

‘MONOPSONY’ IN THE MARKET FOR NURSES? A SEMIPARAMETRIC NOTEMUKHERJEE, Debasri¹**Abstract**

Despite shortage, labor market for registered nurses is often considered as an example of monopsony. A series of empirical papers examine the validity of this ‘monopsony power’ argument and investigate any possibility of ‘monopsonistic exploitation’ in such market. The exploitation can be viewed from different angles – salary or workload. High concentration of the hospitals (leading to monopsony or oligopsony) in the local areas as well as low mobility of the nurses across jobs are claimed to give rise to such exploitation. Exploitation, if present, can aggravate the problem of shortage because a high turnover rate is also observed in such labor market. This paper uses semiparametric regression to examine the ‘monopsonistic exploitation’ argument from the view points of registered nurses’ salary as well as work load and finds only limited support in favor of the exploitation argument. Hospital concentration does not seem to cause any problem as far ‘exploitation’ motive is concerned. However, lack of mobility on part of the nurses seems to impact their salary or work load.

Key Words: Market for registered nurses, semiparametric regression

JEL Classification: C14, I11, J42

1. Introduction:

The present study employs semiparametric regression approach to revisit an important question – does labor market for registered nurses suffer from ‘monopsonistic exploitation’? In other words, the paper investigates if hospital concentration and lack of mobility of nurses have any significant impact on their wages or work load. The shortage of nurses has gained alarming attention over the recent past. The US healthcare industry is experiencing a tremendous shortage in part due to the baby-boomers reaching retirement age. It is a *dual-edged* problem caused by both demand and supply side dynamics. More retired and older people are in increasing need for nurses and health care services whereas more nurses are retiring at the same time.² Although there are various factors which contribute to the problem, two of the major problems, as have been identified in the literature are (1) the problem of monopsonistic/oligopsonistic exploitation in the labor market for nurses, and (2) the lack of adequate training facilities to produce the required number of nurses. *Surprisingly enough*, “the market for registered nurses is often referred to as an example of classic monopsony”, (See, Hirsch and Schumacher, 1995). The number of hospitals (employers) in most areas is very limited, and such localized and concentrated nature of the industry often gives the employers some market power and enables them to impose lower than the competitive wages and higher workloads on the workers (nurses), leading to the alleged monopsonistic/oligopsonistic exploitation. Lack of mobility on part of the nurses may

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Acknowledgment: The author is grateful to the Upjohn Institute for Employment Research for funding the project through ‘Minigrant’.

² The projected shortage of nurses is 800,000 by the year 2020 in the US, estimated by the U.S. Department of Health and Human Services.

also aggravate the problem. Such exploitation not only makes the profession less lucrative in terms of attracting new laborers, but also creates risks in terms of retaining the existing workers.³ Several attempts have been taken to investigate the degree of the alleged exploitation.

There are two distinct empirical lines of research that examine the exploitation argument. The first and the more traditional set of empirical works estimate registered nurses' labor supply elasticity. The second and more recent line of empirical works, however, investigates whether nurses' wage rates vary significantly with respect to (a) hospital concentration (measured by Herfindahl index), and (b) a measure of existing workers' mobility as introduced by Manning (2003). Examples of the first line of research include Sullivan (1989), Staiger et al. (1999), and Askildsen et al (2003) while examples of the second line of research mainly include Adamache and Sloan (1982), and Hirsch and Schumacher (1995, 2005), to name a few. Following Manning (2003), the mobility variable used here is the share of new recruits that move from unemployment or out of labor force rather than from some other employers in the same profession. So it is actually a measure of the lack of mobility (LM, henceforth). Thus a high value of the *lack of mobility* variable (LM) implies that the existing workers/nurses are *not* very mobile and most new recruits are from out of labor force or from some other profession (rather than from the same profession). A high degree of hospital concentration (Herfindahl index) implies that the employers are likely to be monopsonistic/oligopsonistic. A notable paper in this area is by Hirsch and Schumacher, 2005. After controlling for a series of covariates, they find that both hospital concentration and the aforementioned measure of mobility have little impact on nurses' wage differential (nurses wage compared to a control group wage while their control group is comprised of teachers, administrative assistants etc., and this control group wage proxies for the competitive market wage or wage prevailing in other competing professions). While, we use the same data set and the same set of covariates as in Hirsch and Schumacher, 2005, the econometric methodology differs. We also investigate whether hospital concentration or the mobility of nurses' has any impact on nurses' wages or work load. *However, the existing theory on this issue does not guide us anything about the functional form (linear versus quadratic versus mixture or so) that would be appropriate for the regression modeling.* If the true underlying relation is nonlinear, a linear regression can lead to serious misspecification bias. We therefore use local kernel based semiparametric regression which does not assume any functional form (linearity) for the regression and address the issue in a general data-driven specification-free way. The semiparametric regressions used in this paper are also backed by statistical tests, to be discussed later. It is found that mobility variable (or the lack of it) affects the wage differential and workload but the hospital concentration seems to cause no significant harm. The details of the variables, estimation strategy and data are described in section II while results are presented in section III. Section IV concludes.

2. Data and Estimation:

Data: The data set and the covariates used are from Hirsch and Schumacher, 2005. This

³ "In the U.S. hospitals, nursing turnover rate has been reported to range from 15 to 36 percent per year (Hayes et al. 2006). These turnover rates are much higher than those for other health care professionals, which are estimated to be on average 2.3 percent per year", see Stone et al (2007) for details.

is based on Current Population Survey (CPS), American Hospital Association (AHA), and National Sample Survey of Registered Nurses (NSSRN). We follow the same way of testing exploitation as in the existing literature, i.e., examining the impacts of hospital concentration variable (measured by Herfindahl Index) and mobility variable (as defined above) on wage differential (with respect to a control group workers as defined in Hirsch and Schumacher, 2005). They use a 2 step regression where in the first step they estimate a typical wage equation with various covariates including a dummy for registered nurses (RN). Then they obtain the wage differential variable which is simply the estimated coefficient of the RN dummy (in the wage equation) for each area and there are 240 areas in the sample. They use these estimated wage differentials as the dependent variable of the second step regression where they primarily focus on the effects of ‘hospital concentration’ and the ‘mobility’ variables on this wage differential variable. Following Manning (2003), they argue that this measure of mobility/lack of it (as described earlier) is a proxy for inter-employer mobility/lack of it and a higher value of the measure will indicate relatively more power of the employers and less power of the employees, thus serving as a proxy for a measure of possible source of exploitation. The hospital concentration variable is based on the Herfindahl Index and a higher value of it implies more power of the employers, thus also constituting a possible source of exploitation. Both mobility and hospital concentration variables range from 0 to 1.

Estimation: While the estimation in Hirsch and Schumacher (2005) is linear in both the stages, I use a semiparametric (partially linear) technique. For the first stage, I follow the exact same (linear) technique, as they do, whereas in the second stage I use semiparametric estimation (to be discussed below) while regressing the wage differential variable on the ‘hospital concentration’ and ‘mobility’ variables. Thus my estimation differs from theirs at this second or the most important stage of the analysis. Instead of using a linear modeling, I use semiparametric (general nonlinear) modeling which does not impose any linearity (or any functional form) restriction while examining the impacts of hospital concentration and mobility on the wage differential variable and hence avoids any possible functional form misspecification bias problem. The method allows data to determine the underlying functional relations rather than superimposing any particular form, linearity or so. This is mainly important because if the true underlying relations are not linear, a linear regression produces biased coefficients and hypothesis tests. It is too simplistic to assume that the impacts will be uniform at various levels of each of the regressors (as implied by a linear framework). The semiparametric model that is used to examine the impacts of hospital concentration and mobility can be written as:

$$Y_i = X_i\beta + f(Z_{1i}, Z_{2i}) + \varepsilon_i \quad (1)$$

Where Y_i denotes the dependent variable, Z_{1i} and Z_{2i} denote our main variables of interests – hospital concentration variable and lack of mobility (LM) variable - treated nonparametrically (rather than linearly), X_i captures all other control covariates in the second stage regression as in Hirsch and Schumacher (2005), ε_i denotes a standard *i.i.d.* error term, and $f(\cdot)$ denotes the unknown (nonparametric) functional form. Note that we also allow for any possible interactions between Z_{1i} and Z_{2i} and their joint effects on the dependent variable, rather than considering an additive structure where they are assumed to affect the dependent variable independently. The estimation method is a standard kernel based semiparametric estimation as in Robinson (1988) and the approach is

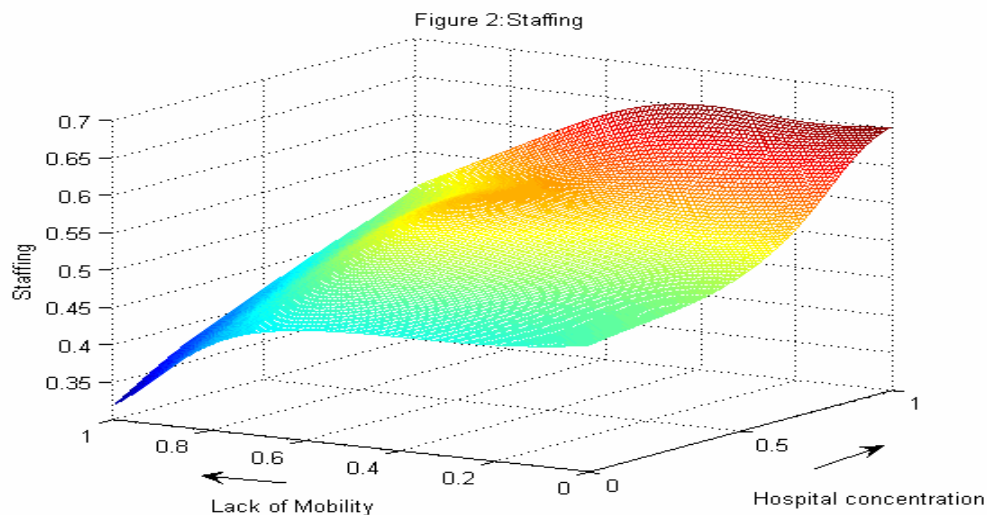
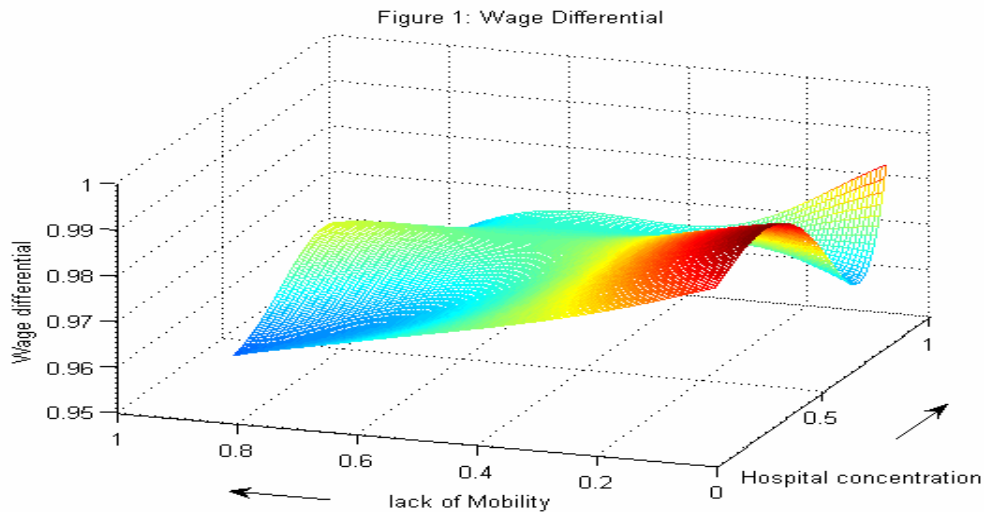
summarized in Pagan and Ullah (1999) or in Li and Racine (2007). Likewise, we also extend the analysis to examine how staffing ratio (nurse to patient ratio) serving as a proxy for workload measure is affected by these two covariates of interest (measuring exploitation). But for this dependent variable only one stage regression is performed. The staffing ratio (RN to hospital bed ratio) is simply regressed on hospital concentration and mobility variable with population and location dummy for metro being the control covariates using equation (1) above. For both wage differential and staffing ratio we apply a new nonlinearity test by Hsiao, Li and Racine (2007). This tests for the null of a linear model against an alternative of kernel based nonparametric model (as is used here). While examining the impacts of hospital concentration and mobility on wage differential variable the test rejects the null of linearity at 1% level (with a p-value 0.000). Also while examining the impacts of hospital concentration and mobility on staffing variable the test rejects the null of linearity at 1% level (with a p-value 0.000). These tests justify our use of semiparametric/general nonlinear model while examining the effects of hospital concentration and mobility variable on registered nurses' wages and work load. Semiparametric modeling also allows one to obtain point-wise estimates of the partial effects and $f(\cdot)$, the function itself, which in turn enables one to analyze the effects of the important covariates on the dependent variable in *various ranges* of the sample. More importantly, since it estimates the true underlying function itself, one can see clearly how the dependent variable is impacted by the main covariates of interest in *various ranges* of the sample.

3. Results

Our results show that on an average none of these measures (hospital concentration or mobility) have any significant impact on either of the two alternative dependent variables, and this is mostly consistent with the findings of Hirsch and Schumacher (2005). However, as mentioned earlier, the novelty of a non/semiparametric analysis is that it obtains *varying* partial effects of any regressor on the dependent variable, as opposed to obtaining a single estimated slope coefficient for a regressor (as in a linear estimation). That is, after estimating $f(\cdot)$, the whole curve, we obtain partial derivatives of the dependent variable with respect to a regressor (or slope of the curve) *at every sample point*. These are our varying partial effects. From these, we find that hospital concentration has no significant impact on wages as most of the varying partial effects (derivatives) of the hospital concentration variable on wages turn out to be insignificant. However, hospital concentration variable seems to have some positive and significant impact on the workload variable (staffing ratio) and this could be due to the fact that hospital consolidation may actually reduce the work load for nurses by achieving some advantage from large scale.⁴ The lack of mobility variable (LM) affects both wages and work load. It seems that about 30% of the varying partial effects with respect to this variable are negative (and significant) when wage differential happens to be the dependent variable, and about one half of the varying partial effects with respect to this variable are negative when work load happens to be the dependent variable. When one obtains a single coefficient estimate from a linear regression, such detailed facts remain hidden inside. This methodology also estimates the underlying functional form of the relation itself, i.e., $f(\cdot)$, rather than simply assuming it to be linear. After obtaining $f(\cdot)$, we

⁴ Some of the varying partial derivatives for this variable on staffing ratio are positive.

plot the estimated $f(\cdot)$, i.e., the fitted value of the dependent variable conditional on the two Z variables (hospital concentration and mobility) against these two Z variables. Figure 1 presents such 3-D surface plot when wage differential is the dependent variable and Figure 2 presents such 3-D surface plot when staffing ratio is the dependent variable.



The graphs capture how these two important covariates affect the dependent variables of interests for all possible contours/ranges of these two main covariates, after controlling for other regressors. Figure 1 shows that estimated wage differential somewhat shows a downward turn with an increase in LM but the hospital concentration does not seem to have any consistent negative impact. See Figure 1. In fact the curve is wavy and fluctuating when the hospital concentration rises. From Figure 2, it is evident that the estimated staffing ratio sharply decreases with an increase in LM , supporting the 'exploitation' argument. That is, predicted/estimated nurse to patient ratio falls with an

increase in LM (i.e. with an increase in monopsony power). However, with an increase in hospital concentration ratio the graph actually shows an upward trend, as mentioned earlier, showing some evidence against ‘exploitation’ argument. A single slope coefficient obtained from a linear regression (which essentially shows only the mean impact of a regressor on a dependent variable for the entire sample) fails to capture such details – because no impact in some range of the sample and significant impact in some other range of the sample may well cancel out each other, showing no significant impact on an average.

4. Conclusion:

Despite shortage of nurses, market for registered nurses is sometimes used as the textbook example of monopsony because of the localized nature of the industry. In any particular area number of hospitals is usually limited, which may give employers some market power. Following the existing empirical literature this paper examines the “monopsonistic exploitation” argument in the market for registered nurses from a new econometric angle and finds only limited support in favor of the argument. Future research can be extended examining the ‘exploitation’ argument from various other economic angles – for example, how many shifts a week do the nurses work and to what extent they are compelled to work overtime and extra shifts, versus their choice of doing so. Efforts can also be made to analyze how sensitive the results are to the construction of the mobility variable.

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