices.

Regarding quality, it is clear that PPMH is a low quality hospital by most measures and a comparison of the change in quality after the acquisition suggests that the PPMH/Palmyra combination reduced quality relative to other similar hospitals in Georgia. This is consistent with the theoretical prediction that a reduction in competition will lead to a strong incentive to reduce investments in quality when prices are regulated.

These findings suggest that any government considering the replacement of antitrust enforcement with health care price and quality regulation should carefully consider the risks. While regulation of provider prices might control health care costs, regulators may have trouble adapting to changes in the market, such as those brought about by mergers. The ability to adapt may be particularly difficult when regulating health care quality, as providers have a strong incentive to cut back on quality investments in response to lessened competition when prices are regulated. The reduction in quality we observed at PPMH/Palmyra after the merger was based on metrics that are currently used by Medicare to promote quality inpatient care. It is possible that other aspects of quality that are more difficult to quantify and incorporate into incentive programs may be even harder to regulate. Overall, the experience of the Phoebe Putney/Palmyra merger highlights the problems that can occur when competition is reduced in a regulated environment.

Figure 1:

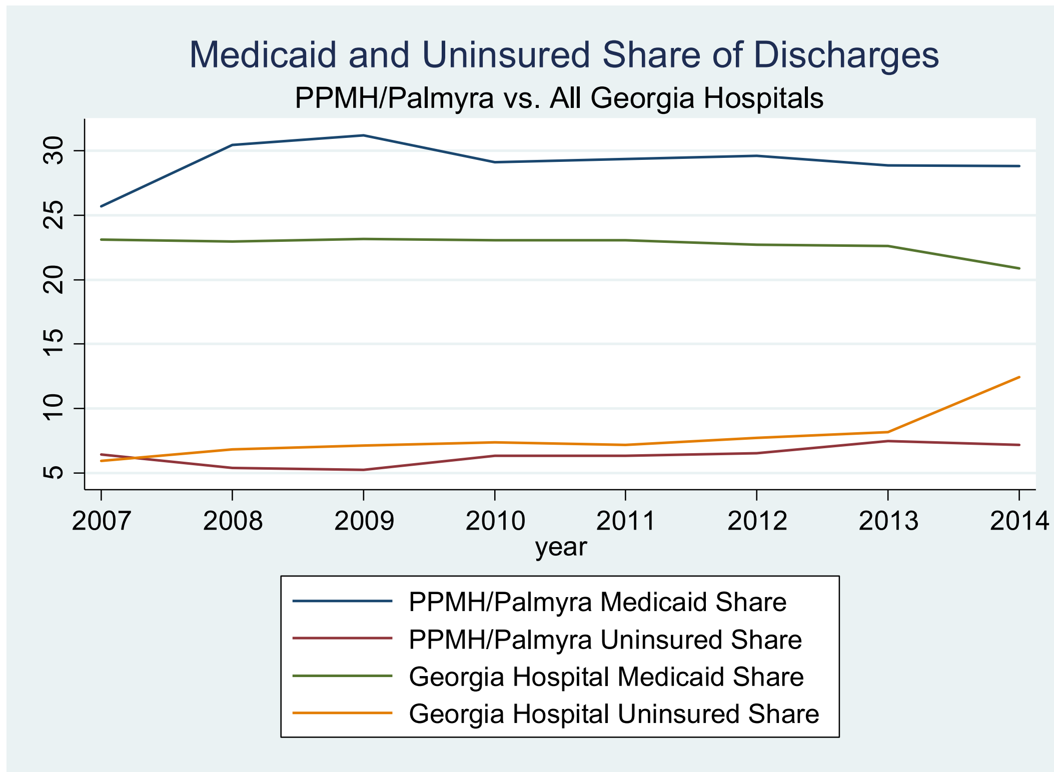


Figure 2:

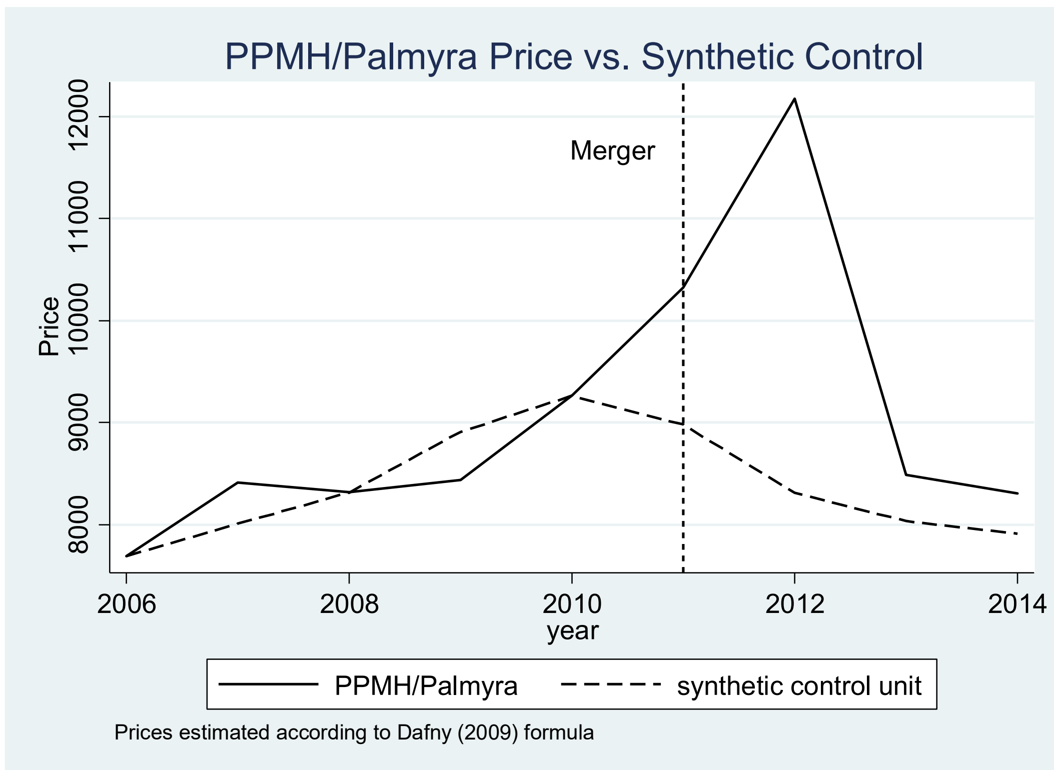


Table 1: Pre-Merger Characteristics for PPMH/Palmyra and the Synthetic Control

Characteristic	PPMH/Palmyra	Synthetic Control Unit
Operating Cost per Adjusted Admission	$1,627	$1,625
Residents and Interns per Bed	0.031	0.031
Occupancy Rate	64.8%	64.8%
Price (2006)	$7,693	$7,690
Price (2008)	$8,314	$8,313
Price (2010)	$9,263	$9,261

Table 2: 2016 Phoebe Putney Overall Composite Ratings

Source: CMS Hospital Compare

Composite Measure	Rating/Comparison to National Average
Mortality	Below the national average
Safety of Care	Below the national average
Readmission	Below the national average
Patient Experience	Below the national average
Effectiveness of Care	Same as the national average
Timeliness of Care	Below the national average
Efficient Use of Medical Imaging	Above the national average
Overall Star Rating (out of 5)	1

Table 3: Summary of Changes to Hospital Compare Measures

	Post-Merger Change at PPMH	**Mean Post-Merger Change Across Controls**	**Difference in Differences (DID)**
Heart Attack Mortality	-1.3	-1.6	0.3
Heart Attack Readmissions	-0.9	-2.8	1.9***
Heart Failure Mortality	-0.4	1.3	-1.7***
Heart Failure Readmissions	0.5	-2.4	2.9***
Pneumonia Mortality	8.3	3.9	4.4***
Pneumonia Readmissions	0.3	-0.9	1.2***
Patient Dissatisfaction	3.0	-2.6	5.6***
Patient Satisfaction	-5.0	6.0	-11***

*** Difference statistically significant ($p < 0.01$)

Control Group = Non-Merging Hospital Authority Hospitals in Georgia

Table 4: Risk-Adjusted 30-Day Heart Attack (AMI) Mortality Rate

		2010	2015	Change	DID
Phoebe Putney Memorial Hospital	Measure	16.4	15.1	-1.3	0.3
	95% CI High	19.9	18.4		
	95% CI Low	13.4	12.4		
Palmyra Medical Center		15.5			
Control Group		16.6	14.5	-1.6	
Georgia		15.8	14.3	-1.5	
National		15.9	14.1	-1.8	

Table 5: Risk-Adjusted 30-Day Heart Attack (AMI) Readmission Rate

		2010	2015	Change	DID
Phoebe Putney Memorial Hospital	Measure	17.5	16.6	-0.9	1.9
	95% CI High	20.5	19.5		
	95% CI Low	14.8	14.2		
Palmyra Medical Center		No report			
Control Group		19.7	16.9	-2.8	
Georgia		18.9	16.6	-2.3	
National		19.8	16.8	-3	

- 2010 covers the period July 1, 2007 through December 31, 2010
- 2015 covers the period July 1, 2012 through June 30, 2015
- 95% CI High = 95% confidence interval upper bound
- 95% CI Low = 95% confidence interval lower bound
- For the control group, “Change” is the mean change across the control group, not the difference in the control group means

Table 6: Risk-Adjusted 30-Day Heart Failure Mortality Rate

		2010	2015	Change	DID
Phoebe Putney Memorial Hospital	Measure	14	13.6	-0.4	-1.7
	95% CI High	17.2	16.4		
	95% CI Low	11.3	11.2		
Palmyra Medical Center		13			
Control Group		11.4	12.5	1.3	
Georgia		11.3	11.6	0.4	
National		11.3	12.1	0.8	

Table 7: Risk-Adjusted 30-Day Heart Failure Readmission Rate

		2010	2015	Change	DID
Phoebe Putney Memorial Hospital	Measure	21.3	21.8	0.5	2.9
	95% High	24.9	24.8		
	95% Low	18.5	19.2		
Palmyra Medical Center		24.8			
Control Group		24.3	21.9	-2.4	
Georgia		23.8	21.6	-2.1	
National		24.8	21.9	-2.9	

- 2010 covers the period July 1, 2007 through December 31, 2010
- 2015 covers the period July 1, 2012 through June 30, 2015
- 95% CI High = 95% confidence interval upper bound
- 95% CI Low = 95% confidence interval lower bound
- For the control group, “Change” is the mean change across the control group, not the difference in the control group means

Table 8: Risk-Adjusted 30-Day Pneumonia Mortality Rate

		2010	2015	Change	DID
Phoebe Putney Memorial Hospital	Measure	11.9	20.2	8.3	4.4
	95% High	14.4	23.2		
	95% Low	9.7	17.7		
Palmyra Medical Center		12.4			
Control Group		12.6	16.4	3.9	
Georgia		12.4	17.0	4.6	
National		11.9	16.3	4.4	

Table 9: Risk-Adjusted 30-Day Pneumonia Readmission Rate

		2010	2015	Change	DID
Phoebe Putney Memorial Hospital	Measure	18.1	18.4	0.3	1.2
	95% High	21.2	21.1		
	95% Low	15.3	16.1		
Palmyra Medical Center		17.2			
Control Group		18.5	17.6	-0.9	
Georgia		18.2	17.3	-0.9	
National		18.4	17.1	-1.3	

- 2010 covers the period July 1, 2007 through December 31, 2010
- 2015 covers the period July 1, 2012 through June 30, 2015
- 95% CI High = 95% confidence interval upper bound
- 95% CI Low = 95% confidence interval lower bound
- For the control group, “Change” is the mean change across the control group, not the difference in the control group means

Table 10: Percent Rating Hospital 0-6 (out of 10) in Overall Satisfaction

	2010	2015	Change	DID
Phoebe Putney Memorial Hospital	10	13	3	5.6
Palmyra Medical Center	8			
Control Group	10.1	7.5	-2.6	
Georgia	9	8	-1	
National	9	7	-2	

Table 11: Percent Rating Hospital 9-10 (out of 10) in Overall Satisfaction

	2010	2015	Change	DID
Phoebe Putney Memorial Hospital	65	60	-5	-11
Palmyra Medical Center	69			
Control Group	66.8	72.8	6	
Georgia	67	71	4	
National	68	72	4	

- 2010 covers the period January 1, 2010 through December 31, 2010
- 2015 covers the period January 1, 2015 through December 31, 2015
- For the control group, “Change” is the mean change across the control group, not necessarily the difference in the control group means

Figure 3:

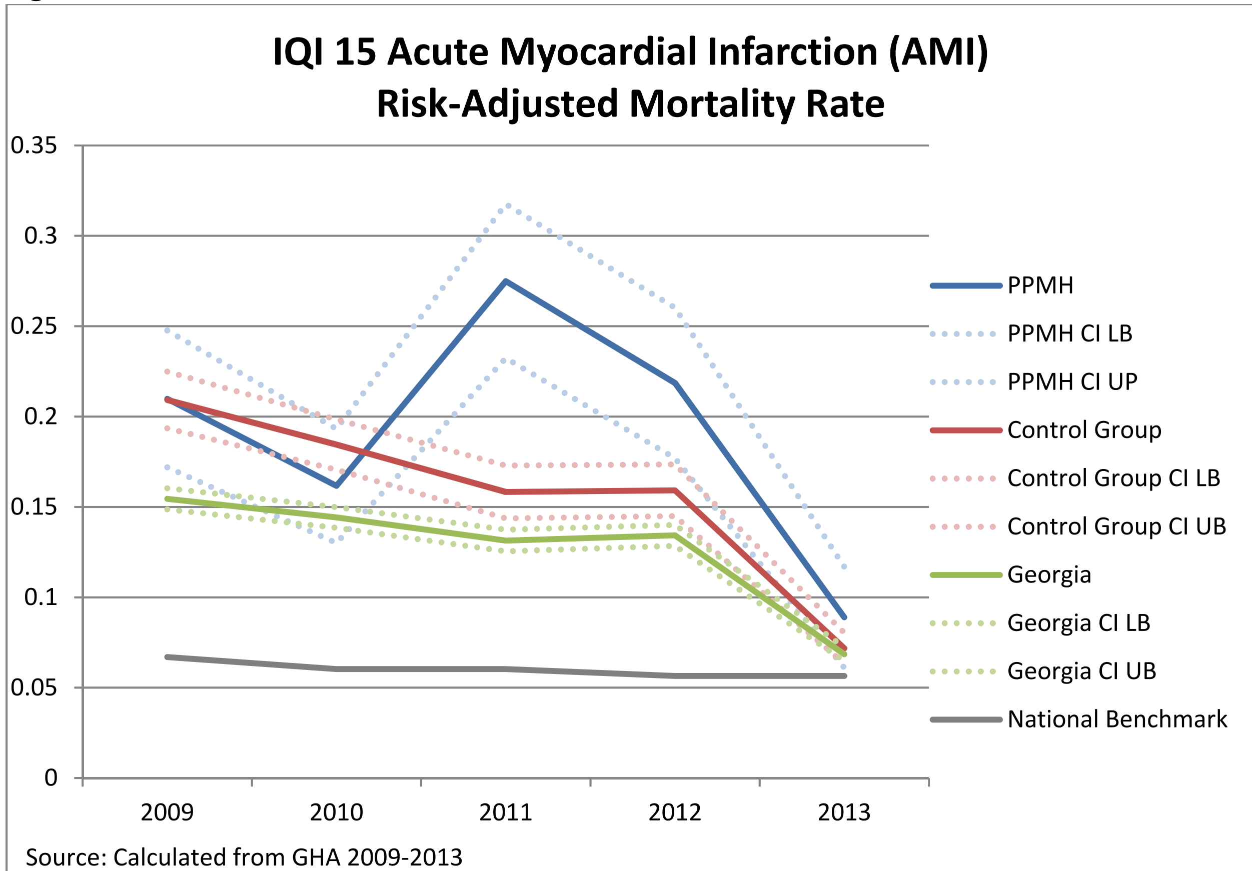


Figure 4:

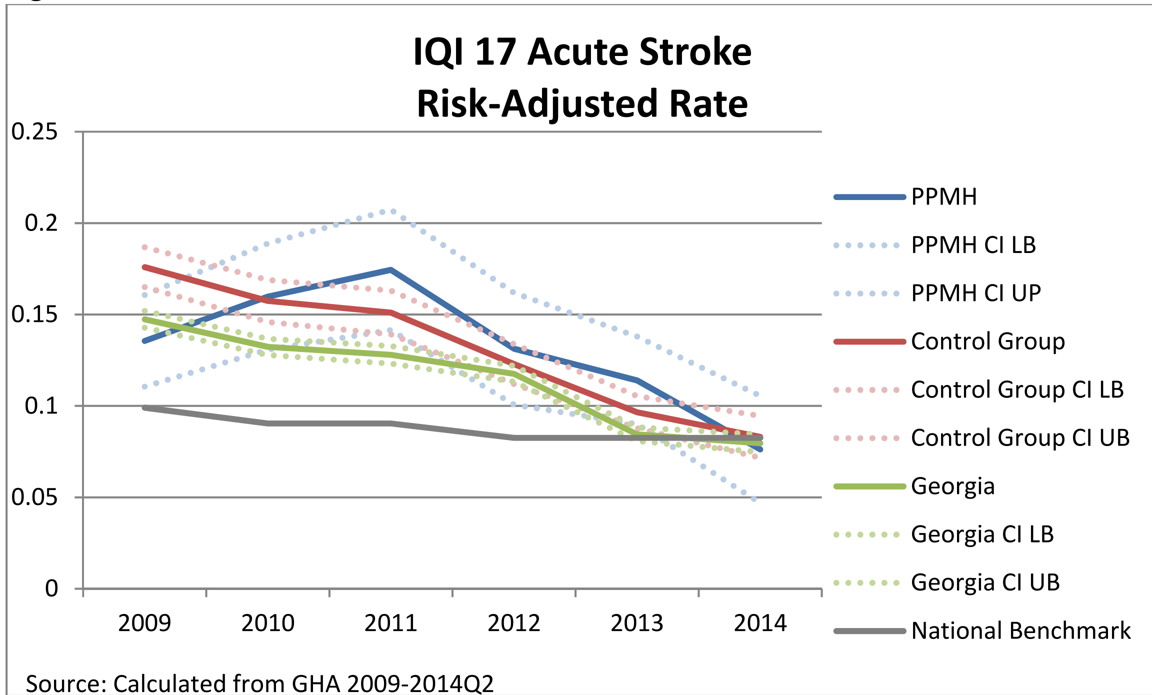


Figure 5:

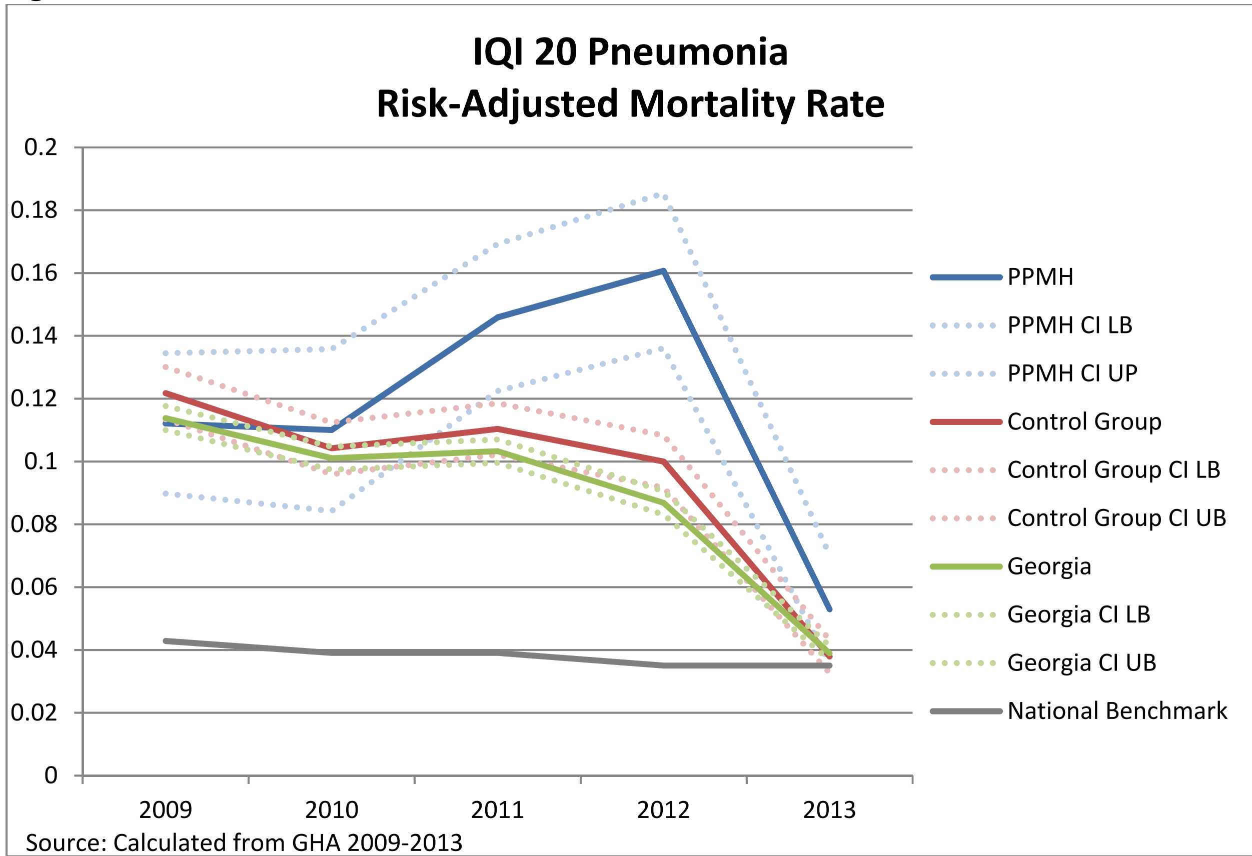


Figure 6:

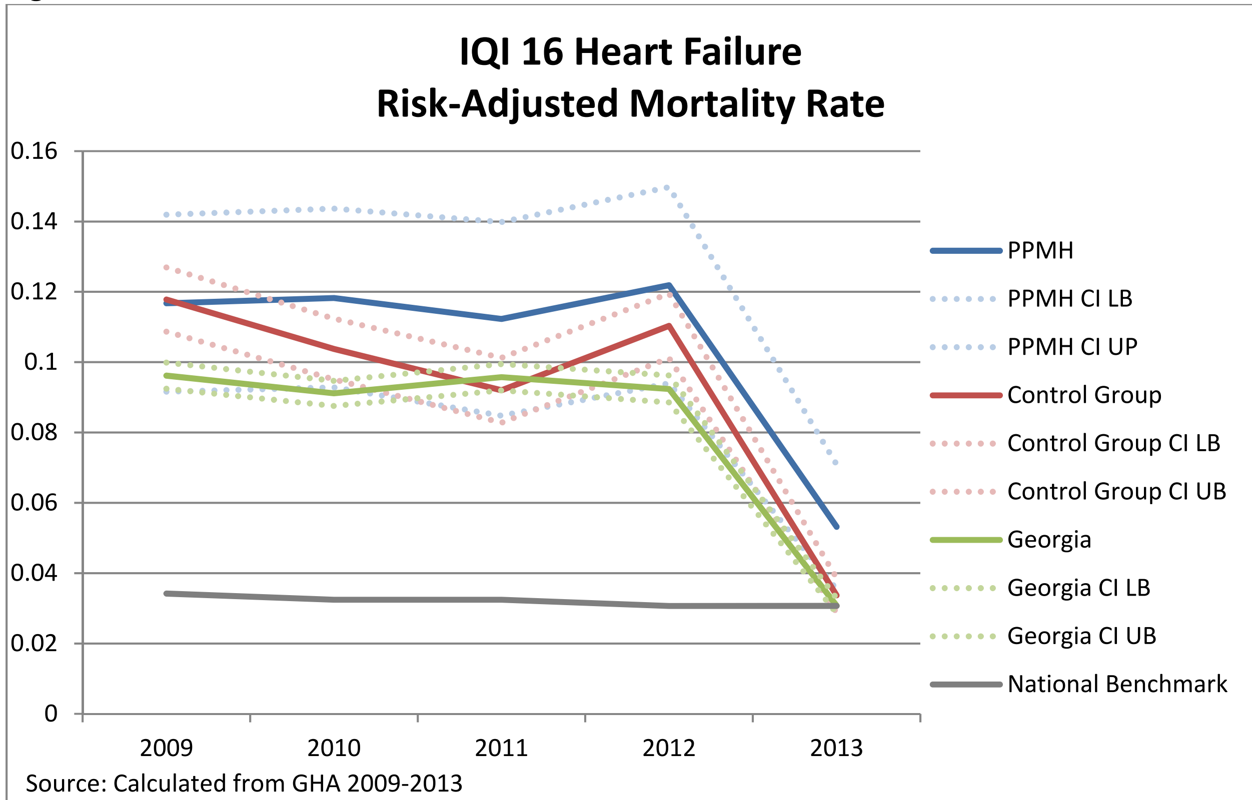
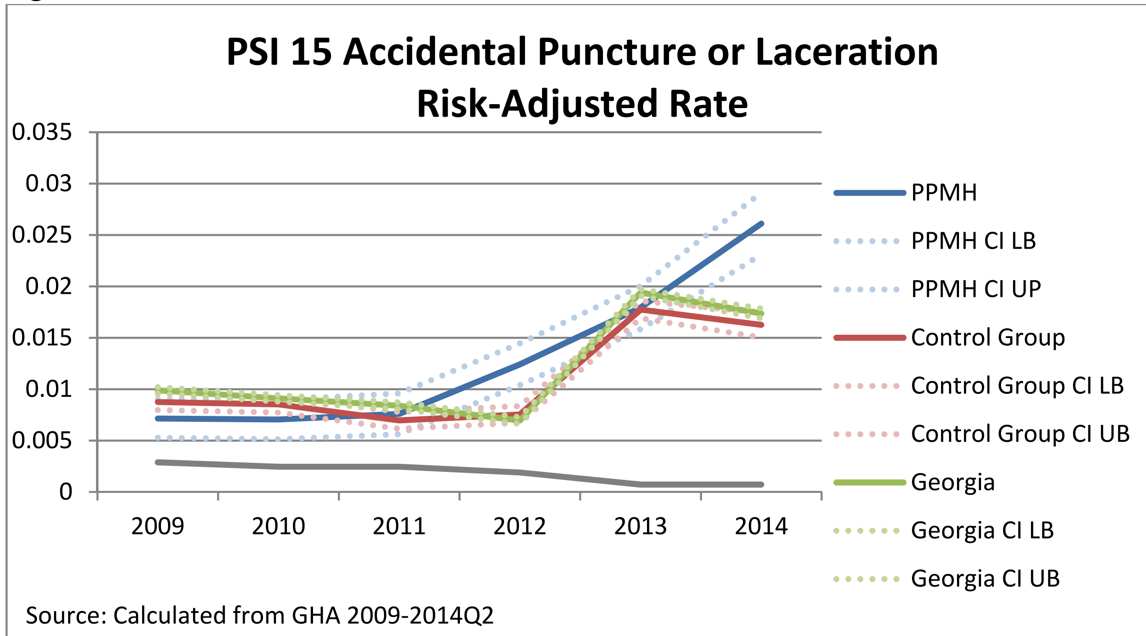


Figure 7:



Source: Calculated from GHA 2009-2014Q2

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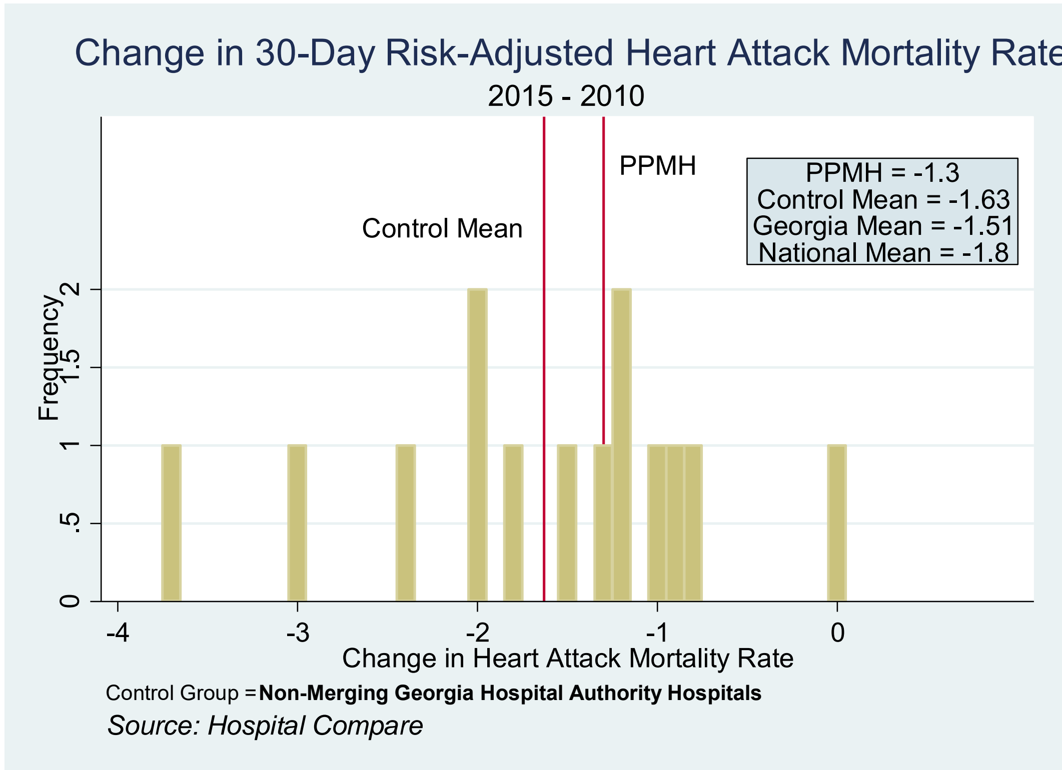
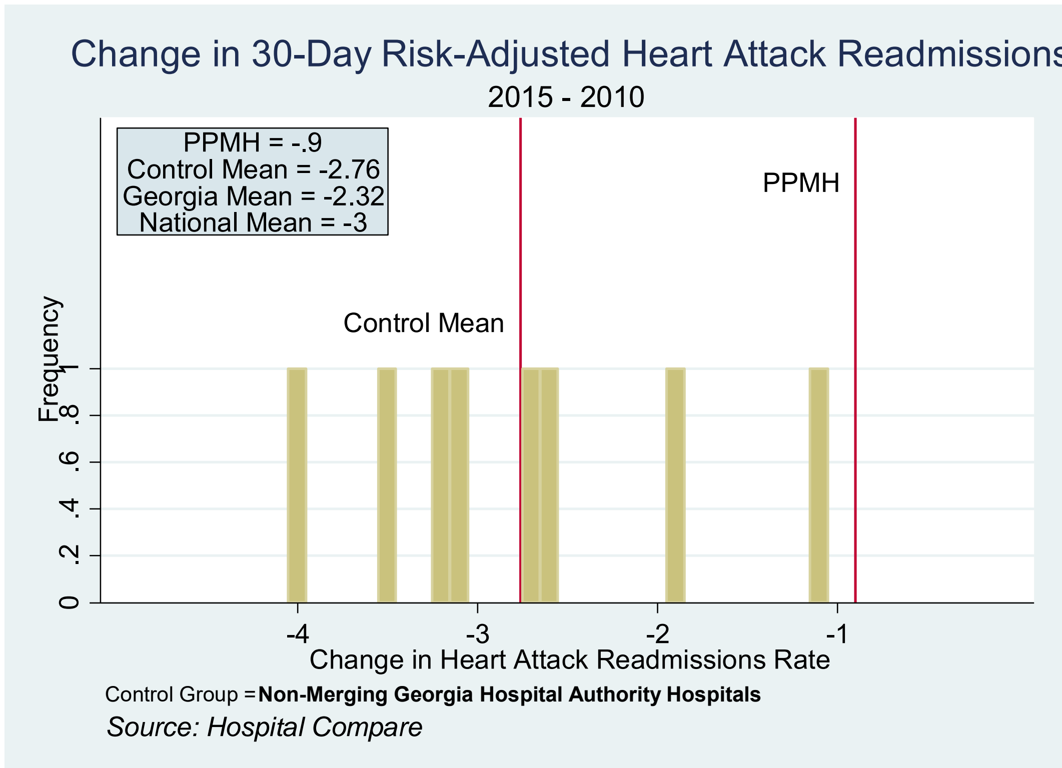
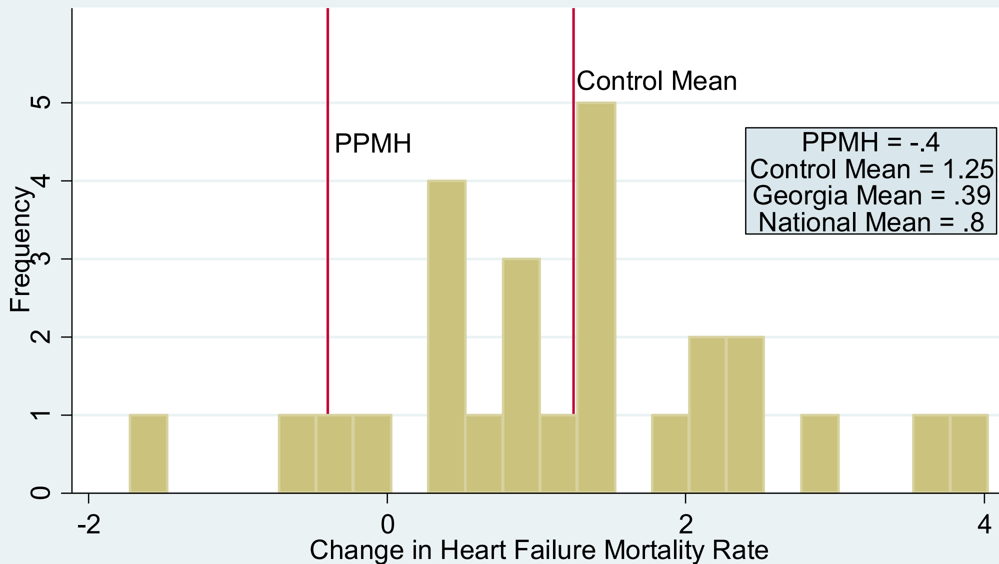
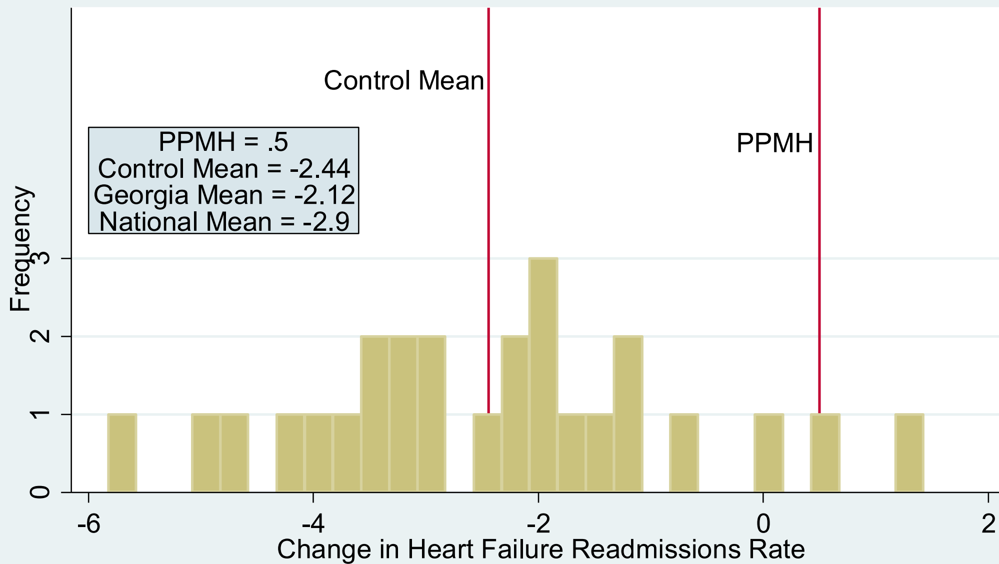
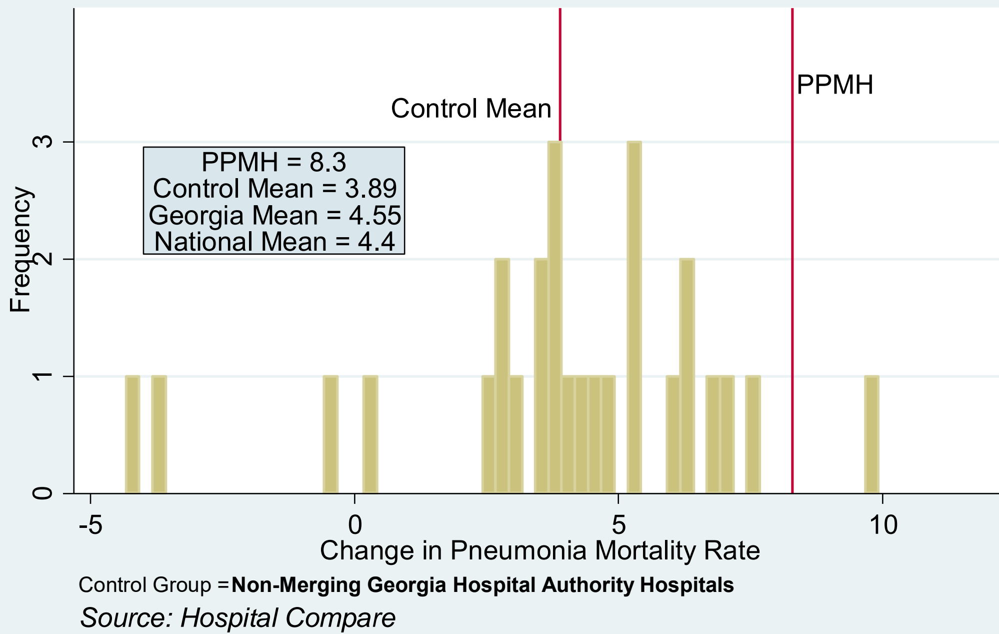
Appendix: Control Group Histograms of Hospital Compare Measures

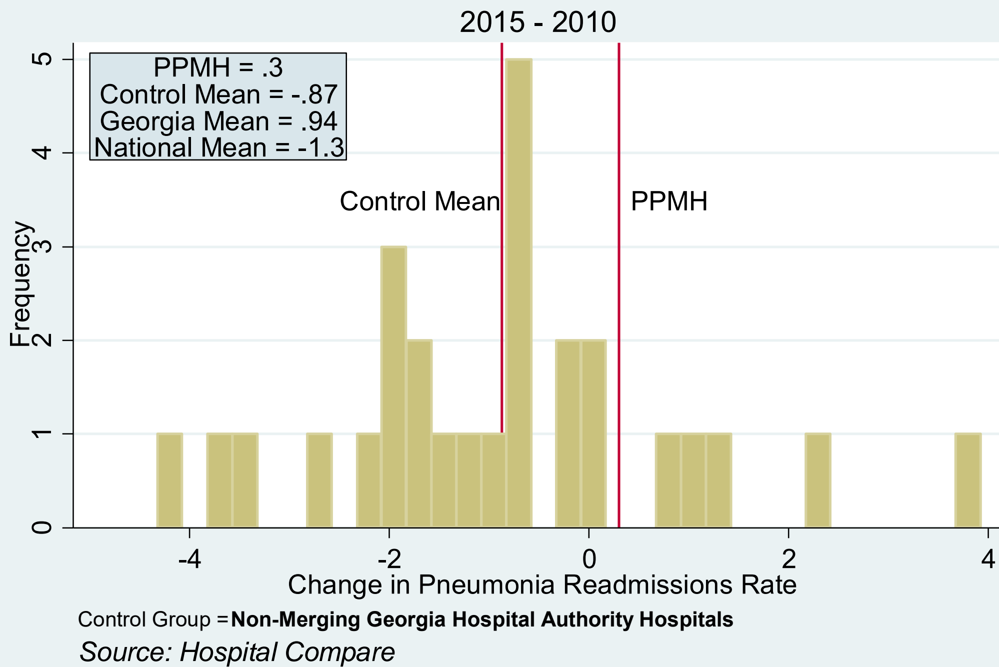


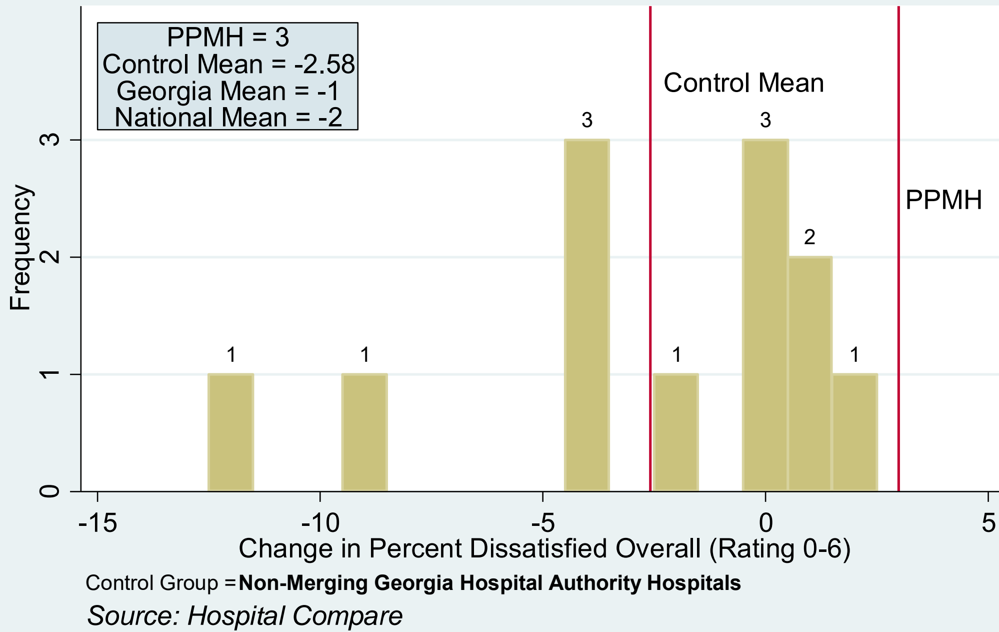


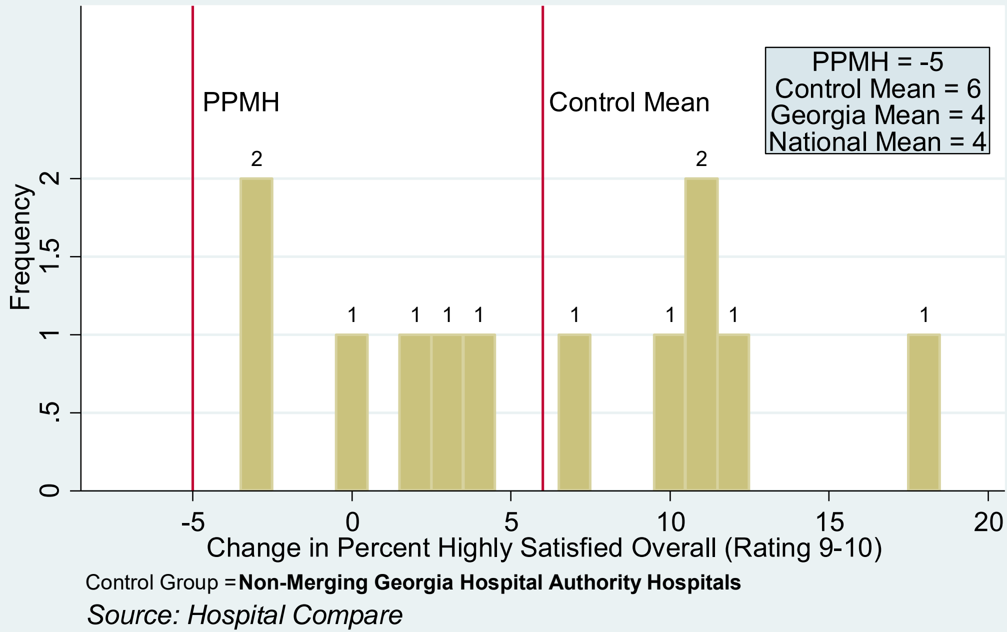

Change in 30-Day Risk-Adjusted Heart Failure Mortality Rate
2015 - 2010
Control Mean
PPMH
PPMH = -.4
Control Mean = 1.25
Georgia Mean = .39
National Mean = .8
Frequency
0
1
2
3
4
5
-2
0
2
4
Change in Heart Failure Mortality Rate
Control Group = Non-Merging Georgia Hospital Authority Hospitals
Source: Hospital Compare

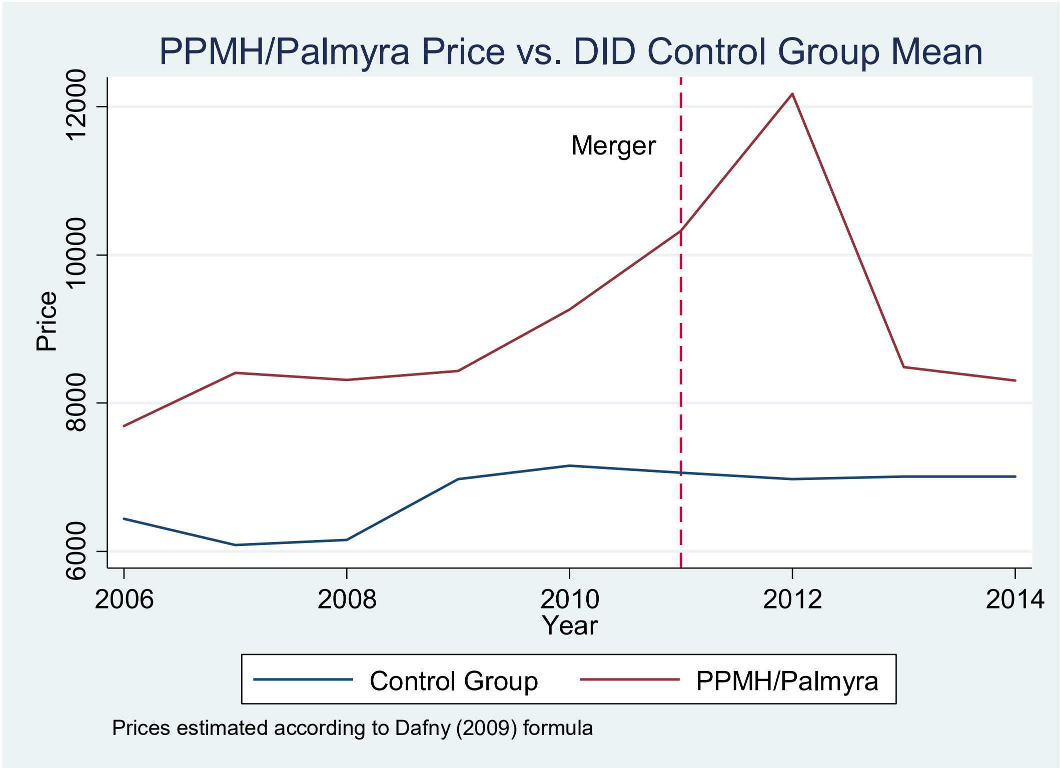

Change in 30-Day Risk-Adjusted Heart Failure Readmissions
2015 - 2010
Control Mean
PPMH
PPMH = .5
Control Mean = -2.44
Georgia Mean = -2.12
National Mean = -2.9
Frequency
0
1
2
3
-6
-4
-2
0
2
Change in Heart Failure Readmissions Rate
Control Group = Non-Merging Georgia Hospital Authority Hospitals
Source: Hospital Compare


Change in 30-Day Risk-Adjusted Pneumonia Mortality Rate
2015 - 2010
Control Mean
PPMH
PPMH = 8.3
Control Mean = 3.89
Georgia Mean = 4.55
National Mean = 4.4
Frequency
0
1
2
3
-5
0
5
10
Change in Pneumonia Mortality Rate
Control Group = Non-Merging Georgia Hospital Authority Hospitals
Source: Hospital Compare


Change in 30-Day Risk-Adjusted Pneumonia Readmissions
2015 - 2010
PPMH = .3
Control Mean = -.87
Georgia Mean = .94
National Mean = -1.3
Control Mean
PPMH
Frequency
0
1
2
3
4
5
-4
-2
0
2
4
Change in Pneumonia Readmissions Rate
Control Group = Non-Merging Georgia Hospital Authority Hospitals
Source: Hospital Compare


Change in Percent Rating Hospital 0-6 Out of 10
in Overall Satisfaction 2015 - 2010
PPMH = 3
Control Mean = -2.58
Georgia Mean = -1
National Mean = -2
Control Mean
PPMH
Frequency
Change in Percent Dissatisfied Overall (Rating 0-6)
Control Group = Non-Merging Georgia Hospital Authority Hospitals
Source: Hospital Compare


Change in Percent Rating Hospital 9-10 Out of 10
in Overall Satisfaction 2015 - 2010
PPMH = -5
Control Mean = 6
Georgia Mean = 4
National Mean = 4
PPMH
Control Mean
Frequency
Change in Percent Highly Satisfied Overall (Rating 9-10)
Control Group = Non-Merging Georgia Hospital Authority Hospitals
Source: Hospital Compare


PPMH/Palmyra Price vs. DID Control Group Mean
Merger
Price
6000
8000
10000
12000
2006
2008
2010
2012
2014
Year
Control Group
PPMH/Palmyra
Prices estimated according to Dafny (2009) formula