Hospital Consolidation and the Nurse Labor Market*

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Abstract

This paper examines the impact of two types of hospital consolidations—mergers and system-joinings—on the employment and wages of nurses. Nurses are an important market to examine as there are persistent reports of shortages and large expected future demand. Using data on all hospital consolidations between 1983 and 2009, I find large employment decreases following a hospital merger but no decrease following a system-joining. I also find zero wage effect from either type of consolidation. I conclude that this result is consistent with the employment decreases being driven by efficiency gains rather than an increase in monopsony power. Keywords: Hospital Consolidation, Hospital Mergers, Monopsony, Nurse Labor Market; *JEL* Codes: L22, I11, J20, J42.

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1 Introduction

A well-documented "merger wave" occurred in the hospital sector during the 1990s and early 2000s. These mergers received a lot of attention from economists, policy makers, and antitrust authorities. There now appears to be a new wave on the horizon. From 2009 to 2012, the number of annual hospital mergers more than doubled, from 50 to 105 (New York Times, 2013). Congressman Jim McDermott recently asked the U.S. Government Accountability Office to investigate the effects of hospital mergers as he is worried that hospitals are starting to resemble the consolidated banks that were once "too big to fail." Furthermore, Cory Booker, Senator from New Jersey, specifically called for the increased scrutiny of the labor effects of mergers.

While hospitals tout increased efficiency and decreasing costs as a reason for the mergers, policy analysts and antitrust authorities worry that the decrease in competition could result in higher prices for consumers.[1] These potential price effects have been studied extensively in the literature. In contrast, in this paper, I am interested in the labor market consequences of consolidation, where consolidation can be one of two types: hospital mergers or hospital system-joinings. Given the importance of hospitals to local labor markets, the effect of consolidation on labor market outcomes could be significant. According to the American Hospital Association, hospitals employed over 5.4 million people in 2011, making them the second largest source of private sector jobs behind restaurants. In fact, Kaiser Permanente, New York City and Health, and Advocate Health Care are the largest non-government employers for all workers in Los Angeles, New York, and Chicago, respectively. Moreover, hospitals employ specialized labor. Researchers have long argued that nurses, in particular, may be subject to monopsony power (Hurd, 1973; Sullivan, 1989; Staiger, Spetz, and Phibbs, 2010) because some research suggests they are relatively immobile (Kovener, Corcoran, and Brewer, 2011; Rosenberg et al., 2011) and because hospital jobs are different in terms of caseloads and tasks from other nursing jobs. Thus, some have argued that hospital mergers could have significant effects on labor markets, especially the market for nurses. In this paper, I use data from the American Hospital Association's Annual Survey (AHA) and the National Sample Survey of Registered Nurses (NSSRN) to create a unique panel data set covering the years 1983-2009. I use a difference-in-differences approach and propensity-score weighting to correct for selection bias, and examine changes in employment levels and wages of registered nurses

[1] For a review of the hospital merger literature, see Williams, Vogt, and Town (2006) as well as Gaynor, Ho, and Town (2014).

(RNs) and licensed practical nurses (LPNs) before and after a hospital consolidation. I also conduct a "rival" analysis similar to Woolley (1989), Connor and Feldman (1998), and Dafny (2009), where I look for effects on the subsample of hospitals that never merge but are exposed to a merger.

This paper contributes to the literature in four main ways. First, and most importantly, while there is a large literature on hospital mergers, these studies focus on merger impacts on prices, costs, and patient outcomes (Connor and Feldman, 1998; Keeler, Melnick, and Zwanziger, 1998; Ho and Hamilton, 2000; Dranove and Lindrooth, 2003; Dranove and Satterthwaite, 2003; Gaynor and Vogt, 2003; Town, Feldman, and Burns 2006; Dafny, 2009; Harrison, 2010; Hass-Wilson and Garmon, 2011; Hayford, 2011; Gaynor, Laudicella, and Propper, 2012; Patel, 2013). They find mixed results. In fact, very few studies have examined the effects of mergers, or any takeover, on labor market outcomes (Brown and Medoff, 1988; McGuckin and Nguyen, 2001; Li, 2012). To the best of my knowledge, no study of hospital mergers has ever focused directly on the potential employment and wage effects.

Second, I allow estimates of the effects to differ by mergers and system-joinings. Thus far, the hospital consolidation literature has largely focused on mergers, and those that do examine system-joinings, tend to treat mergers and system-joinings as the same or draw conclusions about one from results of the other, with the exception of Dranove and Lindrooth (2003), who do separate the two types of consolidation. [2] System-joinings differ from mergers in that they do not result in a full merging of assets or a shared license. Hospitals that join a system share a common governing owner but continue to operate under separate licenses (as defined by the AHA). These system-joinings exist across a wide scale and can involve as little as simply becoming part of a "brand", i.e. far different from a merger, or as much as a full change in the governing owners, essentially mimicking a merger. While wage decisions and union bargaining happen at the hospital level even after joining a system, it is plausible that system-joinings could impact employment through either decreased competition in the labor market or efficiency gains from shared knowledge or facilities.

Third, I contribute to the literature on monopsony power (or buying power) in general, and in the market for nurses specifically (Link and Landon, 1975; Sullivan, 1989; Hirsch and Schumacher, 1995; Staiger, Spetz, and Phibbs, 2010; Matsudaira, 2013). To identify potential reasons for hospital consolidation, I examine how wages

[2] See Dranove and Lindrooth (2003), Cueller and Gertler (2005); Melnick and Keeler (2007), Ho, 2009; Lewis and Pflum (2014, 2015) for studies that examine hospital systems.

of registered nurses and licensed practical nurses change after a hospital merger or a system-joining. If, from a labor perspective, decreased competition for labor is the dominant effect of consolidation then wages should decrease as a result of the increased buying power of the hospitals; if efficiency gains are the dominant effect due to consolidation, as the hospitals contend they are, then wages should be unaffected.

Fourth, and finally, the length of the period covered by the data I have gathered allows for a detailed analysis of both the short-term and long-term effects on local labor market outcomes.

I find that RN employment decreases by an average of 12% after a merger and that this effect persists five years after a merger. I find that LPN employment experiences an even larger decrease following a merger, falling by 18% on average. These results appear to be driven by efficiency gains rather than an increase in buying/monopsony power, as average hospital salary does not decrease.[3] I corroborate that the results are driven by efficiency gains by examining rival hospitals that are exposed to a hospital merger. If hospitals that merge are exploiting an increase in buying power, then hospitals in the same labor market should also be able to exploit the increase in market concentration. While I find some reductions in employment of RNs and LPNs at rival hospitals, these effects do not appear for at least 10 years after the merger occurs. Furthermore, I find no effect on average hospital salary. These employment results at long horizons appear to confirm that the employment effects of a merger are driven by efficiency gains and not an increase in monopsony power as these effects are likely due to unobserved variations in the market that are unrelated to the merger.

Perhaps not surprisingly, the effects of system-joinings on employment levels are much smaller. System-joinings result in a small initial decrease in both RN and LPN employment, but this result is small and insignificant. Additionally, I find little to no effect on hospital salaries in the period after a system-joining. Thus, it appears that the effect on employment levels of joining a hospital system are markedly different than those associated with hospital mergers. Of course, there may be other benefits from system-joinings, such as an increase in profit or financial stability.

The paper is organized as follows. I discuss the theoretical framework in Section

[3]The wage results presented here are only average hospital salary, or payroll per worker. That is, in using the AHA data, I do not observe the extent of the true change in nurses' wages. To deal with this limitation, I supplement my wage data with the National Sample Survey of Registered Nurses and the Bureau of Labor Statistics (BLS) Occupational Employment and Wage Estimates. I discuss this data in further detail in Section 3.3. The results are robust to using this additional and more detailed data.

2, and describe the data in Section 3. I explain my empirical model and present my results in Section 4. Finally, Section 5 offers a discussion of the findings and concluding remarks.

2 Theoretical Framework

My theoretical framework identifies the causes of employment effects, if any, following a hospital consolidation. There are two reasons to expect employment effects following consolidation. First, increases in efficiency resulting from consolidation may require that hospitals reduce labor. Second, an increase in monopsony power due to consolidation can also give rise to reductions in labor. Note that the effects of the two forms of consolidation, mergers and system-joinings, may differ depending on the extent to which they lead to monopsony power in the labor market or give rise to efficiency.

When two hospitals merge, they come together to operate under a shared license. This is a form of horizontal integration. The efficiency benefits from doing so can include eliminating duplicate patient care departments or simply consolidating administrative or legal staff. Interviews with industry insiders indicate that system-joinings may allow for similar forms of efficiency gains depending on the location of the two hospitals. In other words, joining a system can mimic the effects of a merger if two hospitals are located in the same labor market.[4]

Even though system-joining does not result in a shared license, it is plausible that we could see similar employment effects of mergers and system-joinings. For example, two hospitals in the same market that are in the same system may be less likely to compete over workers than two hospitals that are not in the same system. In addition, two hospitals in the same system that are located close to each other may benefit from administrative efficiencies or the ability to allocate patients more efficiently across hospitals.

[4]The same would be true for potential effects of system-joinings on increased prices if hospitals are in the same product market. In fact the two studies that do examine system-joinings, Cueller and Gertler (2005) and Melnick and Keeler (2007), find higher prices and an increase in market power of system-affiliated hospitals versus non-system hospitals.

2.1 Increase in Monopsony Power

The consolidation of two hospitals may cause a change in competition in the labor market, especially the market for specialized labor. In particular, a merger may increase the bargaining power of the employer and thus allow them to reduce worker wages. If a hospital is in an imperfectly competitive labor market, it faces an upward-sloping labor supply curve. A merger resulting in increased buying (or monopsony) power on the part of the hospitals would lead the merged hospital to restrict employment below the competitive level and pay wages below the marginal revenue product of the employee (see Appendix A, Figure A.1). Thus, we would expect to see decreases in employment and wages at the newly consolidated hospital.

Furthermore, suppose there are labor-market effects at consolidating hospitals, and these effects are due to a decrease in employment competition on the demand side. There should also be employment effects at the hospitals in the same labor market that do not partake in any form of hospital consolidation. This is because the consolidation affects the competitiveness of the entire labor market, not just for hospitals that consolidate.[5] The other hospitals in the market, particularly those located most closely to the consolidating hospital, should also see an increase in their buying power. The expectation, therefore, is that rival hospitals in the same labor market as the consolidating hospital will also see a decrease in employment and wages if consolidation results in an increase in monopsony power.

Testable Implication 1: If a hospital merger or system-joining results in a decrease in competition in the nursing labor market, then all else equal, average market wage and number of nurses at the consolidating hospital will decrease. In addition, there should be a decrease in the number of employees and wages at non-consolidating local, i.e. rival, hospitals.

2.2 Efficiency Gains

Hospital consolidation may also lead to increased efficiencies (Lynk, 1995). When a hospital consolidates, scale economies may be realized. For example, consider a

[5] E.g. Dafny (2009) finds an increase in prices at rival hospitals.

merger between two hospitals in the same local health care market. These hospitals may be able to do one or more of the following: close down an under-utilized department that is present in both hospitals pre-merger; share administrative personnel or legal staff; share technologies that decrease demand for certain types of labor. A hospital that joins a system may also be able to enjoy these efficiencies, but perhaps less so to the extent that having a separate license creates a barrier to horizontal integration.

In the case of an increase in efficiency, we would expect wages to stay the same because nothing has happened in the labor market, so the competitive wage is unaffected.[6] There is also a possibility that wages could increase if the efficiency gains result in the hospital being more profitable. If this increase in profit is associated with an increase in the marginal product of labor (MP_L), then wages may rise as employees' wages are adjusted to this higher MP_L. Alternatively, employees acting collectively, e.g. a labor union, may be able to successfully bargain for a share of the higher profit generated post merger or system-joining.[7]

Testable Implication 2: If a hospital merger or system-joining results in increased efficiencies, the number of employees should decrease or output (e.g. number of admissions) should increase. If a hospital merger or system-joining results in increased efficiencies, assuming flat supply, then wages should stay the same. If the source of efficiencies (e.g. a positive change in capital intensity) further enhance MP_L, wages may increase. Finally, rival hospitals should see no change in number of employees or wages.

[6] It is important to note that this framework assumes a flat supply curve of labor. If the supply curve is upward sloping, and an increase in efficiency leads to a decrease in demand for labor, the competitive wage would decrease.

[7] Unfortunately, this is not something I can measure as I do not have data on unionization at the hospital level. This is necessary since nurse bargaining occurs at the hospital level, that is, a union bargains over wages with a specific hospital, even after a hospital has joined a hospital system. For instance if two hospitals join a larger hospital system, say Tenet Healthcare, the bargaining over wages does not happen with Tenet as a whole, it stays at the individual hospital. Therefore, hospital-level fixed effects should capture union presence.

3 Data and Descriptive Statistics

The main dataset used in this paper is the American Hospital Association's (AHA) Annual Survey of Hospitals (1983-2009). I supplement the wage information in the AHA data with data from the National Sample Survey of Registered Nurses (NSSRN) (1984-2004) and the Bureau of Labor Statistic's Occupational Employment and Wage Estimates (1997-2009).

3.1 The American Hospital Association's Annual Survey of Hospitals

The AHA annual survey provides data for 98% of US hospitals, including location, ownership status, employment levels for certain occupations, operating costs, number of beds, admissions, and information on hospital system affiliation. The full sample of hospitals for the years 1983-2009 contains 176,596 hospital-year observations. I restrict the sample to those hospitals that are classified as "general medical and surgical," thus leaving out psychiatric hospitals and other specialty centers that might compete for a different type of employee or have a different propensity to merge or join a system. This reduces the sample to 7,149 hospitals and 143,057 hospital-year observations.

The AHA's annual survey also provides a "summary of changes." Included in this summary of changes are notes concerning hospital mergers and a classification of each merger, i.e. two or more hospitals that merge to form a new hospital or one or more hospitals that merge into an existing hospital. The AHA tracks hospitals that merge as a single entity after mergers, that is the two separate hospitals share a single ID and appear as one hospital after the merger. The AHA merger data used in Dranove and Lindrooth (2003) was generously provided by the authors. I use the AHA information to expand on those data, which covered 1989-1997, and identify all hospital consolidations from 1983-2009.

I use the definition of the AHA when identifying mergers and system-joinings. A hospital merger, as defined by the AHA, is when there is a "full-asset merger" and two separate hospitals come together to operate under a shared license. For example, in 1996, Our Lady of Lourdes Hospital and Lutheran Community Hospital in Norfolk, Nebraska merged to form Faith Regional Health Services. Both of the

original hospitals gave up their separate hospital licenses and began to operate under the same new license. Previous research has shown that hospitals located within 0.3 miles of each other are almost three times as likely to merge as hospitals that are further away from each other (Dafny, 2009). This close proximity of merging hospitals makes it easy for a hospital to condense duplicate and unnecessary operations and reallocate resources as needed.

When a hospital joins a system it retains its license although governing ownership may be transferred to a new governing body. It is important to note that a system-joining that results in full ownership transfer must be reported to the Federal Trade Commission (FTC) and is subject to review. More specifically, under the Hart-Scott-Rodino Antitrust Improvements Act of 1976, mandatory reporting to the FTC or DOJ of an imprending consolidation is required if the consolidation meets a certain financial threshold. This threshold changes yearly, and as of 2017, the threshold was set at $80.8 million. No other type of system-joining needs to be reported. Still, they may be subject to antitrust scrutiny under Section 2 of the Sherman Act.[8]

While a hospital merger always implies a complete consolidation of hospital assets, joining a hospital system can be as weak as only adopting the "brand name" of the system or as strong as a full ownership conversion. The latter may be blocked by the FTC. For example, in 2012, the FTC prevented St. Luke's from joining the Promedica Health System. Even though it was not a traditional "full-asset merger," St. Luke's intended to turn their entire ownership over to Promedica.

Each type of consolidation may allow for a hospital to combine certain aspects of their operations. Both the acquiring and acquired hospital can benefit from consolidation. Hospitals that either join a system or merge are typically in dire financial straits pre-consolidation and are rescued from financial catastrophe. I show this in Appendix B, Table B.1. I use cost per bed as a proxy for financial distress, and perform a probit analysis showing that hospitals that are targeted for either type of consolidation have a higher cost per bed, statistically significant at the 1% level (Table B.1). Presumably, and according to industry insiders, the targeting hospital or existing system sees the poorly-run hospital as an opportunity to restructure, refurbish, and turn a profit.

Figure I shows that there were 637 mergers observed in "general medical and surgical" hospitals between 1983 and 2009, with a peak of 65 mergers in 1997. The

[8]This information is from conversations with individuals from the FTC.

total number of observations for hospitals that merged at some time in the data period is 14,617. Given that I will examine certain outcomes before and after a merger, I further restrict the analysis to those that I can see at least five years before and five years after merging. This leaves a final sample of 11,846 hospital-years for most of my analyses of hospitals involved in a merger.

As for system-joinings, Figure I also shows that there were 5,449 of these between 1986 and 2009, with a peak of 520 system-joinings in 1989. Note that the AHA did not start collecting information on hospital systems until 1985. While some hospitals may have joined a system in 1985, it is unclear from the data if they were in a system in 1984. Therefore, when analyzing hospital systems, I focus on the years 1986-2009. As with hospital mergers, I restrict the analyses to those system-joinings that I can see at least five years before and five years after consolidation. The final number of observations for hospitals that join a system is 15,270 hospital-years.

For hospitals that consolidate, I sum the data for the years prior to consolidation. For example, if hospitals A and B merge to form hospital C, I attach all observations to hospital 'C' and sum up the data for A and B prior to the merger. I similarly sum within systems in the same labor market (the "Component Economic Area", described immediately below) for all system-joinings.[9] In addition, I deal with multiple mergers and multiple hospital system-joinings (a very small subset of hospitals) by creating duplicate observations for those that consolidate multiple times. For instance, if a hospital merges in both 1992 and 1999, then it is combined with the other hospital and is in the dataset twice, appearing in the pre-merger period in the years leading up to 1992 as well as the years up to 1999.

3.2 Market definition

Traditionally, in the health literature, "the market" is typically defined as the Hospital Service Area–the local market area for hospital service. This market definition, however, is concerned with the patient market. As my focus is on labor outcomes, I define markets using the Bureau of Economic Analysis's Component Economic Area (CEA). Each CEA consists of one or more metropolitan areas that serve as centers of economic activity, known as "nodes," and the surrounding counties that are economically related to each node (Johnson, 1995). Commuting patterns are the main

[9]Summary statistics for system-joinings, however, are reported at the hospital-level, not at the system consolidation level.

factor used in determining the appropriate relationships among surrounding counties. CEAs, therefore, are meant to include workers' places of work and places of residence. Given that the CEA is based on commuting patterns workers are more likely to be mobile within a CEA than across them. Thus, it makes sense to define the labor market in which a hospital competes as the CEA.

There are 348 CEAs in the US, of very different sizes, with a median population of 286,415 and a mean population of 1.4 million. The number of hospitals in the AHA data in a CEA varies from 1 to 1400. CEA definitions are obtained from the Federal Communications Commission's website.

The hospital market concentration is measured using the Herfindahl-Hirshman Index (HHI). The HHI is calculated by squaring the market share of each firm competing in the market and then summing the resulting numbers. The HHI can range anywhere from zero, indicating a perfectly competitive market, to 10000, indicating a monopoly. In this paper, market share is calculated as the ratio of total beds in a hospital to total beds in the market. This is a commonly-accepted way of calculating hospital market share (Link and Landon (1975) and Kessler and McClellan (2005)).[10] I count hospitals in the same market that are in the same system as one hospital for the purposes of this calculation (see also Dranove, Shanley, and Simon (1992)). Table I shows that market concentration is slightly higher for the markets where hospitals that merge or join a system are located, but not noticeably different from that of other hospitals. By definition, market concentration also increases after both types of consolidation (Tables II and III), confirming that most system-joinings, like most mergers, tend to occur among hospitals in the same market.

3.3 Wage data

In the AHA survey, hospital administrators are asked to report all hospital and facility personnel who are on the payroll at the end of the reporting period, as well as total payroll expenses. Dividing total payroll expenses by total facility personnel yields an average salary, or payroll per worker, for hospital personnel.[11] Average hospital salary

[10] I also calculate the HHI based on hospital admissions and it is highly correlated with the HHI based on beds. All results are robust to using this alternative definition of HHI.

[11] While the American Hospital Association provides information about the number of physicians employed by the hospital, these numbers are not reported in a uniform way: some hospitals choose to report only those physicians employed by the hospital and others report those that have admitting privileges at the hospital. Therefore, I restrict my analysis to RNs and LPNs.

is used as a proxy for nurses' wage at the hospital. Clearly, this measure captures more than nurses' wage. If either the composition of labor changes or the wages of other hospital personnel move in the opposite direction relative to nurse wages post-consolidation, the wage changes experienced by RNs and LPNs will be incorrectly measured. For example, suppose that after a hospital consolidation, the wages of RNs and LPNs decrease, while the wages of other hospital personnel increase. I will only observe the net change in average hospital salary and will not observe the extent of the true change in RN and LPN wages. To deal with this limitation, I supplement my wage data with the National Sample Survey of Registered Nurses (NSSRN) and the Bureau of Labor Statistics (BLS) Occupational Employment and Wage Estimates.

The NSSRN is a survey administered by the United States Department of Health and Human Services approximately every four years to RNs working in the U.S. Information on base salaries, bonuses, county where employed, job responsibilities, education and demographics of RNs is collected. Selected from the licensure lists in each state, the goal is to sample and estimate the characteristics of the registered nurses in the country. Each survey consists of about 1-2% of all RNs in the U.S. While some RNs are surveyed in multiple years, there are no unique identifiers across survey years, so there is no way to match their data over time.

RN hourly wages from this data source are constructed using total yearly salary (including bonuses but not benefits), hours worked per week, and number of weeks worked in a year. All wages are adjusted to 2004 dollars. Unfortunately, detailed demographic information is unavailable in the survey for privacy reasons. Instead, the data are broken down by demographic "group." Specifically, there are ten age groups (less than 25, 25-29, 30-34, 35-39,...greater than 65). Assuming a minimum working age of 18 and a maximum age of 70, I take age to be the median of each of these groups. There are only two categories for race, namely "white" and "other," and education is stated by type of degree completed. I limit the sample to those nurses who work in a hospital and I remove observations where information is missing on key variables (salary, hours worked, demographic control variables), leaving 109,575 observations. Summary statistics are presented in Table VI. While the sample analyzed is limited to those nurses who work in a hospital, summary statistics for nurses who work in nursing homes and doctors' offices are also displayed for comparative purposes. This table shows that hospital nurses look quite different than those who work in nursing homes and doctors' offices. They earn a higher hourly wage and tend to be more educated. Additionally, 92% of hospital nurses report being involved in direct patient

care while only 9% of nurses working in doctors' offices report the same. Mean comparison tests of hospital RNs with nursing home and doctor's office RNs show that the means of wage, education, race, direct patient care, percent of time spent on patient care, whether the nurse works full-time, and hours worked are all statistically different. Additionally, the data shows that the vast majority of nurses work in a hospital (approximately 80%).

A third source of wage data that I use is the Bureau of Labor Statistics (BLS) Occupational Employment and Wage Estimates. The Occupational Employment and Wage Estimates are put together through a mail survey of non-farm establishments. The sample is derived from the list of establishments maintained by State Workforce Agencies (SWAs) and is selected to provide an accurate representation of establishments from every metropolitan and non-metropolitan area in every state, across all surveyed industries, and from establishments of different sizes. I have annual wage data at the market-level for the years 1997-2009.[12] Not every market is represented each year, so this is an unbalanced panel of market-level wages. Summary statistics for the wage data are presented in Table VII. The mean hourly wage of a registered nurse is $24.19 and this wage ranges anywhere from $7.68 to $53.38. The average registered nurse employment in an MSA is about 5,852 RNs.

The average yearly wage from these two data sources is quite a bit higher than the average hospital wage from the AHA. If we assume that a worker works about 2000 hours per year, than the NSSRN and BLS yearly salaries are approximately, $50,000 and $48,000, respectively. This is larger than the average hospital wage in the AHA of $29,000, indicating the need for the alternative wage data. The NSSRN and BLS provide better proxies of the average wage of a registered nurse.

3.4 Dependent Variables

Summary statistics for hospitals that merged, those that joined a system, and all other hospitals are presented in Table I. These statistics include all hospital observations, not just those observed five years before and after consolidation. Hospitals that merged are larger and supply many more RNs and LPNs on average than those that do not. This higher observed employment level for hospitals that have merged is due to these hospitals being aggregated together for the purpose of these analyses

[12]The BLS provides mean wages at the MSA-level. I map the labor market area (Component Economic Area) onto each MSA and then recalculate the mean wage for the labor market area.

while system-joiners are not. Given the large number of hospitals that belong to single system, the non-aggregated results give a more simplistic picture of what a single hospital in a system looks like. A more comparable mean. therefore, is the employment to output ratio, which adjusts for the relative size of the hospital. RNs per admission and LPNs per admission are significantly lower for consolidating hospitals than for those that do not merge or join a system. This suggests that consolidating hospitals are allocating their employment differently from those that do not consolidate. In addition, organizational type, i.e. the proportion of not-for-profit, for-profit, and government-owned, are different between hospitals that merge or join a system and hospitals that do not partake in either form of consolidation. Almost 65% of hospitals that merge are not-for-profit hospitals, whereas only 41% of hospitals that join a system and 49% percent of hospitals that do neither are not-for-profit.

Tables II and III show the outcome variables of interest five years before, one year before, one year after, and five years after both a merger and a system-joining. On average, there is a small increase in number of RNs and a moderate decrease in number of LPNs the year after a merger in comparison to the year before although when looking at five years before and after it appears that RNs are in decline before a merger and then increasing after. This is in contrast to system-joinings which are associated with a large decrease in the number of both RNs and LPNs one year after a merger, and these levels increase slightly five years after. These large decreases are likely attributable to nurses being re-allocated to other member hospitals following the system-joining. Admissions decrease very slightly one year after a merger, but increase by almost six thousand when looking five years after a merger. System-joinings, however, see their decrease in admissions persist five years after. Average hospital salary (adjusted to 2009 dollars) increases a small amount after merging and slightly decreases after system-joining. Organizational type shifts a small amount for mergers indicating that some hospitals go from either being for-profit or government-owned to not-for-profit after system-joining. System-joinings experience a much bigger shuffling in organizational type, reflecting the recent trend of hospitals shifting from not-for-profit to for-profit (Selvam, 2012).

4 Empirical Analyses

To estimate the effects of hospital consolidation on employment outcomes, I use a difference-in-differences analysis, one for each type of hospital consolidation. Of

course consolidation is not a random event, so I need to correct for selection. I deal with selection in the following ways. First, I conduct a difference-in-differences analysis and include a variety of control variables that are expected to affect the decision to consolidate as well as the outcome variable of interest. Second, I explore the short-term and long-term effects of the mergers and system-joinings both to see if changes immediately follow consolidation and if they persist, while controlling for the same set of factors included in the difference-in-differences estimation. Third, I model the probability of participating in hospital consolidation using observable hospital and market characteristics, and then use propensity score weighting to control for the propensity to consolidate. Fourth, and finally, I examine the effect on rival hospitals: as described in Section 2, if the merged hospitals have increased market power in the labor market, rivals should also benefit from the merger.[13] For the rival hospitals, exposure to a merger is more likely to be an exogenous event.

4.1 Difference-in-Differences Analysis: Mergers Only

In this section, as in the prior literature, I focus on the effects of hospital mergers only and compare them to hospitals that do not merge (Alexander, Halpern, and Lee, 1996; Hass-Wilson and Garmon, 2011). In other words, I ignore the possibility of joining systems in these analyses. Taking the hospital-year as the unit of observation, I restrict my sample to observations for hospitals that never merge, along with those that I observe at least five years prior and five years after their merger. I estimate the following difference-in-differences model as my main specification:

$$\ln(Y_{it}) = \theta After M_{it} + \beta X_{it} + \mu_i + \tau_t + \epsilon_{it} \tag{1}$$

where $After M_{it}$ equals one for periods after the merger for hospitals that merge.[14]

In equation (1), $\ln(Y_{it})$ represents the natural log of eight possible outcome variables of interest for hospital i in year t: the number of registered nurses (RNs), the number of licensed practical nurses (LPNs), the sum of the number of RNs and LPNs, the log number of admissions, the ratio of each of these employment outcomes to number of admissions, and average hospital salary. From section 2, whether ef-

[13]This analysis is limited to mergers because there are not enough hospitals that are exposed to only one system-joining. Almost all markets experience more than one system-joining over the sample period.

[14]Recall that characteristics of merging hospitals are aggregated in the periods before and after the merger. The data, therefore, is at the consolidation-year level.

ficiency or monopsony, θ is expected to be negative for the first six outcomes. For average hospital salary, however, if monopsonistic exploitation is present then θ will be negative as well.

I include (consolidated) hospital fixed effects, μ_i, and year fixed effects, τ_t. I also include a vector of time-varying hospital and market control variables (X_{it}) that are expected to be related to the propensity to merge. These variables are:

Cost per bed: This is a measure of financial distress. It is believed that hospitals that are most likely to want to consolidate and that are targeted for consolidation are in poor financial straits prior to merging and/or joining a system. Since I do not have data on hospital revenue, I cannot calculate hospital profit. I can, however, look at the ratio of costs to beds as a proxy for financial distress. Hospitals that are less financially sound should have a higher cost per bed as they are using their resources less effectively. As shown in Table I and in Section 3, hospitals are more likely to consolidate with a higher cost per bed.

Ownership type (i.e. for-profit, not-for-profit, or government): Hospitals with different ownership types may have different objective functions (Newhouse, 1970). For-profit hospitals answer to shareholders who are looking to make money while not-for-profit hospitals are required to reinvest their profits in the hospital. I want to make sure, therefore, that I am comparing hospitals with similar incentives.

Current system membership: Although we see in Section 3 that joining a system does not preclude merging and vice versa, we may think that those that choose to do both are different from those that do not.

Nearby Hospitals: Dafny (2009) shows that hospitals that are located closer to each other are more likely to merge. Specifically, most hospitals that merge are located within 0.3 miles (as the crow flies) of each other. I adjust for this by including a measure of how many hospitals are in the same zip code. I would expect that having more hospitals within the same zip code makes a hospital more likely to merge.

Table IV column (1) displays the results of estimating equation 1 for the different outcomes of interest. I only show the parameter for $AfterM_{it}$, so each cell of column (1) represents a separate regression. Below each estimate is its standard error clustered at the hospital level. The results show that those hospitals that merge see a 12.9 log points decrease in number of Registered Nurses (RNs) following a merger, when compared to all other hospitals. This result is even larger when looking at the

effect on the number of Licensed Practical Nurses (LPNs) as the employment level falls 18.1 log points following a merger. These results are significant at the 1% level. The number of admissions falls by 14.8 log points following a hospital merger, and accordingly, the change in the ratio of RNs to admissions and LPNs to admissions is small and statistically insignificant. The change in average hospital salary is nearly zero and also insignificant.

Consistent with the theoretical framework in Section 2, the salary result is evidence that the decrease in employment is likely due to gains in efficiency from the merger rather than an increase in monopsony power. The efficiency argument may be undermined by the fact that admissions are decreasing at the same time, indicating that fewer resources are not necessarily producing the same level of output. However, a plausible explanation is that following a merger, hospitals begin to adjust the case mix of patients, shifting away from the lower-profit cases to the more difficult and profitable cases. In this sense, it would be hard to judge output before and after a merger. Additionally, given that admissions decrease following a merger and the number of RNs and LPNs per admission is staying constant, there is less of a concern that this decrease in employment will negatively affect the quality of care at the hospital.

4.2 Difference-in-Differences Analysis: Mergers and System-Joinings

I am also interested in studying system-joinings and directly comparing their effects to mergers. To examine the effects of both mergers and systems, I estimate the following equation:

$$\ln(Y_{it}) = \theta_1 After M_{it} + \theta_2 After S_{it} + \beta X_{it} + \mu_i + \tau_t + \epsilon_{it} \tag{2}$$

where $After S_{it}$ is equal to one in the periods after the system-joining. Like before, $After M_{it}$ is equal to one in the periods after the merger occurs. Note that because I am interested in the changes for systems as well, the sample is restricted to those hospitals that I observe at least five years prior and five years after their system-joining or merger, and all observations of those hospitals that never merge or join a system. I also include the same set of control variables as in equation 1 and again cluster standard errors at the hospital level.

The second and third columns of Table IV, present the results from estimating equation 2. The coefficients for mergers are slightly smaller in magnitude but largely similar, including the decrease in admissions and the zero average salary effect. As for systems, we see that the coefficients are markedly different from those for mergers. First, the change in RNs and LPNs associated with system-joinings are both negative but much smaller and highly insignificant. The only effects that move in the same direction to mergers and are also significant are when examining admissions and the ratio of RNs +LPNs to admissions. Specifically, admissions fall by 5.0 log points after a system-joining (significant at the 10% level) in comparison to the 11.7 log point decrease following a merger. The results also show an increase in the ratio of RNs + LPNs to admissions, significant at the 10% level for system-joinings. In addition, we see a small positive and insignificant effect when examining the ratios of RNs to admissions after either type of consolidation and an increase in the ratio of LPNs to admissions after a system-joining. The positive coefficients on each of these ratios suggests that while the number of RNs may be decreasing, the number available for each patient case the hospital addresses is actually increasing. Again, similar to the results in column (1), these results indicate that the decrease in employment may not result in a decrease in quality of care. A t-test for the difference in coefficients (not shown) of mergers and systems shows statistically significant differences at the 1% level for all coefficients. In other words, merging and system-joining result in very different employment effects.

4.3 Event Study

My main specifications will not allow me to see if changes in the outcome variable are slow moving or a sharp change at the time of the event. To examine this in greater detail, I estimate a model of separate treatment effects for years before and after a merger and a system-joining (Jacobson, LaLonde, and Sullivan, 1993). Specifically, I estimate

$$\ln(Y_{it}) = \delta Merge_{it} + \sum_{n=-6}^{6} M_{it}^{n}\theta + \beta X_{it} + \mu_i + \tau_t + \epsilon_{it} \tag{3}$$

where M_{it}^{n} are a set of dummy variables indicating each hospital's relative timing to a merger (six or more years before merger, five years before merger, ..., five years after merger, six or more years after merger). The omitted category is the year before the event.

I then estimate a similar equation but, again, examine the effects of both mergers and system-joinings.

$$\ln(Y_{it}) = \delta_1 Merge_{it} + \delta_2 System_{it} + \sum_{n=-6}^{6} M_{it}^n \theta_i + \sum_{n=-6}^{6} S_{it}^n \lambda_i + \beta X_{mt} + \mu_i + \tau_t + \epsilon_{it} \quad (4)$$

The results are presented graphically in Figures II and III, where Figure II illustrates the merger coefficients while Figure III illustrates the system-joining coefficients. For brevity, I will only present and discuss the results from equation 4. The results estimating equation 10 are qualitatively similar to those seen in the first column of Table IV as well as the results displayed in Figure II. You can find a discussion about these estimates in Appendix C.[15] As before, all outcomes are measured in logs and these outcomes are depicted on the y-axes. In all figures, the x-axis represents the time relative to the event of merging or system-joining. The 95% confidence intervals are displayed above and below each coefficient line.

In Figure II we see that for both RNs and LPNs, there is no decrease in employment pre-merger, yet a strong negative trend in number of RNs and LPNs after the merger. Both the number of RNs and the number of LPNs are continuing to trend downward even six years post-merger. We also see a large drop in the number of RNs and LPNs immediately at the time of the merger. It is important to keep in mind that these are hospitals that do not close after the merger. While I cannot see if a hospital ultimately closes a few years later, I am able to identify if the hospital closes at the time of the merger. These decreases in employment, therefore, are not the result of an immediate hospital closure.

The result for admissions following a merger appears somewhat anomalous the year before the merger, i.e. the omitted group. However, the point estimates in the year following the merger are more negative than those in the years $t = -2$ and earlier. Ignoring the spike, these results are qualitatively consistent with the findings from the difference-in-differences results presented in section 4.2. There is little change in the ratio of RNs to admissions in the years following a merger, with year three showing a small and significant increase. Therefore, in general, while there is a clear decrease in RN employment, nurse per admission appears to rise. We do see a small decrease

[15]The numerical tables are available upon request.

in the ratio of LPNs to admissions post-merger, but this is statistically insignificant. These results indicate at least some efficiency gains following a merger. Although there is a clear decrease in the number of RNs and LPNs following a merger, there is no change in average hospital salary. Again, this result is consistent with post-merger efficiency gains, rather than an increase in monopsony power.

In Figure III we do not see any obvious jump in employment levels before and after system-joinings. It is clear that the results for RNs and LPNs are very different in magnitude from the effects associated with hospital mergers. For example, although hard to see precisely on the graph, the coefficient on RNs one year post-merger is -0.15, significant at the 1% level, whereas the coefficient on RNs for the period one year after system-joining is -0.03, and insignificant. These effects on mergers persist six years out, while systems-joinings are never associated with a significant change in RN employment. In general, we see no change in average hospital salary following a system-joining, however average salary does decrease by 2.7 log points two years post-system joining, significant at the 5% level. While this could point to some increase in monopsony power, average hospital salary decreases some years and then increases in other years, likely indicating no effect that is associated with system-joinings.

A post-estimation test of the difference in coefficients for each year following a merger and each year following a system-joining shows that the coefficients are statistically different at the 1% level. In other words, I can reject the null hypothesis that the difference in coefficients one year post-merger and one-year post system-joining are equal to zero.

4.4 Propensity Score Analyses

The difference-in-differences and event study results may be biased if certain pre-existing trends in the outcome variables differ across those hospitals that consolidate and those that do not. One way to mitigate this problem is to use a propensity score weighting methodology to create a sample of control hospitals. In this section, I estimate the probability of merging based on a baseline of observable hospital characteristics from the year 1983 (the first year in the data). Specifically I estimate the following specifications using a Probit model:

$$Pr(Merge_i = 1|Z_i, X_m) = \Phi(\beta_1 Z_i + \delta_1 X_m) \tag{5}$$

$$Pr(System_i = 1|Z_i, X_m) = \Phi(\beta_2 Z_i + \delta_2 X_m) \tag{6}$$

$Merge_i$ is an indicator with a value of one for hospitals that ever merge and $System_i$ is an indicator for hospitals that ever join a system. Z_i is a vector of the hospital characteristics used earlier, cost per bed, whether the hospital is in a system (for the mergers-only estimates), and whether the hospital is not-for-profit or for-profit. X_m is a set of market-level variables that includes the number of hospitals in the same zip code and concentration level of the market (HHI). These variables are expected to affect both the likelihood of merging and the outcomes. Given that the baseline characteristics used to create the propensity score are from year 1983, only hospitals that are observed in this year are used to create the propensity score. After estimating the probability of treatment, a weight is created based on this score to create a sample where the baseline covariates are independent of whether a hospital merges or not. I employ an inverse propensity-weighting scheme using these estimated probabilities. Control group hospitals are given weight $\frac{\hat{p}_i}{1-\hat{p}_i}\frac{1-\bar{\hat{p}}_i}{\bar{\hat{p}}_i}$, where $\hat{p}_i$ is the estimated probability of treatment (merging or system-joining) and $\bar{\hat{p}}_i$ is the sample average of this probability. All standard errors are bootstrapped with 200 replications.

After re-estimating equations 1 and 2 correcting for selection bias using these weights, we see that the merger results are actually stronger in most cases.[16] These results are presented in Table V. The effects of merging on employment are even stronger that before, with 14.1 log points and 19.5 log points decreases in the number of RNs and LPNs after a merger, significant at the 1% level. Once again, I find no effect on average hospital salary, further supporting the hypothesis that the reduction in labor is an efficiency effect rather than an exploitation of buying power.

When examining both mergers and system-joinings (Columns (2) and (3) of Table V) we see no effect of system-joinings on the number of RNs or LPNs in a hospital. The change in number of admissions following a system-joining is more negative and still statistically significant at the 10% level. The coefficient indicates that admissions decrease by 4.4 log points following a system-joining. Similar to when estimating without propensity score weighting, the coefficients on mergers after adding in system-joinings are still significant at the 1% level but slightly less negative for RNs, LPNs,

[16]For brevity, I do not include the results of the event study after weighting by propensity score, but these results are qualitatively similar to those found using the difference-in-differences analysis after weighting by propensity scores. These results are available upon request.

and Admissions, and the effect on the ratio of RNs to admissions is smaller and insignificant.

Lastly, there is still no evidence of an effect on average hospital salary due to hospital consolidation when looking at mergers or mergers and system-joinings.

4.5 Additional Analyses

So far the results point to an increase in efficiency post-consolidation and not an increase in buying power, at least with respect to the nurse labor market. Two other ways I check to see if this result holds are (1) explore two other sources of wage data and (2) examine other hospitals in the market that do not merge yet are exposed to a merger ("Rivals Analysis").

4.5.1 Additional Wage Data Analyses

As described in section 3.3, I only observe the net change in average hospital salary and do not observe the extent of the true change in RN and LPN wages. More specifically, the lack of a wage effect may reflect the measurement imprecision of wages. To deal with this limitation, I supplement these analyses using the NSSRN and BLS data. Specifically, I examine how the market wage of RNs change as the number of consolidations in a market increases by estimating the following equations:

Mergers Only:

$$\ln(Wage_{kt}) = \theta \#Mergers_{kt} + \beta X_{kt} + \mu_k + \tau_t + \epsilon_{kt} \tag{7}$$

Mergers and System-Joinings:

$$\ln(Wage_{kt}) = \theta_1 \#Mergers_{kt} + \theta_2 \#SystemJoinings_{kt} + \beta X_{kt} + \mu_k + \tau_t + \epsilon_{kt} \tag{8}$$

where $Wage_{kt}$ is the average log hourly wage of an RN in Component Economic Area (market) k in year t. When using the NSSRN data, I restrict the analysis to only examining the average market wage of RNs working in a hospital. The BLS data does not allow for this type of detailed stratification.

X_{kt} is a set of market control variables. Since the NSSRN provides some demographic information, I control for average age, race, gender and marital status of

hospital RNs in the market. μ_k is a CEA-level fixed effect, τ_t is a year fixed effect, and all standard errors are clustered at the CEA.

The results from estimating equations (7) and (8) are presented in Table VIII. Regardless of the data source used, the effect of hospital consolidations on the wages of RNs is very small and highly insignificant. These results are consistent with the salary results obtained with the AHA data, and they continue to indicate that the effects of consolidation on employment are not due to an increase in monopsony/buying power.

4.5.2 Rivals Analysis

I examine employment effects for hospitals that are exposed to a merger in the market but do not merge themselves, i.e. "rival" hospitals. As discussed in Section 2, if the consolidation affects competition for labor, we may expect there to be employment spillover effects at rival hospitals after a merger. Following Woolley (1989), Connor and Feldman (1998), and Dafny (2009), I conduct a rival analysis where I estimate the effects of being exposed to a merger on the employment effects of interest as well as average hospital salary.

Considering that there is no evidence of wage effects thus far, the results indicate that the effects are efficiency driven. I can further test this by seeing if there are any employment or salary effects at rival hospitals, i.e. those hospitals that are in the same market as a hospital that merges but do not merge. These hospitals experience the same change in concentration but should experience none of the gains in efficiencies as the merging hospitals. If there is monopsony power in the market, I would expect to see a decrease in number of RNs and/or LPNs and a decrease in average hospital salary at non-merging hospitals following a merger of other hospitals within the market. The key assumption here is that exposure to a merger creates an exogenous change in competition for RN and LPN services. I look at hospitals that are exposed to exactly one merger and compare them to hospitals that are not exposed to any mergers. Given that system-joinings are so common, I cannot find enough markets that are exposed to only one hospital that joins a system. Therefore, I conduct the rival analysis for only rivals of merging hospitals.

I perform a difference-in-differences analysis and estimate the following specification using OLS:

$$\ln(Y_{it}) = \alpha_0 + \beta_1 PreExposure_{it} + \sum_{n=1}^{N} Exposure_{it}^{n}\theta_i + \lambda X_{it} + \gamma_i + \theta_t + \epsilon_{it} \qquad (9)$$

where $\ln(Y_{it})$ represents the natural log of three possible outcome variables for hospital i in year t: the number of registered nurses (RNs), the number of licensed practical nurses (LPNs) nurses, and the average hospital salary.[17] $PreExposure_{it}$ is an indicator equal to 1 if the hospital is in the period before "exposure" to a merger and $Exposure_{it}^{n}$ is a set of dummy variables indicating each hospital's relative timing of exposure to a merger, where n is the number of periods since exposure.

Table IX presents the results of a condensed event study where n represents groups of five years since exposure (e.g. 1-5 years since exposure, 6-10 years since exposure,...). The fixed-effects specification in Table IX indicates that exposure to a merger is not associated with a reduction in RN employment until 11-15 years removed from exposure. Specifically, being 11-15 years removed from the event is associated with having 4.4 log points fewer nurses and this grows to 5.3 log points fewer nurses when 16-20 years removed (significant at the 5% level and 10% level, respectively). While it is possible that the effects of an increase in buying power could take 10+ years to occur, it is unlikely. These results at long horizons are probably due to other unobserved variations in the markets, rather than effects directly related to mergers. The results, therefore, appear to confirm that the employment effects of a merger are driven by efficiency gains and not an increase in monopsony power.

The rival event study results are similar for LPN employment levels. The fixed-effects specification in Table IX does not show a significant effect until 16-20 years after exposure to a merger, with a coefficient of -0.08. Again, these results confirm that the effects of a merger on LPN levels are driven by efficiency gains and not an increase in monopsony power.

When examining the average salary in a hospital, I find similar effects, or lack thereof. Table IX shows that average salary is not significant in either specification when examining within each 5-year interval in the post-merger period. Since there is essentially no evidence of an effect on salary at rival hospitals exposed to a merger, it is unlikely that the merger has resulted in an increased exploitation of monopsony

[17] As previously mentioned, average hospital salary is the closest proxy for nurse wage at the hospital level.

power.

Additional rivals analsyes are conducted by estimating a more condensed specification looking simply before and after exposure, as well as a more disaggregated specication that estimates equation 12 but n represents each year from exposure. These results support the estimates seen in Table IX. A discussion of these specifications and results can be found in Appendix D.

5 Discussion and Conclusions

Previous studies of hospital merger effects have focused on prices, costs, and patient outcomes. There is, however, reason to believe that mergers may also affect labor market outcomes as well. First, hospitals may see an increase in efficiency through shared knowledge or facilities. Second, a merger may create a change in labor market competition and lead to an increase in employer monopsony power. The latter has been a concern for the market for nurses due to their perceived relative immobility and specialized labor. Prior studies of monopsony typically look at a change in hospital market concentration on the market wages of nurses. None of these studies, however, exploit mergers as a source of change in competition. In this paper, I examine the effects of hospital mergers and system-joinings on the employment outcomes of Registered Nurses and Licensed Practical Nurses. Nurses are an important labor market to examine as there are persistent reports of shortages and large expected future demand. I find a clear reduction in employment levels following a merger but no change in wages. These results are not with increases in buying power as a result of consolidation. In other words, these results are consistent with the previous lierature that documents cost reduction post-merger (Dranove and Lindrooth, 2003; Harrison, 2011). That is, these costs are partly reduced in the form of a reduction in the employment of nurses. Given these reductions, it would be interesting to examine other subsets of hospital staffing, to see what workers, if any, are replacing these nurses.

I also examine the effects of hospital system-joinings on the same labor market outcomes. System-joinings are another popular type of hospital consolidation, yet receive much less attention than mergers and are rarely differentiated from mergers. In general, the results for system-joinings differ significantly from those of mergers. While there is some evidence of a small decrease in RN employment following a system-joining, it is much less that the effect of a merger and only marginally signif-

icant. In addition, I find no change in LPN employment or average salary following a system-joining. These results are also consistent with previous findings that show a much smaller, if any, cost-reduction following a system-joining.

This paper is not without its limitations. As consolidation is not a random event, I address this selection problem through the use of control variables and propensity score weighting. There may be factors that I do not observe that still affect the probability of consolidating and are correlated with the outcome variables. For instance, profit would be a preferable measure of financial distress than cost per bed, but I do not observe revenues. Second, it is important to realize that attempting to parse out whether the employment affects are efficiency or market-driven is a difficult question and one that cannot be completely answered in this paper. That is, I cannot unambiguously rule out monopsony power as a cause for the reductions in RN and LPN employment since I do not observe RN and LPN wages at the hospital level, only average hospital salary across all employees. Similarly, given that admissions decrease following a merger, it is possible that these decreases in employment are not completely attributable to true "efficiency" gains.

Despite these limitations, it is clear that there are indeed large labor effects following a merger. These results provide the first evidence of employment level effects following a hospital merger and support the previous studies that do not find evidence of monopsony power in the market for nurses (Hansen, 1992; Hirsch and Schumacher, 1995; Hirsch and Schumacher, 2005). Hospital monopsony power has long been thought to be a problem in the nurse labor market. Considering that I examine 27 years of data, three different wage sources, and am able to identify a real change in market competition by examining almost the entire population of hospital consolidations, it is likely that the monopsonistic exploitation is not as prevalent as once believed.

While this study makes no statements on net welfare effects since there is no analysis of price or patient outcomes, it does point to the need for including employment effects in an overall welfare analysis of hospital consolidations. A full welfare analysis of any hospital consolidation should not only include price effects and changes in patient outcomes but also how employment changes and how these effects contribute to patient outcomes. On the other hand, given that I also find a decrease in number of admissions following consolidation as well as no change in the number of RNs per admissions, it may be the case that these employment decreases do not affect quality of care.

Finally, while the results provide evidence that system-joiners are different from mergers, and therefore should not be treated the same as mergers, it does not rule out that some system-joinings may experience similar effects to those of a hospital merger. Since system-joinings cover such a broad range of consolidation, in order to get a more complete picture of how system-joinings affect employment levels in hospitals, it would be necessary to identify those system-joinings that most closely mimic a merger. It is possible that these system-joinings that partake in a greater form of consolidation (i.e. those whose consolidation most closely resembles a merger) see greater employment effects.

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Table I
Summary statistics of all hospitals

	Merging Hospitals	System-Joining Hospitals	Other Hospitals
RNs	503.84	220.51	155.04
LPNs	83.26	35.73	31.67
RNs+LPNs	587.10	256.25	186.71
RNs/1000 Admissions	23.04	33.33	34.35
LPNs/1000 Admissions	5.61	10.67	24.90
RNs+LPNs/1000 Admissions	28.65	31.01	59.26
Avg Hospital Salary ($000s)	28.08	28.47	22.95
Admissions (000s)	24.92	10.23	8.64
Not for Profit (%)	64.85	41.18	49.38
For-profit (%)	18.20	29.04	11.29
Government (%)	16.83	29.77	39.32
HHI (beds)	995.38	981.95	966.95

Merging hospitals are aggregated, while system-joining hospitals are not.

Table II
Examining Hospitals Before and After a Merger

	Before Merging		After Merging	
	5 Years	1 Year	1 Year	5 Years
RNs	506.65	479.38	482.21	589.76
LPNs	99.31	78.69	68.30	73.21
RNs+LPNs	605.96	558.07	550.51	662.97
Admissions (000s)	24.56	23.93	23.47	30.27
RNs/1000 Admissions	23.45	23.20	22.16	22.03
LPNs/1000 Admissions	6.08	5.68	4.78	4.36
Avg Hospital Salary ($000s)	24.01	28.49	30.00	33.65
Not for Profit (%)	63.33	62.33	66.53	69.11
For-profit (%)	18.95	22.43	16.63	15.77
Government (%)	17.72	15.24	16.83	15.12
HHI (beds)	683.67	708.24	1129.26	1178.56

Merging hospitals are aggregated.

Table III
Examining Hospitals Before and After a System-Joining

	Before System-Joining		After System-Joining	
	5 Years	1 Year	1 Year	5 Years
RNs	306.54	328.68	173.30	189.96
LPNs	56.15	46.56	29.98	29.62
RNs+LPNs	362.70	375.24	203.27	219.59
Admissions (000s)	14.49	15.07	8.40	9.23
RNs/1000 Admissions	25.05	27.95	28.95	27.89
LPNs/1000 Admissions	8.00	6.73	9.40	8.23
Avg Hospital Salary ($000s)	23.04	28.23	27.61	31.51
Not for Profit (%)	66.92	66.15	60.55	38.40
For-profit (%)	5.67	11.22	21.10	34.35
Government (%)	27.41	22.63	18.34	27.25
HHI (beds)	949.57	980.78	981.22	937.85

System-joining hospitals are not aggregated at the system-level.

Table IV
Effects of Hospital Consolidation on Employment Outcomes:
difference-in-differences Estimates

	Mergers	Mergers	Systems
Dependent Variables	Equation (1)	Equation (2)	
RNs	-0.129***	-0.101***	-0.020
	(0.023)	(0.021)	(0.030)
LPNs	-0.181***	-0.152***	-0.030
	(0.034)	(0.032)	(0.045)
RNs+LPNs	-0.132***	-0.105***	-0.013
	(0.023)	(0.020)	(0.029)
Admissions	-0.148***	-0.117***	-0.050*
	(0.020)	(0.018)	(0.027)
RNs/Admissions	0.019	0.016	0.030
	(0.015)	(0.015)	(0.021)
LPNs/Admissions	-0.035	-0.036	0.019
	(0.029)	(0.028)	(0.044)
RNs+LPNs/Admissions	0.016	0.012	0.037*
	(0.015)	(0.014)	(0.020)
Avg Hospital Salary	0.005	0.005	-0.002
	(0.009)	(0.009)	(0.012)

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Each row in Column 1 represents a separate regressions, showing the coefficient for $AfterM_{it}$ only. Each row in the next two columns combined also represents a single regression, with coefficients for $AfterM_{it}$ and $AfterS_{it}$ reported in Columns 2 and 3, respectively. All regressions contain the following control variables: cost per bed, the number of hospitals in the same zip code, whether the hospital is not-for-profit or for-profit, and concentration level of the market (HHI). Year fixed-effects are included in all regressions and standard errors are clustered at the hospital level.

Table V
Effects of Hospital Consolidation on Employment Outcomes:
difference-in-differences Estimates, Weighted by Propensity Scores

	Mergers	Mergers	Systems
Dependent Variables	Equation (1)	Equation (2)	
RNs	-0.141***	-0.111***	-0.008
	(0.024)	(0.019)	(0.029)
LPNs	-0.195***	-0.160***	-0.019
	(0.037)	(0.030)	(0.048)
RNs+LPNs	-0.147***	-0.116***	-0.002
	(0.023)	(0.018)	(0.028)
Admissions	-0.172***	-0.126***	-0.044*
	(0.024)	(0.017)	(0.026)
RNs/Admissions	0.031**	0.015	0.036*
	(0.015)	(0.014)	(0.021)
LPNs/Admissions	-0.023	-0.035	0.022
	(0.033)	(0.028)	(0.045)
RNs+LPNs/Admissions	0.025*	0.010	0.041**
	(0.014)	(0.013)	(0.020)
Avg Hospital Salary	0.004	0.004	-0.003
	(0.009)	(0.009)	(0.012)

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Each row in Column 1 represents a separate regressions, showing the coefficient for $AfterM_{it}$ only. All regressions contain the following control variables: cost per bed, the number of hospitals in the same zip code, whether the hospital is not-for-profit or for-profit, and concentration level of the market (HHI). Year fixed-effects are included in all regressions and standard errors are clustered at the hospital level.

Table VI
NSSRN Summary Statistics

	Hospital		Nursing Home		Doctor's Office	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Log wage	3.14	0.39	2.97	0.42	2.99	0.50
Hourly wage	24.99	15.52	21.52	16.57	22.50	16.42
Hours per week	35.86	10.87	35.13	11.58	33.83	11.74
Weeks per year	50.33	5.44	49.94	6.49	49.84	6.32
Age (Median)	39.14	10.47	45.66	11.42	42.98	10.13
Male	0.18	0.38	0.16	0.37	0.23	0.42
Race = White	0.90	0.30	0.92	0.27	0.94	0.24
Married	0.69	0.46	0.69	0.46	0.79	0.40
Widowed/Divorced/Separated	0.14	0.35	0.20	0.40	0.13	0.34
Never married	0.15	0.35	0.10	0.30	0.07	0.25
Any children?	0.90	0.30	0.89	0.31	0.86	0.35
Full time	0.71	0.45	0.68	0.47	0.64	0.48
RN Diploma	0.34	0.47	0.47	0.50	0.41	0.49
Associate's Degree	0.38	0.49	0.38	0.48	0.33	0.47
Bachelor's Degree	0.27	0.45	0.15	0.35	0.25	0.44
Master's Degree	0.00	0.04	0.00	0.04	0.01	0.07
Involved in Direct Patient Care	0.92	0.27	0.03	0.17	0.09	0.29
% time spent on administration	8.40	18.89	19.32	26.91	11.03	19.94
% time spent on consultation	5.16	11.03	7.16	12.76	8.13	13.37
% time spent on patient care	69.67	34.07	38.23	33.96	68.97	31.23
% time spent on supervising	10.70	19.34	26.61	26.20	5.67	13.54
% time spent on research	1.41	6.84	1.62	6.69	1.89	8.62
% time spent on teaching	3.36	10.06	4.59	12.87	1.82	6.63
% time spent on other duties	1.17	8.06	2.23	11.37	2.33	11.68
Household income < 15K	0.01	0.10	0.04	0.18	0.01	0.11
15K < Household income < 25K	0.07	0.26	0.11	0.31	0.05	0.22
25K < Household income < 35K	0.14	0.35	0.17	0.37	0.10	0.30
35K < Household income < 50K	0.25	0.43	0.26	0.44	0.20	0.40
50K < Household income < 75K	0.28	0.45	0.24	0.43	0.27	0.45
75K < Household income < 100K	0.15	0.35	0.12	0.32	0.18	0.38
100K < Household income < 150K	0.08	0.27	0.06	0.23	0.12	0.33
Household income > 150K	0.02	0.15	0.01	0.11	0.06	0.24
Observations	109575		12682		14551	

Table VII
Summary Statistics of BLS Wage Data: 1997-2009

	Observations	Mean	S.D	Min	Max
Mean Wage	4270	24.19	5.49	7.68	53.38
Median Wage (50th Percentile)	4270	23.65	5.52	7.21	55.88
Hourly Wage of 10th Percentile	3952	17.81	3.87	5.54	33.88
Hourly Wage of 25th Percentile	3952	20.62	4.52	6.10	45.16
Hourly Wage of 75th Percentile	3951	28.04	6.47	8.34	63.39
Hourly Wage of 90th Percentile	3947	32.57	7.59	10.17	69.19
Total Employment of RNs (by MSA)	3660	5852.21	9514.59	60	99010

Table VIII
Supplemental Wage Data Results using NSSRN and BLS data

	Mergers	Mergers	Systems
	Equation (7)	Equation (8)	
Market Log Wage of RN (NSSRN)	-0.005	-0.006	-0.003
	(0.010)	(0.034)	(0.004)
Market Log Wage of RN (BLS)	0.004	0.005	0.000
	(0.004)	(0.004)	(0.003)

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

The first row is the effect on RN wage using the National Sample Survey of Registered Nurses (NSSRN). The second row is the effect on RN wage using the Bureau of Labor Statistics Occupational Employment and Wage Estimates (BLS).

Table IX
Event Study: Rival Analysis, Employment Effects on Hospitals Exposed to a Merger

	(1) RNs	(2) RNs	(3) LPNs	(4) LPNs	(5) Salary	(6) Salary
Pre-Exposure	-0.0292	-0.0100	0.0234	-0.0012	0.0033	0.0169
	(0.0284)	(0.0142)	(0.0394)	(0.0251)	(0.0298)	(0.0128)
1 to 5 years since exposure	-0.0044	0.0112	0.0226	0.0239	0.0132	0.0163
	(0.0224)	(0.0134)	(0.0324)	(0.0215)	(0.0224)	(0.0116)
6 to 10 years since exposure	-0.0082	-0.0096	0.0040	-0.0006	0.0193	0.0119
	(0.0264)	(0.0156)	(0.0355)	(0.0265)	(0.0264)	(0.0138)
11 to 15 years since exposure	-0.0382	-0.0440**	-0.0121	-0.0316	-0.0116	-0.0180
	(0.0277)	(0.0159)	(0.0369)	(0.0310)	(0.0280)	(0.0145)
16 to 20 years since exposure	-0.0329	-0.0531*	-0.1523**	-0.0786*	0.0003	-0.0105
	(0.0361)	(0.0206)	(0.0533)	(0.0385)	(0.0357)	(0.0188)
Hospital FE		Yes		Yes		Yes

All regressions contain the following control variables: cost per bed, the number of hospitals in the same zip code, whether the hospital is not-for-profit or for-profit, and concentration level of the market (HHI). Year fixed-effects are included in all regressions and standard errors are clustered at the hospital level.

Figure I
Number of Hospital Mergers and System-Joinings: 1983-2009

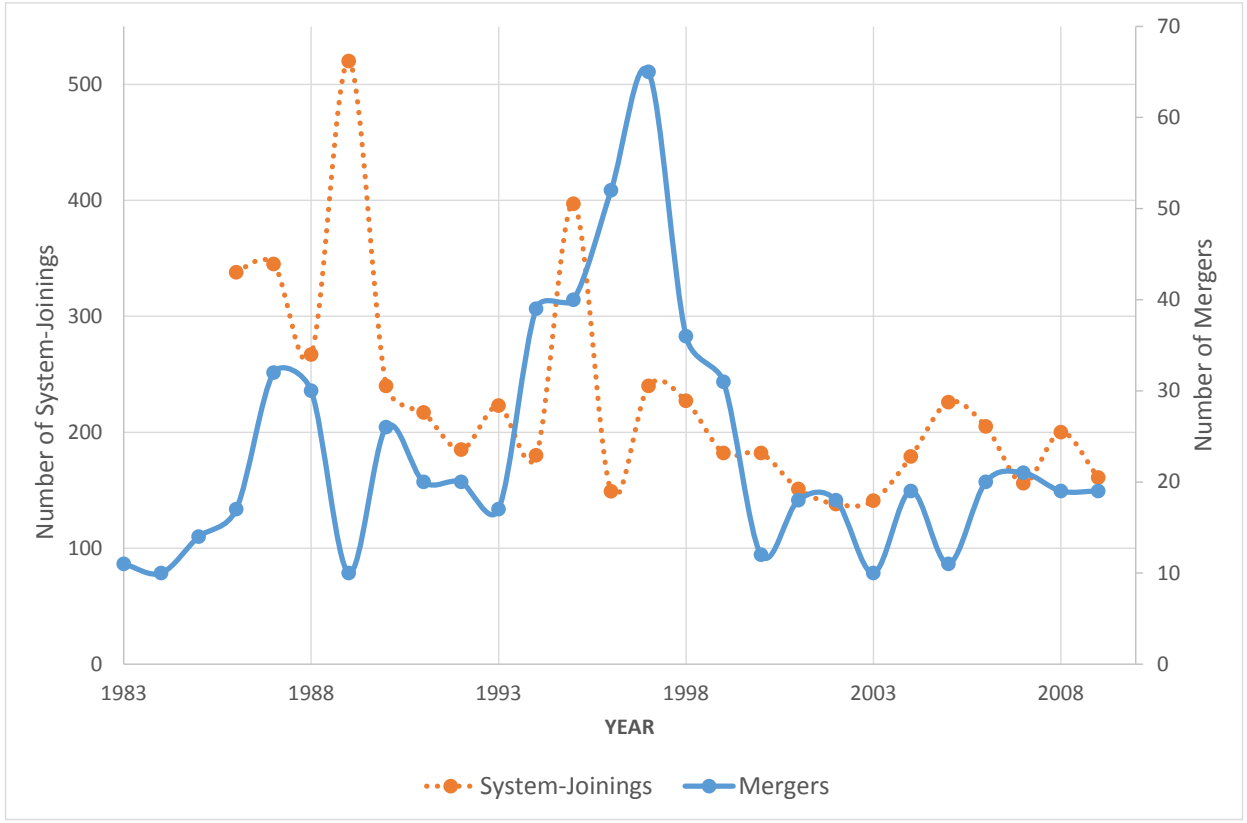
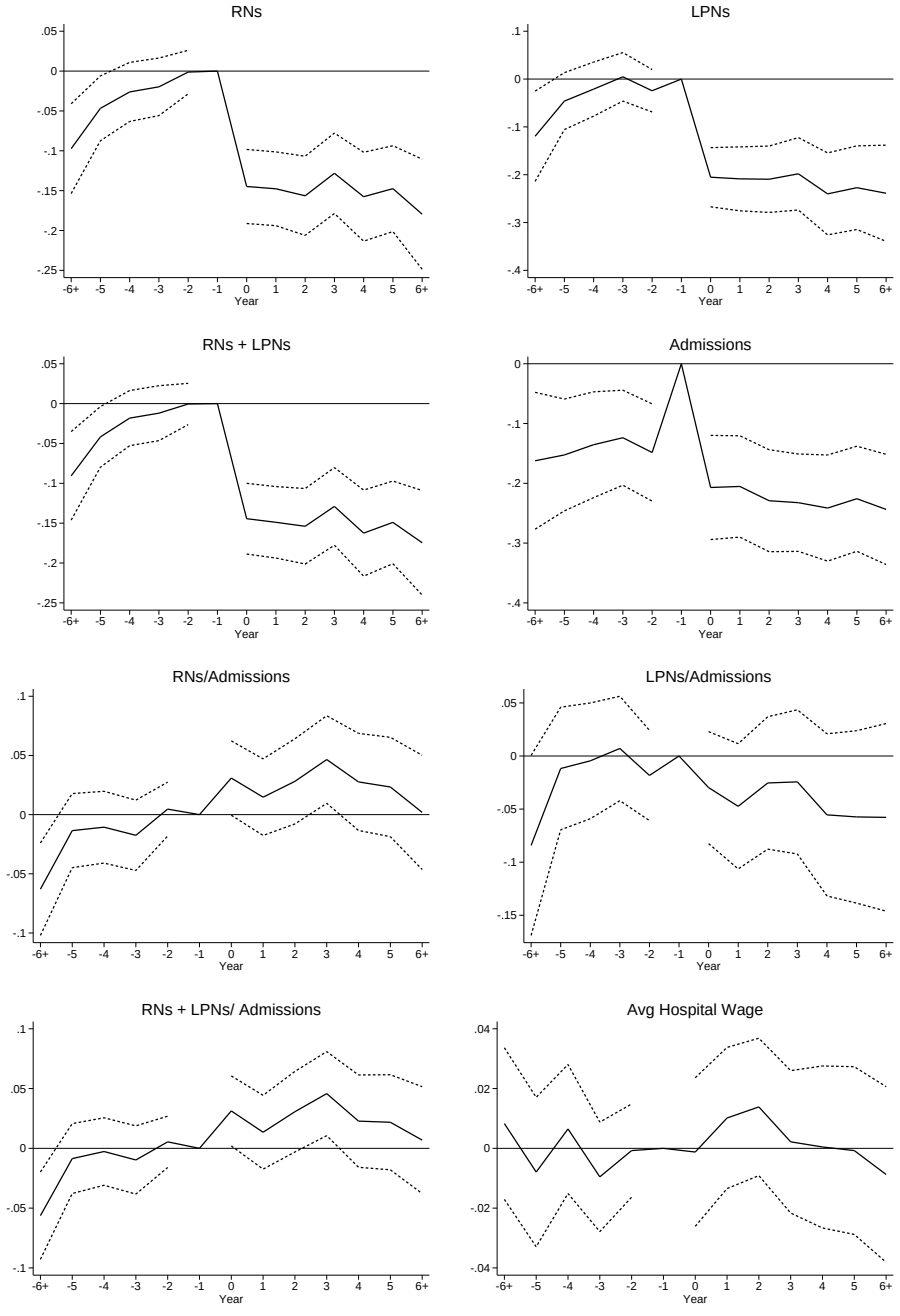
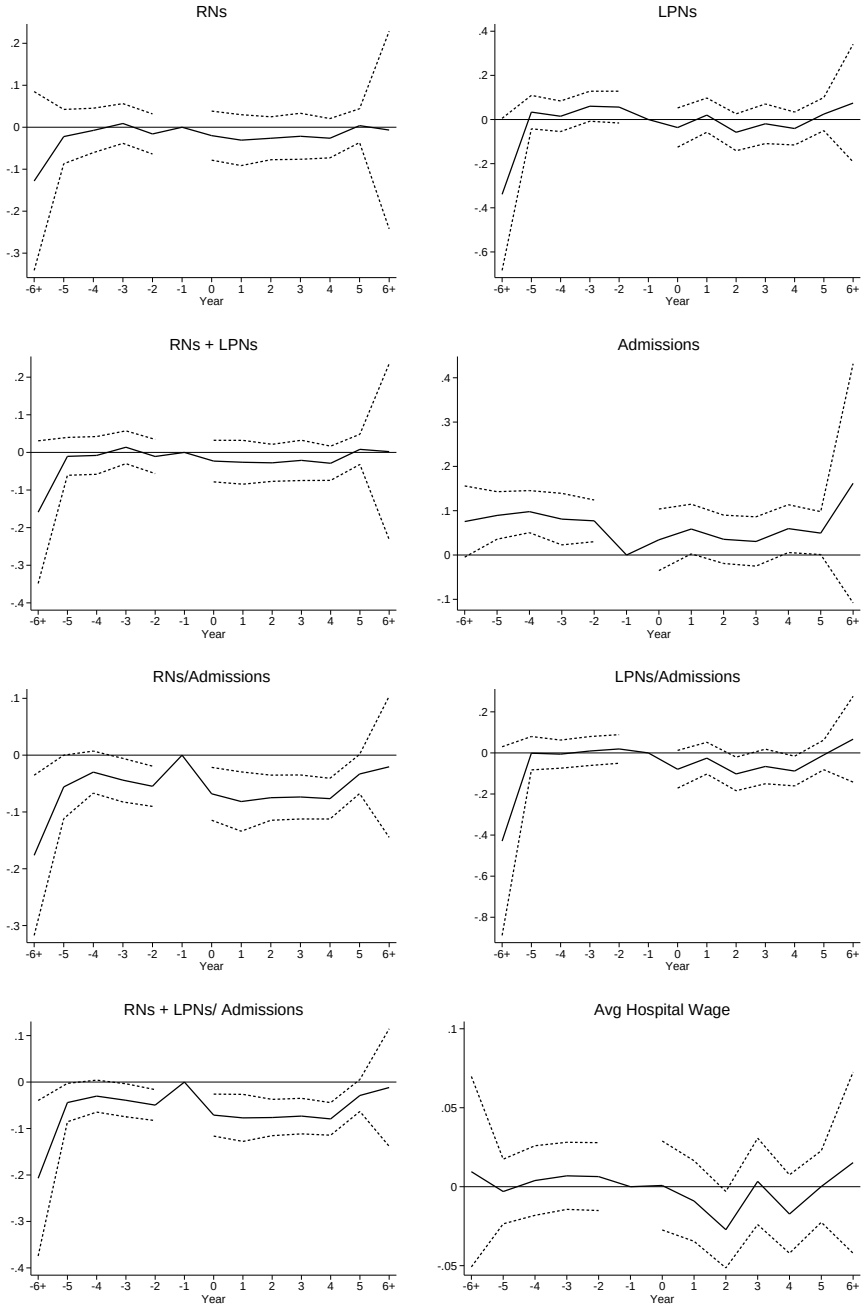


Figure II
Event Study Results: Effects of Mergers (Mergers and Systems Effects Both Estimated)



Graphs indicate the estimated effects and 95% confidence intervals for each year surrounding a merger or system-joining. The year prior to merger is omitted in all regressions. All outcomes are measured in logs.

Figure III
Event Study Results: Effects of Joining Systems (Mergers and Systems Effects Both Estimated)



Graphs indicate the estimated effects and 95% confidence intervals for each year surrounding a merger or system-joining. The year prior to merger is omitted in all regressions. All outcomes are measured in logs.

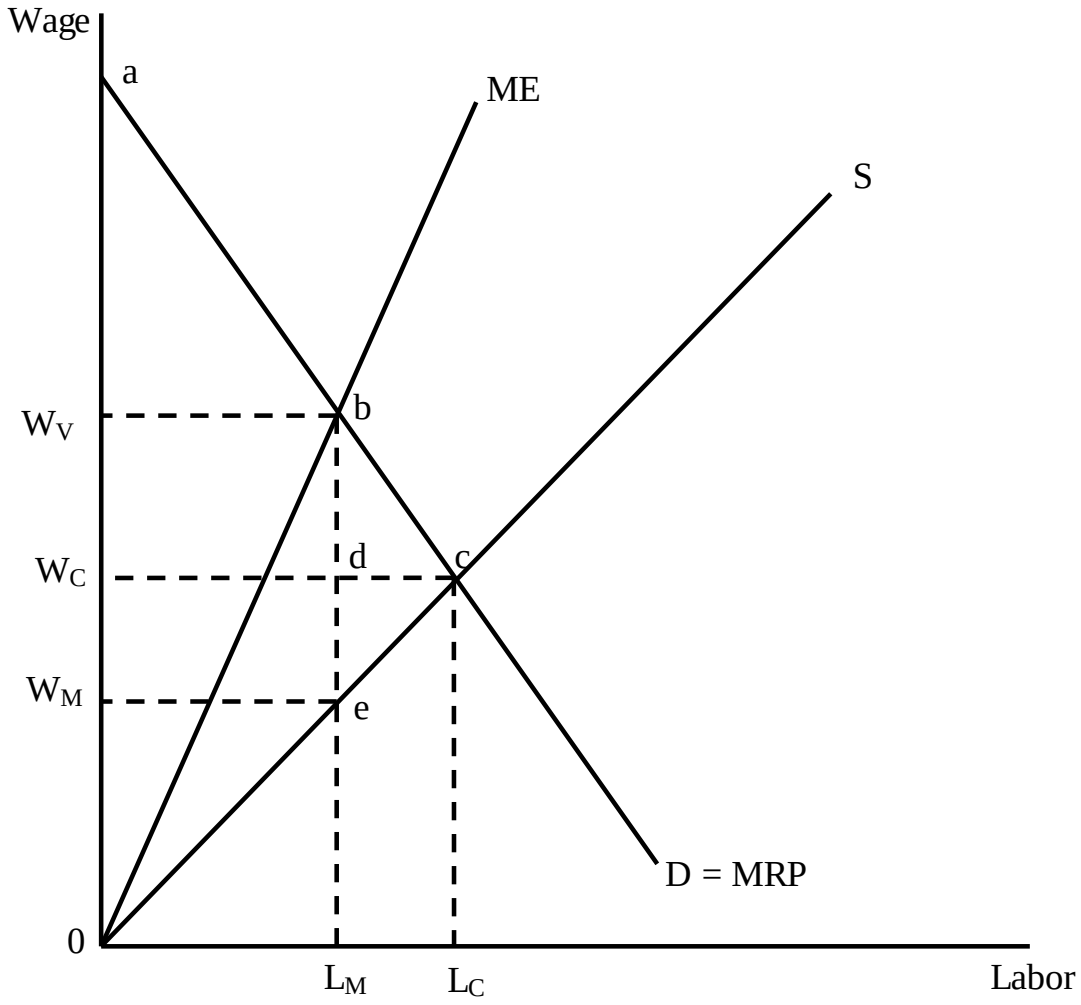
Appendices

A A Simple Model of Monopsony

If a hospital faces an upward sloping supply curve of nurses, it is possible that monopsonistic behavior on the part of hospitals could explain changes in employment and wages. If a hospital has monopsony power, they will behave like the hospital in Figure A.1.

For the hospital, profit maximization occurs where marginal revenue product (MRP) equals marginal expenditure (ME). Thus the monopsony employment is L_M and the monopsony wage is W_M. Keep in mind the hospital will only hire a nurse when there is value or revenue to be gained from the unit so the hospital's demand for each nurse is their marginal revenue product. Clearly the profit maximizing number of nurses and corresponding wage is less than the amount of nurses that would have been hired under competition, L_C and W_C, respectively. Additionally, it is worth noting that the monopsony wage of W_M is not only below the competitive wage of W_C, but well below the marginal value of labor, W_V. The difference between the marginal value and the wage paid is known as the *monopsonistic exploitation*.

Figure A.1
Monopsony Labor Market



B Characteristics Associated with Consolidation

The probability of consolidating is estimated based upon a set of observable hospital characteristics from the year 1983 (the first year in the data). These results show that a higher cost per bed is associated with an increased probability for both types of hospital consolidations. In addition not-for-profit hospitals and for-profit hospitals are more likely to consolidate than government-owned hospitals. Having another hospital in the same zip code is also associated with a higher probability to consolidate.

Table B.1
The Effects of Hospital Characteristics on the Probability of Consolidating: Mergers and System-Joinings

	(1) Mergers	(2) System-Joinings
HHI(00s)	-0.0027***	-0.0013*
	(0.0006)	(0.0005)
Cost per Bed (000s)	0.0231***	0.0286***
	(0.0003)	(0.0002)
System Membership	0.7775***	
	(0.0175)	
Not-For-Profit	0.2768***	0.1673***
	(0.0136)	(0.0118)
For-Profit	0.5036***	0.1346***
	(0.0177)	(0.0168)
Number of Hospitals (in zip code)	0.0556***	0.0253***
	(0.0043)	(0.0043)
Constant	-1.9731***	-1.6396***
	(0.0147)	(0.0128)

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

For ease of interpretation, HHI is divided by 100 and cost per bed is divided by 10000.

C Event Study: Mergers Only

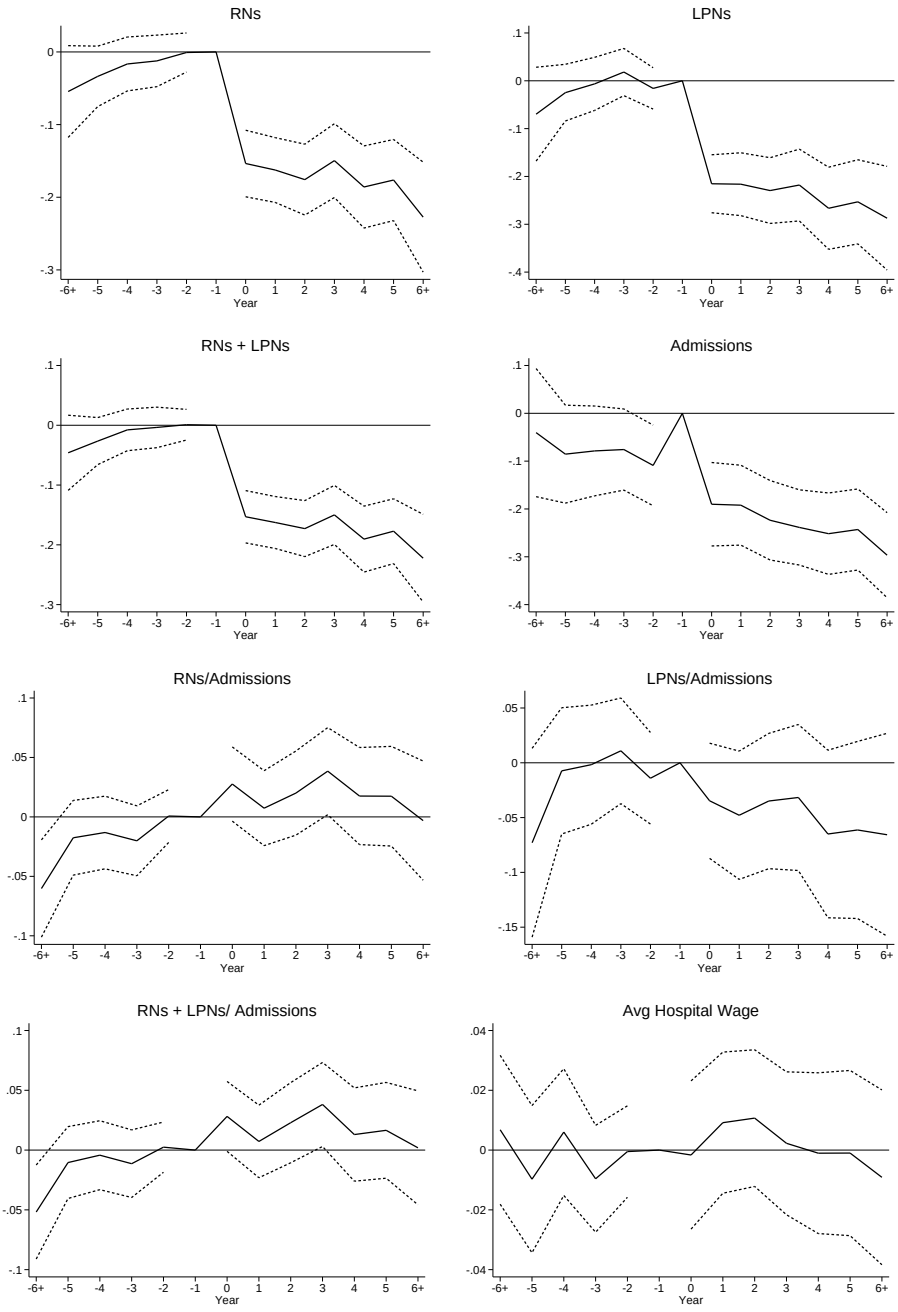
I estimate a model of separate treatment effects for the years before and after a merger. Specifically, I estimate equation 10 which is restated below:

$$\ln(Y_{it}) = \delta Merge_{it} + \sum_{n=-6}^{6} M_{it}^{n}\theta + \beta X_{it} + \mu_i + \tau_t + \epsilon_{it} \tag{10}$$

where M_{it}^{n} are a set of dummy variables indicating each hospital's relative timing to a merger (six or more years before merger, five years before merger, ..., five years after merger, six or more years after merger). The omitted category is the year before the event.

Figure C.1 shows the different employment outcomes in relation to the timing of mergers. These results are very similar to those seen in Figure II when examining both mergers and system-joinings. Both the number of RNs and LPNs decrease following a merger and continue to decrease for at least six years post-merger. This is also a small decrease in the ratio of LPNs to admissions post-merger, but this is statistically insignificant. Combined with the employment to output results, the lack of a salary effect after a merger indicates that the decrease in employment is the result of an efficiency gain and not an increase in monopsony power. The admissions results, while insignificant pre-merger, may indicate that admissions are trending downward before a merger. This would further support the idea that employment decreases post-merger are not a result of monopsony power. Instead, it's possible that hospitals that merge are currently experiencing an excess supply of e.g. beds, labor, etc., pre-merger.

Figure C.1
Event Study Results: Effects of Mergers (Only Merger Effects Estimated)



Graphs indicate the estimated effects and 95% confidence intervals for each year surrounding hospital mergers. The year prior to merger is omitted in all regressions. All outcomes are measured in logs.

D Rivals Analysis: Additional Specifications

In addition to the estimation in Section 4.5.2, I also estimate the following equation:

$$\ln(Y_{it}) = \alpha_0 + \beta_1 PreExposure_{it} + \beta_1 AfterExposure_{it} + \lambda X_{it} + \gamma_i + \theta_t + \epsilon_{it} \quad (11)$$

where $\ln(Y_{it})$ represents the natural log of three possible outcome variables for hospital i in year t: the number of registered nurses (RNs), the number of licensed practical nurses (LPNs) nurses, and the average hospital salary.[18] $PreExposure_{it}$ is an indicator equal to 1 if the hospital is in the period before "exposure" to a merger and $AfterExposure_{it}$ is an indicator equal to 1 if the hospital in a period following "exposure" to a merger. Indicators for the amount of years since the merger occurred are alternatively used in place of the aggregated indicator $AfterExposure_{it}$. X_{it} is vector of the same time-varying hospital and market control variables as used in equation (1). Year fixed-effects (θ_t) are included and the regressions are run with hospital fixed-effects (γ_i) unless otherwise indicated. Standard errors are clustered at the hospital level.

The results of the pre- versus post-exposure effects are reported in Table D.1. Being in the post-exposure period does not appear to be associated with a change in the number of RNs or LPNs employed nor is it associated with a change in the average hospital salary. As expected, being in the pre-exposure period is also not associated with any difference in number of RNs or LPNs or average salary at a hospital.

I also conduct more of a traditional event study, like that in Section 4.3, on rival hospitals and present these in Table D.2. In other words, I estimate the following equation:

$$\ln(Y_{it}) = \alpha_0 + \beta_1 PreExposure_{it} + \sum_{n=1}^{N} Exposure_{it}^{n} \theta_i + \lambda X_{it} + \gamma_i + \theta_t + \epsilon_{it} \quad (12)$$

where $PreExposure_{it}$ is an indicator equal to 1 if the hospital is in the period before "exposure" to a merger and $Exposure_{it}^{n}$ is a set of dummy variables indicating each hospital's relative timing of exposure to a merger.

This estimation provides a more detailed look at the results described in Section

[18] As previously mentioned, average hospital salary is the closest proxy for nurse wage at the hospital level.

4.5.2 and are presented in Table D.2. While we saw in Table IX that employment decreases did not occur until 10 years after exposure to a merger, the further disaggregated indicators (Table D.2) show that this effect is concentrated in years 12-17, with the largest coefficient coming in year 15. This means that exposure to a merger is not associated with a reduction in RN employment until 12 years after the merger occurred. Again, while it is possible that the effects of an increase in buying power could take 10+ years to occur, it is unlikely. These results at long horizons are probably due to other unobserved variations in the markets, rather than effects directly related to mergers. These results, therefore, appear to confirm that the employment effects of a merger are driven by efficiency gains and not an increase in monopsony power.

Similarly, the disaggregated indicators show that the LPN employment decreases in Table IX are concentrated to years 14-16, with the largest coefficient coming in year 16. This means that exposure to a merger is not associated with a reduction in LPN employment until 14 years after the merger occurred. Again, these results confirm that the effects of a merger on LPN levels are driven by efficiency gains and not an increase in monopsony power.

Finally, Table D.2 indicates that while their might be an effect of exposure to a merger on average salary, this does not occur until year 14. In general, there is essentially zero effect on salary at rival hospitals exposed to a merger, it is unlikely that the merger has resulted in an increased exploitation of monopsony power.

Table D.1
Rival Analysis: Employment Effects on Hospitals Exposed to a Merger, Difference-in-Differences Estimates

	(1) RNs	(2) RNs	(3) LPNs	(4) LPNs	(5) Salary	(6) Salary
Pre-Exposure	-0.0456	-0.0329	-0.0324	-0.0290	-0.0222	0.0032
	(0.0370)	(0.0180)	(0.0472)	(0.0317)	(0.0400)	(0.0147)
After-Exposure	-0.0310	-0.0268	-0.0637	-0.0195	-0.0186	-0.0040
	(0.0260)	(0.0180)	(0.0514)	(0.0300)	(0.0300)	(0.0154)
Hospital FE		Yes		Yes		Yes

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

All regressions contain the following control variables: cost per bed, the number of hospitals in the same zip code, whether the hospital is not-for-profit or for-profit, and concentration level of the market (HHI). Year fixed-effects are included in all regressions and standard errors are clustered at the hospital level.

Table D.2
Event Study: Rivals Analysis, Employment Effects on Hospitals Exposed to a Merger

Years since Exposure:	RNs	RNs	LPNs	LPNs	Salary	Salary
< 0	-0.0290	-0.0087	0.0234	0.0008	0.0037	0.0176
	(0.0284)	(0.0144)	(0.0394)	(0.0253)	(0.0298)	(0.0129)
1	0.0025	0.0080	0.0179	0.0162	0.0218	0.0096
	(0.0240)	(0.0138)	(0.0349)	(0.0225)	(0.0240)	(0.0119)
2	0.0076	0.0199	0.0244	0.0342	0.0191	0.0209
	(0.0233)	(0.0156)	(0.0354)	(0.0246)	(0.0229)	(0.0129)
3	-0.0088	0.0109	0.0071	0.0150	0.0104	0.0197
	(0.0243)	(0.0157)	(0.0357)	(0.0263)	(0.0245)	(0.0135)
4	-0.0184	0.0089	0.0460	0.0381	0.0059	0.0180
	(0.0253)	(0.0163)	(0.0359)	(0.0261)	(0.0249)	(0.0133)
5	-0.0060	0.0096	0.0193	0.0189	0.0092	0.0152
	(0.0267)	(0.0166)	(0.0374)	(0.0278)	(0.0261)	(0.0141)
6	-0.0007	0.0026	0.0223	0.0210	0.0287	0.0196
	(0.0265)	(0.0165)	(0.0368)	(0.0295)	(0.0261)	(0.0151)
7	-0.0089	0.0043	-0.0005	0.0045	0.0265	0.0258
	(0.0275)	(0.0182)	(0.0386)	(0.0299)	(0.0268)	(0.0151)
8	-0.0111	-0.0133	0.0070	0.0027	0.0144	0.0114
	(0.0282)	(0.0180)	(0.0391)	(0.0296)	(0.0281)	(0.0156)
9	-0.0144	-0.0244	-0.0110	-0.0201	0.0193	0.0062
	(0.0296)	(0.0176)	(0.0399)	(0.0315)	(0.0290)	(0.0157)
10	-0.0059	-0.0199	-0.0018	-0.0139	0.0072	-0.0051
	(0.0306)	(0.0179)	(0.0420)	(0.0344)	(0.0310)	(0.0160)
11	-0.0361	-0.0277	-0.0174	-0.0135	-0.0192	-0.0096
	(0.0313)	(0.0174)	(0.0421)	(0.0347)	(0.0311)	(0.0157)
12	-0.0718*	-0.0374*	0.0083	0.0027	-0.0481	-0.0162
	(0.0361)	(0.0187)	(0.0429)	(0.0343)	(0.0359)	(0.0169)
13	-0.0577	-0.0391*	0.0049	-0.0237	-0.0233	-0.0058
	(0.0347)	(0.0183)	(0.0428)	(0.0371)	(0.0347)	(0.0165)
14	0.0153	-0.0721***	-0.0181	-0.0843*	0.0503	-0.0379*
	(0.0337)	(0.0213)	(0.0508)	(0.0423)	(0.0339)	(0.0171)
15	-0.0017	-0.0762**	-0.0672	-0.1067*	0.0313	-0.0423*
	(0.0360)	(0.0231)	(0.0561)	(0.0459)	(0.0366)	(0.0201)
16	-0.0256	-0.0744**	-0.1307*	-0.1152*	-0.0036	-0.0399
	(0.0386)	(0.0251)	(0.0597)	(0.0488)	(0.0389)	(0.0271)
17	-0.0495	-0.0624*	-0.1387*	-0.0799	0.0005	-0.0049
	(0.0431)	(0.0244)	(0.0621)	(0.0481)	(0.0402)	(0.0195)
18	-0.0283	-0.0385	-0.1243	-0.0795	-0.0003	-0.0056
	(0.0425)	(0.0249)	(0.0650)	(0.0499)	(0.0426)	(0.0240)
19	-0.0128	-0.0437	-0.2248**	-0.0922	0.0171	-0.0066
	(0.0450)	(0.0262)	(0.0771)	(0.0585)	(0.0449)	(0.0222)
20	-0.0490	-0.0466	-0.1612*	-0.0234	-0.0088	0.0128
	(0.0440)	(0.0289)	(0.0721)	(0.0560)	(0.0480)	(0.0276)
Hospital FE		Yes		Yes	Yes	