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ABSTRACT

A variety of recent theoretical and empirical advances have renewed interest in monopsonistic models of the labor market. However, there is little direct empirical support for these models, even in labor markets that are textbook examples of monopsony. We use an exogenous change in wages at Veterans Affairs hospitals as a natural experiment to investigate the extent of monopsony in the nurse labor market. In contrast to much of the prior literature, we estimate that labor supply to individual hospitals is quite inelastic, with short-run elasticity around 0.1. We also find that non-VA hospitals responded to the VA wage change by changing their own wages.

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1. Introduction

Standard competitive models assume that individual firms are price-takers in the labor market. However, since Robinson (1933) first coined the term "monopsony," economists have considered the alternative case in which individual firms face upward sloping labor supply curves and, therefore, have market power which enables them to set wages. Originally, monopsony power was thought to exist primarily in fairly specialized labor markets, in which a single firm bought labor in an isolated labor market (analogous to a monopolist in a product market). More recently, a variety of theoretical models have suggested that monopsonistic behavior may be pervasive, with individual firms facing upward-sloping labor supply curves because of the presence of oligopoly, differentiation between firms, moving costs, costly job search, or efficiency wages (Boal and Ransom, 1997).

Empirical evidence of monopsony is quite mixed (see Boal and Ransom, 1997, for a recent review). On the one hand, monopsony provides a possible explanation for a variety of facts that are difficult to explain in the competitive model. For example, monopsony has been used to explain why an increase in the minimum wage led to an increase in employment (Card and Krueger, 1995), why there is a positive relationship between firm size and wages (Green, Machin and Manning, 1996), and why there are persistent differences across firms in wages and vacancy rates (Boal and Ransom, 1997; Card and Krueger, 1995; Yett, 1975). On the other hand, direct estimation of the elasticity of labor supply to individual firms suggests that firms have very little market power over wages even in labor markets that are textbook examples of monopsony such as nurses (Sullivan, 1989; Hansen, 1992) and coal miners (Boal, 1995).

This paper investigates whether individual hospitals have monopsony power in the labor market for Registered Nurses (RNs). The RN labor market is a popular textbook example of monopsony (e.g., Ehrenberg and Smith, 1987) because of persistent variations in wages across regions and across hospitals, along with nearly continuous reports of shortages since World War II (Yett, 1975; Aiken, 1982; Roberts, et al., 1989; Greene and Nordhaus-Bike, 1998). Thus, if one found no evidence of monopsony power in this market, it would be difficult to argue that monopsony was a pervasive feature of the labor market.

We analyze the effect of an exogenous, legislated change in RN wages at Veterans Administration (VA) hospitals. Our analysis differs in two important ways from the prior literature estimating monopsony power at the firm level. First, previous studies have used measures of output demand as instruments for wages in estimating the supply elasticity. In contrast, our source of identification comes from a legislated change in wages at certain hospitals. Thus, our empirical approach relies on a similar source of identification as that used in recent studies of the minimum wage (Card and Krueger, 1995). Arguably, this legislated change in wages provides the perfect "natural experiment" with which to answer the key question: does an exogenous change in wages at one hospital affect employment at that hospital or at competing hospitals? A second difference from the prior literature is that our empirical analysis is explicitly motivated by a model of geographic differentiation among firms, similar to Salop

(1979), in which hospitals compete directly only with their nearest neighbors. This model suggests that other hospitals will change their wages in response to the VA wage change, and the response will be largest at hospitals that are nearest to the VA.

Our empirical results are consistent with the presence of monopsony power in the RN labor market, generated by geographic differentiation between hospitals. We find that wages at non-VA hospitals responded to the VA wage change, and this response was largest among hospitals located within 15 miles of a VA hospital. In addition, we find that RN employment at individual hospitals responded very little in the short run to the resulting changes in relative wages between hospitals. Our estimates of the short-run elasticity of labor supply to an individual hospital average around 0.1, far lower than previous estimates in the literature. Overall, this evidence suggests that hospitals are wage-setters in the RN labor market, with considerable market power.

2. Previous studies of monopsony in nursing

Studies of monopsony in the nursing labor market have been motivated by two observations. First, in rural regions, there may be only one hospital and few other employers for registered nurses, potentially providing RN employers with market power. Second, as stated above, there have been persistent reports of nursing shortages since the 1940s. Research on nursing labor markets has provided conflicting evidence about the monopsony hypothesis.

Studies of nursing monopsony generally have taken two approaches. One line of literature has examined whether there is a relationship between labor market concentration and wage levels in cross-sectional analyses. Several studies have found that RN wages are lower when there are fewer hospitals or when hospital markets are more concentrated (Hurd, 1973; Link and Landon, 1975; Bruggink, et al., 1985; Robinson, 1988). However, studies that more carefully adjust for other area specific factors, such as the cost of living, find no evidence that market concentration *per se* is associated with lower wages (Adamache and Sloan, 1982; Feldman and Scheffler, 1982; Hirsch and Schumacher, 1995).

A more recent approach has sought to explicitly estimate the elasticity or inverse elasticity of labor supply to an individual hospital. In a simple static model of monopsony, the inverse elasticity of labor supply is a measure of "exploitation" analogous to the Lerner index, and equals the percentage amount that the wage lies below marginal revenue product (see Boal and Ransom, 1997). Sullivan (1989) estimated a wage elasticity of supply to individual hospitals of 1.26 over a one year period and 3.85 over a three year period using a national sample of hospitals from 1980 to 1985. In contrast, Hansen (1992), using an almost identical methodology, found that supply was very elastic in California from 1980 to 1987. Hansen's estimates of the labor supply elasticity ranged from 29 to 56. In a dynamic model these short-run elasticity estimates will overstate the amount of exploitation if labor supply is more elastic in the long run. Under reasonable assumptions, even Sullivan's estimates suggest that monopsony power is small in this market, with RN wages no more than 10 percent below their competitive level (Boal and Ransom, 1997).

There are two reasons to believe that these estimates may overstate the short-run supply elasticity (and thereby understate the amount of monopsony power). First, in both papers hospital days are assumed to be exogenous demand shifters and serve as instruments in estimating the supply curve by two stage least squares (2SLS). Therefore, these papers' 2SLS estimates of elasticities greater than 1 reflect the fact that for a given decline in hospital days, we observed RN employment to fall by more (often much more) than RN wages. However, reimbursement of hospitals changed dramatically over this period with the introduction of Medicare's Prospective Payment System in 1984, and hospitals responded to this change by reducing days spent in the hospital (Coulam and Gaumer, 1991). This suggests that much of the observed variation in hospital days over the early 1980s was endogenous. If hospital days were chosen endogenously, one would expect a positive association between the error in the supply equation and hospital days. This would bias the 2SLS method towards overstating the positive relationship between hospital days and RN employment, and therefore bias upward the estimate of the elasticity of supply.

A second reason to believe that these estimates may overstate the short-run supply elasticity is that both studies measure the wage using the average RN wage in the hospital. If a wage increase results in disproportionate hiring at the entry level, and entry level workers are paid less, then the change in the average wage will tend to understate the actual change in the wage (because of the shift toward entry-level workers). As a result, estimates of the labor supply elasticity will be biased upwards (Boal and Ransom, 1997, fn. 25).

3. RN wages and the VA policy

In 1991, the VA went from paying RNs based on a national scale to a system that set RN wages based on a local wage survey. This legislated change in RN wages at VA hospitals provides an ideal opportunity to examine whether there is monopsony in the RN labor market, while avoiding many of the problems of the previous literature. A short panel of data is available for VA and non-VA hospitals with complete information on staffing levels, patient caseloads, wages (including starting wages), and other hospital characteristics. The data can be first-differenced to control for variation in the cost of living and unmeasured attributes of hospitals. Finally, no assumptions need to be made about exogenous demand shocks, since the legislation generates exogenous changes in wages at VA hospitals, and these changes can in turn be used to construct instruments for wage changes at competing non-VA hospitals.

Prior to 1991, the Department of Veteran Affairs (VA) set registered nurse (RN) wages in all of its hospitals according to a national pay scale, with only minor adjustments to wages for hospitals in high wage markets. This policy seriously affected the VA's ability to recruit and retain RNs for two reasons. First, VA wages tended to lag behind the market throughout the 1980s, as real wages of RNs rose rapidly. More importantly, this policy caused VA wages to diverge from those of local labor markets, because nurse wages vary widely across regions. VA hospitals could respond somewhat to market conditions by obtaining waivers from the VA Central Office for wage increases. Although the waiver system improved the ability of VA hospitals to match market wages, the waivers were constrained by VA budgets and were often granted after local wages had risen further. For example, based on data from 1990 (see section 5, below), starting RN wages in Milwaukee – a relatively low wage market -- averaged $11.20/hour at non-VA hospitals while the VA starting wage was competitive at $11.65/hour. However, in San Francisco – a relatively high wage market -- the VA wage lagged well behind the market, with non-VA hospitals paying an average hourly wage of $16.30 and the local VA hospitals paying only $14.00.

The VA sought to remedy this problem with the passage of the Nurse Pay Act of 1990, which changed how the VA set wages for RNs, effective April 7, 1991. This law tied RN wages at each VA hospital to those that prevail in its local labor market, with market wages determined by an annual survey of other hospitals in each VA's region.[1] As a result, wage scales of RNs were immediately raised to match the market in the roughly two-thirds of VA hospitals that had been paying below the prevailing market wage.[2] At the remaining VA hospitals that were paying above market, wages were held constant in nominal terms until they came in line with the prevailing market wage. Thus the law generated an exogenous change in RN wages at VA hospitals, with the magnitude of the wage change varying across hospitals.

In addition to mandating wage changes, the Nurse Pay Act of 1990 provided each VA with additional funds in its budget to finance their increased wage bill. As a result, individual VA hospitals that had their wages raised by the act were free to hire additional RNs up to previously determined staffing needs (which were well above staffing levels for nearly all VA hospitals), with the costs being passed on to the central office. Thus, VA hospitals were essentially free to hire all nurses willing to work at the legislated wage level.

In summary, the Nurse Pay Act of 1990 provides a unique opportunity to examine the extent of monopsony power in the nurse labor market. We can estimate the elasticity of supply of RNs to individual hospitals based on a legislated change in the wage, unrelated to changes in supply shocks, at VA hospitals in which labor demand was not binding. Moreover, we can learn to what extent hospitals have wage setting power by observing whether non-VA hospitals adjusted their wages in response to the change in VA wages.

4. Theoretical model

Consider a general model of monopsony in which firms face a labor supply curve that is upward sloping in their own wage and downward sloping in the wage of competitors:

$$L_i = f(w_1, w_2, \ldots, w_k) \quad \text{where} \quad \partial L_i / \partial w_i > 0,\ \partial L_i / \partial w_j < 0 \text{ for } i \neq j,\ i=0,\ldots,k \qquad (1)$$

A profit-maximizing firm will set wages to maximize $R(L_i) - L_i * w_i$, where R(.) is the firm's revenue function, L_i is the firm's employment, and w_i, is the firm's wage. The first-order condition for this problem implies:

$$\frac{MRP - w}{w} = \varepsilon^{-1} \quad (2)$$

Where MRP is the marginal revenue product of labor, and ε is the own-wage elasticity of labor supply. Thus, the own-wage elasticity of labor supply is the key to measuring monopsony power, and summarizes the extent to which a firm may reduce wages below the competitive level.

To guide our empirical work, we consider a simplified version of equation (1). Our model is an application of Salop's (1979) model of competition around a circle. We assume RNs are distributed uniformly around a circle, and they choose to work at one of N hospitals. Given our focus on short-run labor supply, we ignore the issue of hospital entry and exit, and treat N as fixed.[3] Hospitals are located equidistant around the circle, with the distance between hospitals (and the number of nurses located between hospitals) equal to α. A nurse located between two hospitals will choose to work at the hospital at which the wage net of travel costs is highest. Letting τ represent the travel costs per unit distance, it is straightforward to derive the labor supply facing a given hospital as a function of its own wage and the wage of its nearest competitors:

$$L_i = \alpha + \frac{1}{\tau}\left(w_i - \frac{w_{i-1} + w_{i+1}}{2}\right), \; i=0,\ldots,N \quad (3)$$

where w_{i-1} and w_{i+1} are wages at the two adjacent hospitals. Thus, the simple structure of competition along a circle yields a labor supply equation that depends only on the gap between a hospital's wage and the average wage of its two nearest competitors. Total labor supply to the market is assumed fixed (e.g. a doubling of all wages does not affect the labor supply to any individual hospital).

Wages at the VA are set exogenously by federal policy, but wages at all other hospitals are assumed to be set endogenously. If the marginal benefit to a hospital of employing a nurse is β, we assume that hospitals set wages to maximize the total net benefits derived from RNs; i.e., they choose w to maximize $L(\beta\text{-}w)$. The first order condition for this maximization problem provides the wage setting equation (i.e., labor demand) for the model:

$$w_i = \beta - \tau L_i \quad (4)$$

Thus, wages are set below marginal product and the size of the wage mark-down depends on the slope of the labor supply equation (3).

Equations (3) and (4) provide the structural equations for the model. The labor supply equation (3) cannot be estimated by OLS, since wages are set endogenously according to equation (4). Estimation of the labor supply equation requires valid instruments, i.e. variables that are correlated with wages but not correlated with the error in the labor supply equation (α). If one hospital in the market (the VA) sets the wage independently of α, then that wage can serve as an instrument since it will affect the wage at all other hospitals in the market.

It is relatively straightforward to solve this model of competition on a circle, and derive the reduced form equation for each hospital's equilibrium wage. Note that this reduced form equation is important in that it serves as the first stage equation in estimating labor supply. In the standard model of competition on a circle, all hospitals would be identical and the solution would be a symmetric wage equilibrium with $w^* = \beta - \alpha\tau$. Our model is not symmetric, since the VA hospital differs from all non-VA hospitals in that its wage is set exogenously. Therefore, the equilibrium is asymmetric with equilibrium wages at non-VA hospitals depending on the distance between each hospital and the VA. Distance is measured by the number of hospitals (d) located between a given hospital and the VA (e.g. d=0 for the two hospitals located adjacent to the VA).

If there is only one VA hospital setting wages exogenously in each market, then (after some algebra) equilibrium wages at non-VA hospitals can be shown to be a weighted average of the VA wage (w^{VA}) and the symmetric equilibrium wage (w^*):

$$w_i = (1-\theta_i)w^* + \theta_i w^{VA} \tag{5}$$

The weight placed on the VA wage (θ_i) captures the effect of VA wage on wages at non-VA hospitals, and depends only on the number of hospitals (N) in the market and on each hospital's distance from the VA (d). It is straightforward to derive three useful properties of θ_i in this model. First, θ_i is between 0 and 1/2 which implies that non-VA hospitals will respond partially to VA wage changes. Furthermore, θ_i decreases with distance from the VA ($\partial\theta_i/\partial d<0$), as one would expect if hospitals are differentiated by location. Finally, θ_i decreases with the number of competitors on the circle ($\partial\theta_i/\partial N<0$), suggesting that non-VA hospitals will respond less to VA wage changes when the VA has a smaller share of the market.

This simple model of the RN labor market is useful for two reasons. First, the model has empirical implications. Structural labor supply to a particular hospital depends only on the wage gap between a given hospital and its nearest neighbors, increasing with the wage paid by that hospital and decreasing with the wage paid by nearby hospitals. Furthermore, wages at non-VA hospitals are positively related to VA wage changes, with the strongest effect of VA wages at hospitals located near the VA and with few competitors. The second reason that the model is useful is that it demonstrates how changes in VA wages can be used to identify the labor supply equation. Changes in VA wages provide a natural instrument for identifying the labor supply equation, since these changes are arguably exogenous and affect wages at all hospitals either directly (at VA hospitals) or indirectly (at non-VA hospitals through equation (5)).

5. Data

The data used in this study are obtained from several publicly available sources and from the VA's records. The unit of observation for our analysis is a hospital. Our primary source of information about nurse wages and employment in non-VA hospitals is the American Hospital Association's (AHA) *Nursing Personnel Surveys* (NPS) of 1990 and 1992. Thus, we have one year of data prior to the Nurse Pay Act (1990), and one year of data that was entirely post-implementation (1992). Unfortunately, data is not available from the NPS after 1992.

The 1990 *Nursing Personnel Survey* surveyed all hospitals in the United States, while the 1992 data are limited to non-Federal facilities. This survey collects detailed information about RN employment and wages, along with a wide variety of additional information such as budgeted positions, the mix of nursing staff (RNs, LPNs, etc.), tenure, education, vacancy and turnover rates, work schedules, collective bargaining, and temporary and foreign nurse utilization. The NPS was used to obtain wages for non-VA hospitals, to calculate market wages faced by all hospitals, and to provide background information about each hospital. In 1992, less than half of the hospitals surveyed responded to questions about wages and employment levels, limiting our sample size significantly.

The AHA's *Annual Survey of Hospitals* provides additional data on hospital characteristics for VA and non-VA facilities and is available in 1990 and 1992 for most hospitals in the United States. These surveys provide a wide range of information about general hospital characteristics, and provided us with information on hospital location. The AHA survey also includes some data about nurse staffing, which were used to check the validity of the *Nursing Personnel Survey*.

The VA Personnel and Accounting Integrated Data (PAID) system, salary surveys conducted for the Locality Pay System, and published VA data on employment levels of nurses provide most of our information on VA hospitals, since federal hospitals did not respond to the NPS in 1992. The VA's CALM system 830 file contains facility level information on the aggregate number of RNs on staff (full-time equivalent) and their average salary. The VA PAID system data file is used to measure starting wages for RNs at VA hospitals. The Personnel Office at the VA's Central Office provided copies of the Nurse Pay Act RN pay schedules for each VAMC and copies of the wage surveys. These provide additional data on the changes in RN wages at VA hospitals and wages at hospitals that compete with the VA hospitals. We also use these data to check the accuracy of the NPS data in 1990.

Cross-checks of the different data reveal little inconsistency in our measures of wages, employment levels, and hospital characteristics. This alleviates any concern arising from the fact that the NPS and AHA data are based on hospital responses to surveys. Similarly, the VA accounting data should be of high quality, since they are from an internal accounting system instead of survey responses. While it is likely that some measurement error exists in our data, we do not believe that it is sufficiently large to bias the results of this study.

The employment of RNs is measured as the full-time equivalent (FTE) employment of RNs in each hospital for which we have data. Wages are the lowest hourly wage reported by the hospital. We selected the lowest hourly wage for our wage measure for two reasons. First, the lowest wage will apply to entry level nurses with basic education and no experience. Thus, changes in this wage measure will not be biased by differences across hospitals or over time in average RN characteristics such as tenure or experience. Second, one might argue that labor supply is particularly sensitive to entry-level wages, because hospitals often offer non-pecuniary benefits to retain more senior RNs, such as more choice of shifts.

Based on the latitude and longitude centroid for the zip code of each hospital, we calculated the distance from each hospital to the nearest VA. Our final sample is limited to hospitals that are within 60 miles of a VA, and our empirical work distinguishes hospitals that are more than 15 miles and more than 30 miles from a VA.[4] Similarly, for each hospital we calculated the number of other short term general hospitals (from the AHA Annual Survey) within a 15 mile radius. Finally, we used similar distance calculations to identify the two nearest competitors for each hospital. The wage at each hospital's two nearest competitors is defined as the average log wage of the two hospitals nearest to the hospital in question who report wages in both 1990 and 1992.

To some extent, each VA may have had some influence over the wage change it experienced between 1990 and 1992 through discretion over which hospitals to include in the wage survey. This would raise doubt about the exogeneity of the VA wage changes. An alternative measure of the change imposed on VA hospitals by the Nurse Pay Act is the gap between market wages and VA wages in 1990, prior to the Nurse Pay Act's implementation. This 1990 wage gap is not influenced by the VA's actions following the Act, yet will measure the impact the Nurse Pay Act should have had on a VA hospital's wages.

For each VA, we calculated the gap between the VA wage and its market's wage in 1990 as the difference between the average log wage in each VA's market area (weighted by hospital beds) and the VA log wage. The VA market area is defined as either the Consolidated Metropolitan Statistical Area, the Metropolitan Statistical Area (if the CMSA does not exist), or, for rural hospitals, the market area includes all other rural hospitals in the state.

Finally, to control for differences in the cost of living and local labor market conditions, we construct dummy variables for the CMSA / MSA in which each hospital is located and, for rural hospitals, dummy variables for the remainder of the state.

Table 1 presents selected summary statistics for all hospitals, for VA hospitals, and for non-VA hospitals. In 1990, just under 60 percent of VA hospitals paid wages that were below market, with the average VA hospital paying 1.9 percent below market. There was considerable variation in the wage gap across VA hospitals. The Nurse Pay Act brought VA wages up to the market level in 1992. As a result, VA wages increased more between 1990 and 1992 (12.5 percent) than did wages at non-VA hospitals (9.9 percent), and the variation in wage growth was larger at VA hospitals as well. Growth in employment also was more rapid at VA hospitals, with RN FTEs increasing by 8.3 percent as compared to 5.6 percent in non-VA hospitals. Thus, VA wages increased by 2.6 percent more than non-VA wages following the Nurse Pay Act, and VA employment increased by 2.7 percent more than non-VA employment. These estimates suggest a labor supply elasticity of around 1, although the standard error on this simple Wald estimate is over 0.7.

The remaining variables in Table 1 describe the ownership and location of the hospitals in our sample. Just over 10 percent of the sample are VA hospitals. Non-VA hospitals are, on average, 23 miles from the nearest VA, with over half of the sample more than 15 miles from the nearest VA and about one third more than 30 miles. On average, both VA and non-VA hospitals have more than 10 competitors within a 15 mile radius, although there is significant variation in the number of competitors.

6. Empirical Analysis

Reduced Form Wage Equations for Non-VA Hospitals

We examine the effect of the VA's wage changes on wages at other hospitals by estimating the reduced-form wage equation (5) in differenced form:

$$\Delta(\ln w_i) = \alpha_0 + \alpha_1\Delta(\ln w_i^{VA}) + \alpha_2 D15_i\Delta(\ln w_i^{VA}) + \alpha_3 D30_i\Delta(\ln w_i^{VA}) + \varepsilon_i \qquad (6)$$

where w_i is the wage at a non-VA hospital, w_i^{VA} is the wage at the nearest VA hospital to hospital i, and $D15_i$ and $D30_i$ are dummy variables which equal one if hospital i is more than 15 or more than 30 miles from a VA. We take the difference of each variable between 1990 and 1992 to control for hospital characteristics which are constant over time. As discussed above, we expect $\alpha_1 > 0$ and α_2 , $\alpha_3 < 0$; i.e., the change in the VA wage should have a positive effect on the wage change in other hospitals, but this effect should decline in magnitude as hospitals are further from the VA.

Estimates of equation 6 are presented in Table 2. The dependent variable in all the regressions is the change in the log wage of RNs at non-VA hospitals. Several variations of this equation were estimated. The first column includes only the change in the log wage at the nearest VA. The second column interacts the VA wage change with two dummy variables: one for whether the hospital is more than 15 miles from a

VA and another for whether there is more than a 30 mile distance. The third column adds MSA dummy variables to allow for area specific trends in wages. Finally, the fourth column adds dummy variables for being more than 15 and 30 miles from a VA.

The results for all specifications are consistent with the theory. The VA wage change has a positive and significant effect on wages at neighboring hospitals, but this effect is significantly smaller (about half the magnitude) in hospitals that are 15-30 miles from a VA, and disappears almost entirely for hospitals more than 30 miles from a VA hospital. For example, in the first column we estimate that the elasticity of wages at non-VA hospitals with respect to the VA wage is .128, i.e. a 1.28 percent increase in response to a 10 percent increase in the wage at the nearest VA. In the second column we allow the effect of the VA wage to vary with distance to the VA. The estimated elasticity increases to .178 for hospitals within 15 miles of a VA (the reference group), but is significantly lower for hospitals 15-30 miles from the VA (.100), and lower still for hospitals more than 30 miles from the VA (.051).[5] Results for the remaining specifications are quite similar.

Changes in the VA wage were not entirely determined by the law since VA hospitals had some discretion in determining which hospitals to survey in setting 1992 wages. Thus, some of the positive correlation between VA wage growth and wage growth at nearby hospitals may reflect the VA's response to wages at other hospitals. The gap between the market wage and the VA wage in 1990 is used in Table 3 as a proxy that predicts the wage growth that resulted from the Nurse Pay Act. This wage gap in 1990 is not influenced by the VA's later actions. The first column of Table 3 estimates the relationship between this proxy and actual wage growth between 1990 and 1992 at the VA hospitals. There is a very strong relationship between the wage gap that existed for each VA in 1990 and each VA's subsequent wage growth, with a precisely estimated coefficient on the wage gap that is near one and an R-squared on this simple regression of just over 0.5.

The remaining columns of Table 3 (columns II-V) estimate the same specifications as in Table 2 for non-VA hospitals using the wage gap from 1990 in place of actual wage growth at the nearest VA. The results are quite similar to those of Table 2 (although the estimated elasticities are noticeably larger when MSA dummies are included). In particular, the wage gap has a positive, statistically significant effect on wage growth at non-VAs, and this effect is smaller at hospitals that are further from the VA.

The first two columns of Table 4 investigate whether the effect of the VA wage change on other hospitals' wage growth is larger in markets with fewer competitors, as suggested by our simple model. The first column limits the sample to hospitals that had fewer than five competitors within 15 miles, and the second column limits the sample to hospitals with five or more competitors within 15 miles. Each regression includes the VA wage gap in 1990, this gap interacted with dummy variables for being more than 15 and more than 30 miles from a VA, and MSA dummy variables. The point estimates indicate that changes in the VA wage has similar effects on hospitals in competitive markets to those in less competitive markets. These results provide no evidence that a wage change at an individual hospital is less important when there are more hospitals in the market. However, the standard errors on these estimates are quite large, so the power of this test is obviously low.

When the VA implemented the Nurse Pay Act, it did not change nominal wages at hospitals that paid higher wages than the market. Thus, we should not observe a response by non-VA hospitals to the 1990 VA wage gap if the gap is negative because the negative gap was not correlated with the actual wage change at the VA. Columns III and IV of Table 4 examine this possibility. Column III presents the coefficients of an equation for non-VA hospitals with a positive wage gap at the nearest VA (i.e., the VA wage is lower than the market wage). As expected, the VA wage change has a large, statistically significant effect on non-VA hospitals' wages. Column IV presents the same equation for hospitals for which the VA wage gap is negative. Where the VAMC paid more than the market, and thus didn't change its wages with the Nurse Pay Act, the VA wage gap has no effect on the wages of other hospitals.

Labor Supply Equations for All Hospitals

We estimate the labor supply equation (3) in a first-difference form to measure the elasticity of supply of RNs:

$$\Delta(\ln L_i) = \theta_0 + \theta_1\Delta(\ln w_i - \ln w_j) + \mu_i \qquad (7)$$

L_i is the number of RN FTEs employed at hospital i (for VAs and other hospitals), w_i is the wage at hospital i, and $\ln w_j$ is the average log wage at hospital i's two nearest competitors. θ_1 is the elasticity of supply of RNs to an individual hospital. We found evidence of heteroskedasticity in the error, and therefore weight all regressions by the number of beds at the hospital in 1990.

As discussed earlier, OLS estimates of equation (5) are biased. We estimate equation (7) using two-stage least squares. The VA wage change mandated by the Nurse Pay Act provides the instrument for the change in the log wage gap $\Delta(\ln w_i - \ln w_j)$. We take care in specifying the first stage equation. According to theory, the impact of the VA wage change on $\Delta(\ln w_i - \ln w_j)$ depends on whether the hospital and its nearest neighbors are VA hospitals and, if not, which VA the hospital is closest to and how far it is from that VA. The estimates in Tables 2, 3, and 4 suggest that the wage growth in any given hospital should be specified as:

$$\Delta \ln w_i = \pi_0 + DVA_i(\pi_1 + \pi_2 \Delta \ln w_i^{va}) +$$
$$(1-DVA_i)(\pi_3 \Delta \ln w_i^{va} + \pi_4 D15 + \pi_5 D30 + \pi_6 D15 \Delta \ln w_i^{va} + \pi_7 D30 \Delta \ln w_i^{va}) \quad (6)$$

where DVA is an indicator for being a VA hospital. In the first stage equation, we wish to estimate the difference in wage growth between a hospital and its two nearest neighbors. Therefore, the appropriate specification for the first stage includes the differences between the hospital and each of its two nearest neighbors. Table A1 provides estimates of the first stage equations for various specifications. The coefficients are generally as expected. F-tests indicate that the instruments are strongly correlated with the change in the wage gap.

Estimates of labor supply elasticities from two-stage least squares estimates of equation (7) are given in Table 5. The first three columns construct the instruments using the *actual* wage change at the VA. The first specification does not include the instruments that rely on distance from a VA, while the second specification adds these instruments. Column III adds MSA dummies and a dummy for being a VA to the supply equation. The MSA dummies capture local factors (such as alternative wages) that may influence supply, while the VA dummy captures any common change at the VA that may have made employment more or less attractive at the VA. The remaining three columns of Table 5 repeat these specifications but construct the instruments using the wage gap at the VA in 1990 as a proxy for the actual VA wage change (for reasons discussed earlier). For all specifications, we tested and could not reject the over-identifying restrictions; therefore, our instruments appear appropriate for our model.

The labor supply elasticities estimated in Table 5 are reasonably consistent across specifications. The estimates range from 0 to 0.2, with standard errors of about 0.13. Thus, for the specifications in Table 5, we estimate an inelastic short-run labor supply curve facing hospitals. Even the high end of the 95% confidence intervals for the labor supply elasticity does not go above 0.5. These estimates of labor supply elasticity are an order of magnitude smaller than those estimated by Sullivan (1989) and Hansen (1992).

Table 6 estimates specifications similar to those in Table 5, but allows the change in own wage and the change in the nearest competitor's wage to have separate effects rather than constraining them to enter as a difference.[6] If the specifications of Table 5 are correct, own wage and competitor's wage should enter with opposite signed coefficients of the same magnitude. The coefficients are generally opposite signed and the magnitudes are small, with elasticity estimates for these specifications remaining in the 0 to 0.2 range. The only exception is for the specification that includes MSA dummies and the actual change in the VA wage: for this specification the coefficient on the wage change at competitors is poorly identified and the point estimate is wrong-signed.

Table 7 investigates the sensitivity of these estimates when the sample is restricted to (1) VA hospitals, (2) non-VA hospitals, (3) hospitals with fewer than five competitors within 15 miles, (4) hospitals with five or more competitors within 15 miles, and (5) hospitals for which the nearest VA had a positive wage gap. The basic conclusions are not particularly sensitive to these sample restrictions. All of the elasticity estimates remain small relative to the previous literature. There is more range in the elasticity estimates for these specifications (from -0.1 to 0.6) but this might be expected given the relatively large standard errors for these specifications relative to those reported in Table 5.

7. Discussion

Our analysis provides two pieces of evidence which suggest that hospitals have market power in the nurse labor market and act as monopsonists in setting wages. First, we find that competing hospitals respond to legislated wage changes at the VA -- a ten percent increase in wages at the VA is estimated to have increased wages by two percent at hospitals within 15 miles, and by roughly one percent in hospitals 15-30 miles from the VA. Second, we find that the labor supply curve facing an individual hospital is very inelastic – a ten percent increase in wages is estimated to increase labor supply by between zero and two percent;

These results contradict much of the recent literature investigating monopsony. This literature has found little (if any) evidence of monopsony power in the labor market. In particular, our estimates of the labor supply elasticity are an order of magnitude below comparable estimates in the literature. This raises the question: Why is this so?

One key difference between this study and others is in the instruments used to identify the supply elasticity. We rely on a legislated change in the wage at the VA as an instrument. Thus, our identification is similar to recent studies of the minimum wage, which also find that legislated changes in wages have small positive effects on employment. Moreover, these legislated changes in wages are arguably ideal instruments for this problem because they come close to simulating the thought experiment that matters for labor supply: how will an exogenous increase in wages affect the VA's ability to attract nurses? The earlier literature used changes in caseload at the hospital as an instrument. As argued earlier, there are reasons to believe that caseload may not be a valid instrument and the potential bias would be in the direction of overstating supply elasticities.

A second difference is our data. We have relied on starting wage data (rather than average wages) which avoids potential aggregation bias that may lead to bias in estimating wage changes. In addition, we are more careful to focus on the difference between a hospital's wages and those of its nearest competitors, while the existing literature has generally measured competing wages as average wages at the county or MSA level. Finally, our estimates rely on data from 1990-92, while both Sullivan (1989) and Hansen (1992) use data from the early and mid 1980s when dramatic changes in hospital reimbursement may have resulted in bias.

Apart from differences in our data and instruments, our focus on VA hospitals may be generating the difference in our findings. Our evidence of market power may be due to the fact that hospitals are a textbook example of monopsony, and VA hospitals are highly differentiated workplaces (by being a federal employer and serving a unique cohort of patients). The supply of nurses might thus be segmented according to RNs' preferences for working or not working at VA facilities, reducing the response of labor supply to the change in the VA wage. On the other hand, it is not clear that the case of a VA hospital is that different from employers in other sectors of the economy. For example, within the fast-food or high-tech industries, workplaces are also highly differentiated in terms of corporate culture and customer base. Therefore, our results may be representative of the monopsony power exercised by many employers.

Our estimates of the short-run labor supply elasticity around 0.1 are quite low. If these were long-run elasticity estimates, they would imply that the marginal revenue product (MRP) of RNs was about 10 times their wage. However, common sense and most empirical studies (Sullivan, 1989; Hansen, 1992) suggest that long-run elasticities are considerably higher than short-run elasticities. Unfortunately, data were unavailable to examine longer-run supply elasticities.[7] However, if we assume that the long-run elasticity is infinite, then Boal and Ransom (1997) have shown that the amount of "exploitation" – the difference between MRP and the wage as a fraction of the wage –

is given by the short-run inverse elasticity of supply multiplied by r/(1+r), where r is the discount rate. Thus, for a discount rate of 5%, our elasticity estimates imply that the MRP of RNs was about 50% above their wages. This evidence, therefore, suggests that firms have considerable monopsony power.

Table 1: Summary statistics for RN wages and employment, 1990-1992
Means and standard deviations (in parentheses)

	All	VA	Non-VA
Wage gap at nearest VA in 1990	.013	.019	.012
[log(market wage)–log(VA wage)]	(.081)	(.079)	(.081)
Nearest VA wage below market in 1990?	53.0%	58.7%	50.0%
Change in log wage (90-92)	.102	.125	.099
	(.073)	(.088)	(.070)
Change in log wage (90-92)	.122	.125	.122
at the nearest VA	(.093)	(.088)	(.094)
Change in average log wage (90-92)	.102	.101	.102
At two nearest competitors	(.056)	(.058)	(.056)
Change in RN FTEs, (90-92)	.059	.083	.056
	(.212)	(.088)	(.223)
VA hospital?	11.6%	100%	0%
Distance to nearest VA (miles)	20.3	0	23.0
	(18.2)	(0)	(17.7)
More than 15 miles to nearest VA?	50.4%	0%	57.0%
More than 30 miles to nearest VA?	30.4%	0%	34.4%
# hospitals within 15 miles	11.6	10.9	11.7
	(17.3)	(15.6)	(17.5)
# observations in sample	1334	155	1179

Table 2: Reduced form estimates of the impact of VA wage changes on the wage changes in non-VA hospitals, 1990-92.

Dependent Variable: ln(Wage92)-ln(Wage90)

Sample: All non-VA hospitals within 60 miles of a VA

Independent Variables:	*I*	*II*	*III*	*IV*
Change in log wage of RNs at the nearest VA (90-92)	0.128 (0.022)	0.178 (0.025)	0.137 (0.053)	0.190 (0.061)
Change in log wage of RNs at the nearest VA (90-92) * dummy if > 15 miles to VA	---	-0.078 (0.034)	-0.105 (0.043)	-0.139 (0.075)
Change in log wage of RNs at the nearest VA (90-92) * dummy if > 30 miles to VA	---	-0.049 (0.036)	-0.035 (0.048)	-0.100 (0.083)
Dummy if > 15 miles to VA	---	---	---	0.008 (0.012)
Dummy if > 30 miles to VA	---	---	---	0.013 (0.012)
MSA Dummies?	No	No	Yes	Yes
R-Squared	0.029	0.044	0.274	0.276
# Observations	1179	1179	1179	1179

Standard errors in parentheses.
Based on data from AHA Annual Survey and Nursing Personnel survey, 1990 and 1992, augmented with wage and employment information for VAs from VA administrative data.
All wages refer to starting (lowest) wages of RNs.

Table 3: Reduced form estimates of the impact of VA wage gap in 1990 on the wage changes in VA and non-VA hospitals, 1990-92

Dependent Variable: ln(Wage92)-ln(Wage90)

Sample: Hospitals within 60 miles of a VA

Independent Variables:	*I*	*II*	*III*	*IV*	*V*
	VA only	non-VA only	non-VA only	non-VA only	non-VA only
Wage gap at nearest VA in 1990 [log(market wage) - log(VA wage)]	0.830 (0.060)	0.090 (0.025)	0.161 (0.037)	0.345 (0.076)	0.344 (0.076)
Wage gap at nearest VA in 1990 * dummy if > 15 miles to VA	---	---	-0.109 (0.065)	-0.154 (0.078)	-0.146 (0.079)
Wage gap at nearest VA in 1990 * dummy if > 30 miles to VA	---	---	-0.033 (0.069)	-0.112 (0.087)	-0.120 (0.088)
Dummy if > 15 miles to VA	---	---	---	---	-0.008 (0.007)
Dummy if > 30 miles to VA	---	---	---	---	0.000 (0.007)
MSA Dummies?	No	No	No	Yes	Yes
R-Squared	0.559	0.011	0.017	0.281	0.282
# Observations	155	1179	1179	1179	1179

Standard errors in parentheses.
Based on data from AHA Annual Survey and Nursing Personnel survey, 1990 and 1992, augmented with wage and employment information for VAs from VA administrative data.
All wages refer to starting (lowest) wages of RNs.
The market wage is calculated as the average starting wage in 1990 among hospitals in each VA's market.
The market wage is a weighted average, using the number of hospital beds as weights. Markets are CMSAs; MSA for hospitals not in a CMSA; and state for hospitals not in a MSA or CMSA.

Table 4: Reduced form estimates of the impact of VA wage changes on the wage changes in non-VA hospitals, 1990-92 for alternative samples of hospitals

Dependent Variable: ln(Wage92)-ln(Wage90)

Sample: All non-VA hospitals within 60 miles of a VA

Independent Variables:	*I*	*II*	*III*	*IV*
	< five competitors within 15 miles	>= five competitors within 15 miles	positive wage gap at nearest VA	negative wage gap at nearest VA
Wage gap at nearest VA in 1990	0.348 (0.167)	0.403 (0.118)	0.558 (0.150)	0.127 (0.203)
Wage gap at nearest VA in 1990 * dummy if > 15 miles to VA	-0.168 (0.184)	-0.199 (0.145)	-0.179 (0.100)	0.030 (0.148)
Wage gap at nearest VA in 1990 * dummy if > 30 miles to VA	-0.155 (0.103)	0.162 (0.279)	-0.184 (0.119)	-0.021 (0.158)
MSA Dummies?	Yes	Yes	Yes	Yes
R-Squared	0.366	0.260	0.343	0.247
# Observations	612	567	616	563

Standard errors given in parentheses.
Based on data from AHA Annual Survey and Nursing Personnel survey, 1990 and 1992, augmented with wage and employment information for VAs from VA administrative data.
All wages refer to starting (lowest) wages of RNs.

Table 5: Two stage least squares estimates of RN labor supply elasticities

Dependent Variable: ln(RN FTEs, 1992)-ln(RN FTEs, 1990)

Sample: All hospitals within 60 miles of a VA

Independent Variables:	*I*	*II*	*III*	*IV*	*V*	*VI*
Change in the log wage gap between hospital and its two nearest competitors	0.076 (0.121)	0.080 (0.120)	0.016 (0.138)	0.185 (0.135)	0.185 (0.134)	0.127 (0.153)
Dummy if VA hospital	---	---	0.023 (0.015)	---	---	0.019 (0.015)
MSA Dummies?	No	No	Yes	No	No	Yes
"FAR" instruments included?	No	Yes	Yes	No	Yes	Yes
"GAP" instruments used?	No	No	No	Yes	Yes	Yes
p-value for test of the over-id restrictions	0.71	0.45	0.31	0.20	0.20	0.12
# Observations	1334	1334	1334	1334	1334	1334

All regressions are weighted by the number of hospital beds in 1990.
Standard errors given in parentheses. All wages refer to starting (lowest) wages of RNs.
Change in the log wage gap between a hospital and its two nearest competitors is defined as:
[ln(wage92)-ln(wage90)]-[ln(compwage92)-ln(compwage90)]
where compwage90/2 is as defined in Table A2.
Specifications with "FAR" instruments use first-stage regressions given in columns II, III, V, and VI of Table A2.
Specifications using "GAP" instruments use first-stage regressions given in column IV-VI of Table A2.

Table 6: Two stage least squares estimates of RN labor supply elasticities allowing separate effects of own wage and competitors wage

Dependent Variable: ln(RN FTEs, 1992)-ln(RN FTEs, 1990)

Sample: All hospitals within 60 miles of a VA

Independent Variables:	*I*	*II*	*III*	*IV*	*V*	*VI*
Change in own log wage	0.083	0.120	0.046	0.232	0.199	0.183
	(0.124)	(0.122)	(0.168)	(0.141)	(0.156)	(0.193)
Change in log wage at two nearest competitors	-0.006	-0.048	0.074	-0.061	-0.224	-0.028
	(0.188)	(0.183)	(0.310)	(0.232)	(0.269)	(0.332)
Dummy if VA hospital	---	---	0.023	---	---	0.017
			(0.015)			(0.016)
MSA Dummies?	No	No	Yes	No	No	Yes
"FAR" instruments included?	No	Yes	Yes	No	Yes	Yes
"GAP" instruments used?	No	No	No	Yes	Yes	Yes
p-value for test of the over-id restrictions	0.80	0.12	0.25	0.26	0.20	0.09
# Observations	1334	1334	1334	1334	1334	1334

All regressions are weighted by the number of hospital beds in 1990.
Standard errors given in parentheses. All wages refer to starting (lowest) wages of RNs.
Change in log wage at two nearest competitors is [ln(compwage92)-ln(compwage90)], where compwage is as defined in Table A2.
Specifications with "FAR" instruments use the same instruments as in columns II, III, V, and VI of Table A2, plus the analogous set of variables for the hospital (e.g. not differenced from the competitor).
Specifications using "GAP" instruments use the same instruments as in column IV-VI of Table A2, plus the analogous set of variables for the hospital (e.g. not differenced from the competitor).

Table 7: Two stage least squares estimates of RN labor supply elasticities
Dependent Variable: ln(RN FTEs, 1992)-ln(RN FTEs, 1990)
For alternative samples of hospitals

Independent Variables:	*I*	*II*	*III*	*IV*	*V*
	VA only	Non-VA only	< five hospitals within 15 miles	>= five hospitals within 15 miles	positive wage gap at nearest VA
Change in the log wage gap between hospital and its two nearest competitors	0.111 (0.095)	-0.073 (0.281)	0.590 (0.302)	-0.019 (0.191)	0.129 (0.212)
Dummy if VA hospital	---		-0.024 (0.024)	0.037 (0.022)	0.020 (0.025)
MSA Dummies?	No	Yes	Yes	Yes	Yes
"FAR" instruments included?	Yes	Yes	Yes	Yes	Yes
"GAP" instruments used?	Yes	Yes	Yes	Yes	Yes
p-value for test of the over-id restrictions	0.58	0.35	0.02	0.75	0.34
# Observations	155	1179	685	649	707

All regressions are weighted by the number of hospital beds in 1990.
Standard errors given in parentheses. All wages refer to starting (lowest) wages of RNs.
Change in the log wage gap between a hospital and its two nearest competitors is defined as:
[ln(wage92)-ln(wage90)]-[ln(compwage92)-ln(compwage90)]
where compwage90/2 is as defined in Table A2.
Specifications with "FAR" instruments use first-stage specifications given in columns II, III, V, and VI of Table A2.
Specifications using "GAP" instruments use first-stage specifications given in column IV-VI of Table A2.

Table A1: First-stage estimates predicting the change in the wage gap between a hospital and its two nearest competitors, 1990-92

Dependent Variable: [ln(Wage92)-ln(Wage90)]-[ln(CompWage92)-ln(CompWage90)]

Sample: All hospitals within 60 miles of a VA

Independent Variables:	*I*	*II*	*III*	*IV*	*V*	*VI*
	Using the actual change in the log wage at the nearest VA			Using the VA log wage gap in 1990 as proxy for wage change at the VA		
Difference between hospital and nearest competitor in:						
(1) Dummy for VA hospital (DVA)	-0.020 (0.008)	-0.018 (0.008)	-0.017 (0.011)	0.014 (0.005)	0.016 (0.005)	0.022 (0.008)
(2) Dummy if > 15 miles from VA (D15)	---	0.019 (0.013)	0.018 (0.016)	---	0.006 (0.008)	0.011 (0.010)
(3) Dummy if > 30 miles from VA (D30)	---	0.016 (0.013)	0.022 (0.017)	---	0.015 (0.008)	0.022 (0.011)
(4) DVA * Change in log wage of RNs at nearest VA	0.477 (0.084)	0.548 (0.090)	0.606 (0.105)	0.659 (0.098)	0.754 (0.108)	0.821 (0.132)
(5) (1-DVA) * Change in log wage of RNs at nearest VA	0.149 (0.068)	0.227 (0.078)	0.268 (0.088)	0.331 (0.080)	0.438 (0.098)	0.485 (0.116)
(6) D15 * change in log wage of RNs at nearest VA	---	-0.134 (0.082)	-0.110 (0.097)	---	-0.123 (0.092)	-0.111 (0.109)
(7) D30 * Change in log wage of RNs at nearest VA	---	-0.060 (0.100)	-0.028 (0.124)	---	-0.048 (0.099)	-0.061 (0.128)
Difference between hospital and second nearest competitor in:						
(1) Dummy for VA hospital (DVA)	-0.050 (0.008)	-0.051 (0.008)	-0.049 (0.011)	0.001 (0.005)	0.000 (0.005)	0.004 (0.008)
(2) Dummy if > 15 miles from VA (D15)	---	-0.003 (0.010)	-0.008 (0.012)	---	-0.005 (0.006)	-0.016 (0.008)
(3) Dummy if > 30 miles from VA (D30)	---	-0.004 (0.012)	-0.012 (0.018)	---	-0.004 (0.007)	-0.009 (0.010)
(4) DVA * Change in log wage of RNs at nearest VA	0.569 (0.080)	0.570 (0.083)	0.595 (0.109)	0.433 (0.087)	0.419 (0.093)	0.536 (0.131)
(5) (1-DVA) * Change in log wage of RNs at nearest VA	0.108 (0.066)	0.112 (0.074)	0.126 (0.095)	0.007 (0.070)	-0.019 (0.085)	0.107 (0.119)
(6) D15 * Change in log wage of RNs at nearest VA	---	0.011 (0.064)	-0.020 (0.079)	---	0.044 (0.071)	-0.019 (0.088)
(7) D30 * Change in log wage of RNs at nearest VA	---	-0.007 (0.087)	0.019 (0.117)	---	-0.011 (0.091)	0.006 (0.124)
Indicator if hospital is a VA	---	---	-0.010 (0.016)	---	---	-0.016 (0.017)
MSA Dummies?	No	No	Yes	No	No	Yes
R-Squared	0.254	0.258	0.360	0.203	0.208	0.322
F-test of instruments	75.37	32.80	23.58	56.44	24.74	17.90
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
# Observations	1334	1334	1334	1334	1334	1334

All regressions are weighted by the number of hospital beds in 1990. Standard errors in parentheses.
All wages refer to starting (lowest) wages of RNs. Wages of competitors (CompWage92,Compwage90) are the average log wage of the hospital's two closest competitors who report wages in both 1990 and 1992.
Columns IV-VI use the VA log wage gap in 1990 (log(market wage)-log(VA wage)) in place of the change in the log VA wage in constructing all independent variables. The market wage is constructed as discussed in the footnote to Table 3.

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[1] The local market for each VA is defined as the Consolidated Metropolitan Statistical Area (CMSA) or Metropolitan Statistical Area (MSA) in which the VA is located. The 27 VA hospitals in rural areas are allowed to determine their local competitors within reasonable limits. If there are 15 or fewer non-VA hospitals in the local market, all hospitals are surveyed. If there are more than 15 other hospitals, the survey is based on a sample of the other hospitals.

[2] These figures are computed from the data discussed below.

[3] The 1992 American Hospital Association survey discussed below has about one percent fewer observations than the 1990 data. Thus, the assumption that the number of hospitals is constant does not seem overly restrictive.

[4] Our results are not sensitive to the 60-mile limit to our sample.

[5] Note that equation 6 is specified so that the effects are cumulative, e.g. the effect of the VA wage on wages at hospitals more than 30 miles away is .178-.078-.049=.051.

[6] For the specifications in Table 6 we include own wage growth and wage growth at the two nearest competitors separately and instrument for both. In those specifications we add the undifferenced versions of the right hand side variables in equation (6) to our instrument list – these added instruments can predict wage growth at a hospital, whereas the differenced versions can only predict the difference in wage growth between a hospital and its neighbors.

[7] The last year of the Nursing Personnel Survey was 1992.