Managed Care Penetration and the Earnings of Health Care Workers

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Abstract

In the last fifteen years one of the biggest changes in the health care system has been the growth of managed care health insurance. Given that it appears that managed care has had a significant impact on the output side of the health care industry, this paper examines what, if any, affect it has had on input markets. It examines the impact of HMO market share on the wages of health care workers over the years 1990 through 1998. I examine and compare the wages of registered nurses and a health care comparison group. First I construct an adjusted earnings index to examine real wage growth for both groups, and then I estimate the relative earnings differential between RNs and the comparison group. The effect of managed care on wages is examined by conducting a two-stage estimation process where in the first step regression the set of coefficients measure the RN wage differential across MSAs and over time. These coefficients are then used as the dependent variable in the second step regression which relates the MSA wage differential to MSA specific measures of market conditions. I find that markets with a large HMO market share are associated with slightly lower wages for health care workers. When community fixed effects are added to the model, however, the effect is no longer significant.

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I. Introduction

In the last fifteen years one of the biggest changes in the health care system has been the growth of managed care health insurance. Medical costs per capita have been growing at 4 percent per year for the last five decades. 1995 spending was 102 times more than what it was in 1950.[1] These rising costs led to frequent calls for reform in the industry from increased government regulation to less intrusive market-based reforms. The rise of managed care health insurance is one such market-based reform. The standard "moral hazard" explanation for market failure in health care is that since insured patients do not pay the full marginal price for medical care coverage, patients tend to over-consume the good. Traditional insurance drives the marginal price of medical care toward zero so consumers tend to demand care until the marginal product of additional care is nearly zero. Spending on medical care increases even though the additional gains from such spending are very low or nonexistent. From society's standpoint, the cost of medical care is much greater than the benefits.

Managed care style health insurance differs from traditional fee-for-service health insurance in the incentives placed before doctors and hospitals. Traditional insurance compensates caregivers based on the costs they incur. Managed care insurance reimburses caregivers typically on a per patient basis as opposed to a per service basis. Thus, doctors and hospitals have an incentive to provide care for a patient at a minimum cost.

Managed care refers to an arrangement through which a group contracts with a number of providers who agree to provide medical services to members of the group for a fixed, capitated payment. This can take many different forms, the most common of which are health maintenance organizations (HMOs). While there are many types of plans, the common characteristic of managed care is to limit the high levels of utilization frequently found in traditional plans.

[1] Health Care Financing Administration (www.HCFA.gov).

There is recent evidence that suggests managed care has been somewhat successful in lowering the level of costs in the industry (Baker, 2000; Baker and Phibbs, 2000; Chernew et al., 1998; Cutler and Sheiner, 1998). This paper examines the impact, if any, of HMO market share has on the wages of health care workers over the years 1990-1998. I examine the wages of registered nurses (RNs) and a health care comparison group. Given that it appears that managed care has had a significant impact on the output side of the health care industry, this paper examines what, if any, affect it has had on input markets. I find that in markets with a high level of HMO market share, the wages of health care workers are lower. The size of this effect, however, is rather small and is only marginally significant.

The next section provides a review of previous literature on the effects of managed care on labor markets. Section III discusses the data and its descriptive statistics. Section IV studies the effect of managed care on wages. I find that markets with a large HMO market share are associated with slightly lower wages for health care workers. When community fixed effects are added to the model, however, the effect is no longer significant.

II. Previous Literature

There has been relatively limited literature examining the effect of managed care on health care labor markets. Spetz (1999) examines how the shift to managed care affects the prospective payment system on the hospital employment of registered nurses, licensed practical nurses and aides. Labor demand equations are estimated for RNs, LPNs, and aides, where employment is a function of wages, hospital output, technology and other characteristic. She finds that HMOs are associated with a lower use of LPNs and aides, and that HMOs do not have a statistically significant effect on the demand for RNs. HMO penetration also has a statistically significant negative effect on hours worked by LPNs and aides, but not on hours worked by RNs. These results are not consistent with the perception that HMO growth is causing reductions in the demand for RNs.

Simon, Dranove, and White (1999), attempt to determine the effects of managed care growth on the incomes of primary care and specialist physicians. The article provided evidence that changing market forces are leading to adjustments in the chosen market for physicians. Using two-stage least squares they estimate the effect of local managed care penetration on physicians' incomes, and found that the number of primary physicians as well as their income are rising with the growth of managed care. The coefficient on the predicted change in managed care penetration suggests that each increase in managed care penetration of one percentage point resulted in a cumulative $2,263 gain in real income over the period 1985 through 1993.

Schumacher (2001) examines the earnings and employment patterns of registered nurses over the 1988 to 1998 period and compares them to college-educated females and other workers in the health care industry. He then examines the source of the decline in RN relative wages and if managed care's presence in metropolitan areas has any impact on RNs wages. A two-stage estimation process was conducted to examine the effect of HMO market share on RN wages. After decomposing the relative wage loss for RNs he finds that his results are consistent with the hypothesis that wage declines were due to declines in the demand for RNs. He finds that RNs employed in metropolitan areas with a strong managed care presence earn slightly lower wages than RNs in areas with less managed care, but that HMO penetration can only explain a small part of the variation in RN wages across metropolitan areas and across time.

III. Data and Descriptive Statistics

The data used in this paper are from the monthly Current Population Survey (CPS) Earnings Files, conducted by the Bureau of Census, from January 1990 through December 1999. HMO penetration by metropolitan statistical area over the years 1990-1998 is obtained from Laurence Baker at Stanford University. MSA level data were obtained by summing county level HMO enrollment over all the HMOs serving the country. HMO market share was

computed as the ratio of enrollees to the Census Bureau estimate of the total county population, and then aggregating to the MSA level.

I focus on two groups of health care workers. First, registered nurses are examined. RNs are the single largest occupation in the industry and the second largest occupation among female professionals. Next, a comparison group of workers is examined. This group consists of all workers in the health care industry other than RNs.[2] This group is intended to capture industry-wide trends in the industry.

Table 1 displays the descriptive statistics for RNs and the health care comparison group for the years 1990 - 1999. The average real wage (in 1999 dollars) is $19.84 for RNs and $13.39 for the health care comparison group. The percentage of female RNs is 94.2 percent while for the comparison group it is 79 percent. The comparison group average years of schooling is 13.6 years, slightly lower than the average of 15.1 years for RNs. Both RNs and the comparison group have similar amounts of experience.

An adjusted earnings index is constructed to examine real wage growth over the period, after accounting for differences in worker and labor market characteristics. For the two different groups of workers the following equation is estimated:

$$\ln W_{in} = \sum_{j=1}^{J} \beta_j X_{inj} + \sum_{y=2}^{Y} \tau_y YEAR_{iny} + \varepsilon_{in} \qquad (1)$$

where $\ln W_{in}$ is the log real wage for worker i in group n, X contains observed personal and job-related characteristics that affect the wage, β their estimated coefficients, and ε is a well-behaved error term. The year dummy (τ) coefficients provide an estimate of log earning

[2] The following Census industry categories were included: offices of physicians, offices of dentists, offices of chiropractors, offices of optometrists, offices of health practitioners, n.e.c., hospitals, nursing and personal care facilities, and health services, n.e.c. Omitted from this group were medical scientists, physicians, dentists, optometrists, and podiatrists who are likely to have a high proportion of individuals with earnings topcoded in the CPS.

differences by year after controlling for other characteristics. The estimated year coefficients are converted to a percentage index by the formula exp(τ)*100.

The adjusted wage indices from 1990 to 1999 for RNs and the comparison group (1990=100) are displayed in Figure 1. Real wages for RNs increased steadily from 1990 through 1993. In 1993 an RN earned 4.7 percent higher wages than a RN in 1990. In 1994 RN wages decreased almost five percent from the year before. They increased slightly in 1995 but then continued to decrease in 1996 and 1997. By 1997 RN wages had decreased almost ten percent from their high in 1993. Wages increased in 1998 and 1999, so that an RN in 1999 earned over three percent more than a similar RN in 1997, and returned to their 1990 level.

The health care comparison group did not experience the increase in wages as the RNs did. Wages remained relatively constant from 1990 to 1993. Real wages then decreased almost three percent from 1990 to 1994. Wages increased in 1995 only to decrease once again in 1996, by about three percent. In 1996 wages were between three and four percent lower than those wages in 1990 for a similar worker. The years 1997, 1998, and 1999 have continued to increase wages from their low in 1996.

Overall there has been a slight decrease in RNs wages from 1990 to 1999, but the health care comparison group has only had an increase of less than one percent over the same period of time. RNs real wages did experience a decrease in the 1990s relative to the health care comparison group because along with their increase during that time the decreases were larger than those for the comparison group.

For each of the years, relative earnings were examined by estimating the following equation:

$$\ln W_{iy} = \sum_{j=1}^{J} \beta_j X_{iyj} + \delta_y RN_{iy} + \varepsilon_{iy} \qquad (2)$$

where $\ln W_{iy}$, X, β and ε are defined as in equation 1, and y indicates the year. RNs are pooled with the health care comparison group and RN is a dummy variable equal to 1 if the worker is employed as a RN. The coefficient δ_y provides an estimate of the relative earnings differential between RNs and their comparison group for the year y. This allows earnings to vary over time, but restricts the equation to be the same for the nurses and the health care comparison group.

Table 2 displays log wage differentials comparing RNs with the health care comparison group. RNs made significant relative wage gains on the comparison group from 1990 through 1994. In 1990 RNs earned 38.6 percent higher wages than the comparison group, which increased to as high as 45.5 percent in 1993.[3] In 1994 RNs experienced a significant decrease in relative wage gains over the comparison group from their high of 45.5 percent to 37.9 percent. This pattern continued in the following three years and in 1997 RNs wages were only 32.3 percent higher than the comparison group. In 1998 there was an increase of almost one percent but in the following year relative wage gains for RNs had decreased once again to 30.7 percent. Overall RN relative wages increased from 1990 to1993 but decreased from 1994 to 1999. The above statistics show that RN wages declined in both real and relative terms in the mid 1990's. One possible cause of this decline is the rise of managed care health insurance.

IV. The Effect of Managed Care on Wages

Next I examined the relationship between RN earnings and the presence of managed care health insurance. I use data on HMO penetration by metropolitan statistical area over the years 1990-1998 to examine the role of HMOs on wages. These data were obtained by summing county level HMO enrollment over all the HMOs serving the county. HMO market share was computed as the ratio of enrollees to the Census Bureau; estimate of the total county population, and then aggregating to the MSA level. For more information about these data, see

[3] The coefficients in Table 2 are converted to a percentage index using the formula (exp (β)*100)-1.

Baker (1995), or Baker and Brown (1999). HMO market share by MSA increased relatively steadily over the period, from an average of about 12.6 percent in 1990 to 23.1 percent in 1998. The standard deviation of HMO market share by MSA remained relatively stable between about .11 and .13 over the period. Since the HMO data are MSA-specific, we can only conduct the analysis for workers in large MSAs (1990 population greater than 100,000). The health care data used other than the HMO market share variable was obtained from the Bureau of Health Profession's Area Resource File. These variables include per capita admission, and per capita MDs.

To examine the effect of HMO market share on RN wages I follow the approach of Schumacher (forthcoming) and conduct a two-stage estimation process. A wage equation similar to the one estimated above was first estimated, but including is a set of MSA dummy variables interacted with three year groups (1990-1992, 1993-1995, and 1996-1998).

That is I first estimate:

$$\ln W_{itk} = \sum_{j=1}^{J} \beta_j X_{itkj} + \sum_{t=2}^{T} \delta_t TIME_{tik} + \sum_{k=2}^{K} \phi_{kt} MSA * TIME_{kit} + \varepsilon_{itk} \qquad (3)$$

where $\ln W_{itk}$ is the natural logarithm of hourly earnings of worker i in time period t in labor market (MSA) k; X includes individual-specific variables (indexed by j) affecting RN wages, with β_j the estimated coefficients; MSA is a set of dummy variables corresponding to the CMSA/MSAs and TIME is a set of dummy variables for the three time periods. The set of coefficients ϕ_{kt} measures the RN wage differential across MSAs and over time, and is used as the dependent variable in the second-step (weighted least squares) equation. Those estimates of ϕ are used in a second step regression relating the MSA wage differential to MSA-specific measures of market conditions.

This equation is:

$$\phi_{kt} = \alpha + \gamma HMO_{kt} + \eta Admis_{kt} + \theta MDs_{kt} + \kappa \ln pop_{kt} + \nu Period_t + \varepsilon_k \qquad (4)$$

where ϕ_{kt} is the wage differential in MSA k in time period t, HMO is the HMO penetration variable, Admis is per capital hospital admissions, MDs is per capita MDs, lnPop is the log of MSA population, and Period represents dummy variables for two of the three year groups.

The first step regression coefficient estimates capture the within-area effects owing to variation across individuals in measurable characteristics, with fixed area/year wage effects measured by coefficient estimates on the MSA dummy variables. Differences in area wage differentials are explained, in turn, by HMO penetration, hospital admissions, the number of physicians, and MSA size. If HMOs have been able to lower RN wages in MSAs where HMO presence is the strongest, then there should a negative and significant estimate on the coefficient γ.

Table 3 displays the descriptive statistics for the variables used in the second step regression. The MSA population mean is 750,766 individuals annually. On average, the HMO market share in each MSA is 15.6%. RNs in the average MSA across time earn .7% higher wages than the omitted group (RNs, New York City 1990-1992). The health care comparison group earns .4% less wages than the omitted group in the average MSA across time. The per capita MDs variable had a mean of 2.555, for every one thousand individuals there are, on average, 2.555 MDs.

The second step regression is run using weighted least squares where the inverse of the standard error from the first step regression is used as the weight. Weighted least squares is used to correct for heteroskedasticity: the larger MSAs will have more first step observations and therefore, the coefficient estimates in large MSAs in the first stage regression will be estimated more precisely than those for smaller MSAs. Results from the second step regression are displayed in Table 4 for both RNs and the health care comparison group. The first column results for the RN model which shows a marginally significant negative relationship

between RN wages and HMO market share - a one standard deviation increase in HMO market share (.11) is associated with a one percent decrease in RN wages. The effect for the health care comparison group is similar (.9%). These are relatively small effects for both RNs and the comparison group. If HMO's result in a decrease in the demand for health care workers, one might expect a larger effect than found here. As the log population increases by 10% RNs wages increase, on average, by 2.7%, and the comparison group wages increase by 4.2%. Per capita MDs and per capita admissions did not have a significant effect on RNs wages. The year group variables had significant effects on RNs and the comparison group's wages. RNs in 1993-1995 earned almost 17% more than RNs in 1990-1992, and the comparison group earned 25.4% more. RNs in the year group 1996-1998 earned only 13.6% more than RNs in 1990-1992 and the comparison group earned 25.7% more. After the MSAs were added to the regression for the fixed effect models all significant results became insignificant except for the year group dummies.

While the effects in Columns 1 and 2 are economically small, the effect may still be due to other omitted factors, such as community tastes or income. The second specification in Table 4 controls for this by including MSA specific dummy variables in the model. This specification holds the MSA constant and now variation in HMO market share *within* MSA across year group is used to explain the MSA wage differentials. If the coefficient on market share is significant in this model, then this would suggest that it is, indeed, market share that explains the differential and not something unique about the MSA. Table 4 shows that the coefficient estimates are nowhere near significant. This suggests that community fixed effects completely explain the small relationship between the MSA wage differential and HMO market share.

I next interact the HMO market share variable with the three year group dummies to allow the effects of the variables to change over time. Table 5 shows the coefficient estimates from the interaction variables for both RNs and the comparison group. For both groups the magnitude of the coefficient on the HMO market share variable increased (became more

negative) over each time period. But only in the last time period is there a marginal significant effect for RNs and a significant effect for the comparison group, but these effects are still relatively small. One reason for HMOs only having a small but observable effect on the last group of years could be that only as HMOs are becoming dominant in the insurance market they are able to have an effect on wages. Before this time HMOs did not have as much control over the market and RNs had a choice of whether to work for non-HMOs and HMOs had no choice but to pay the higher wage.

The finding of a relatively small or no wage effect across MSAs due to HMO penetration is consistent with previous research and with theoretical predictions. If RNs are sufficiently mobile across MSAs, then if HMOs are able to lower RN wages in a particular MSA, the supply curves should adjust so that relative wages across MSAs equalize. Thus HMOs may lower the overall wage for health care workers but will not affect the differentials across MSAs. Differences will arise, however, in employment levels. This is consistent with the findings of both Spetz (1999) and Buerhaus and Steigler (1996). Therefore it is possible that managed care has significantly lowered wages but workers are sufficiently mobile across MSAs so that wages equalize.

V. Conclusion

This paper examines the effect of HMO market share on the earnings of health care workers through the 1990s. Real wages for RNs increased steadily from 1990 through 1993 and then began to decrease through 1997. RNs wages decreased almost ten percent in 1997 from their high in 1993. RN wages began to rise again in 1998 and continued to do so in 1999 when their wages returned to their 1990 level. The wages of the comparison group remained relatively constant from 1990 to 1993. Since 1997 wages have continued to increase for the comparison group. Although RN wages have decreased slightly from 1990 to 1999, the comparison group's wages have only increased by less than one percent over the same period of time. RN relative wages increased significantly from 1990 to 1993 over the comparison group but have

decreased from 1994 to 1999. The statistics show that RN wages have decreased in both real and relative terms in the 1990s.

HMO market share by MSA has risen steadily over the period. Relatively small effects were found for both RNs and the comparison group when the relationship between wages and market share was examined. After including a set of MSA specific dummy variables in the model to account for community tastes or income, the estimates were not found to be significant. This suggests that the small relationship that did exist between the MSA wage differential and HMO market share could be completely explained by community fixed effects.

HMOs can only explain a small part of the decline in RNs wages although HMOs are becoming a much stronger presence in the health care market. With concern over rising costs, increased regulation, the restructuring of the private health industry both the supply and demand side of health care have been affected. HMOs might not have a direct effect on the wages of RNs but have indirectly affected them by causing the health care market to change certain procedures while trying to cut costs. With the presence of HMOs hospital stays have decreased which could in turn, decrease the demand for services, which could lead to a decrease in the demand for RNs.

The finding of a relatively small or no wage effect across MSAs due to HMO penetration is consistent with previous research and theory. But, as stated earlier, it is possible that managed care has significantly lowered wages but workers are sufficiently mobile across MSAs so that wages equalize.

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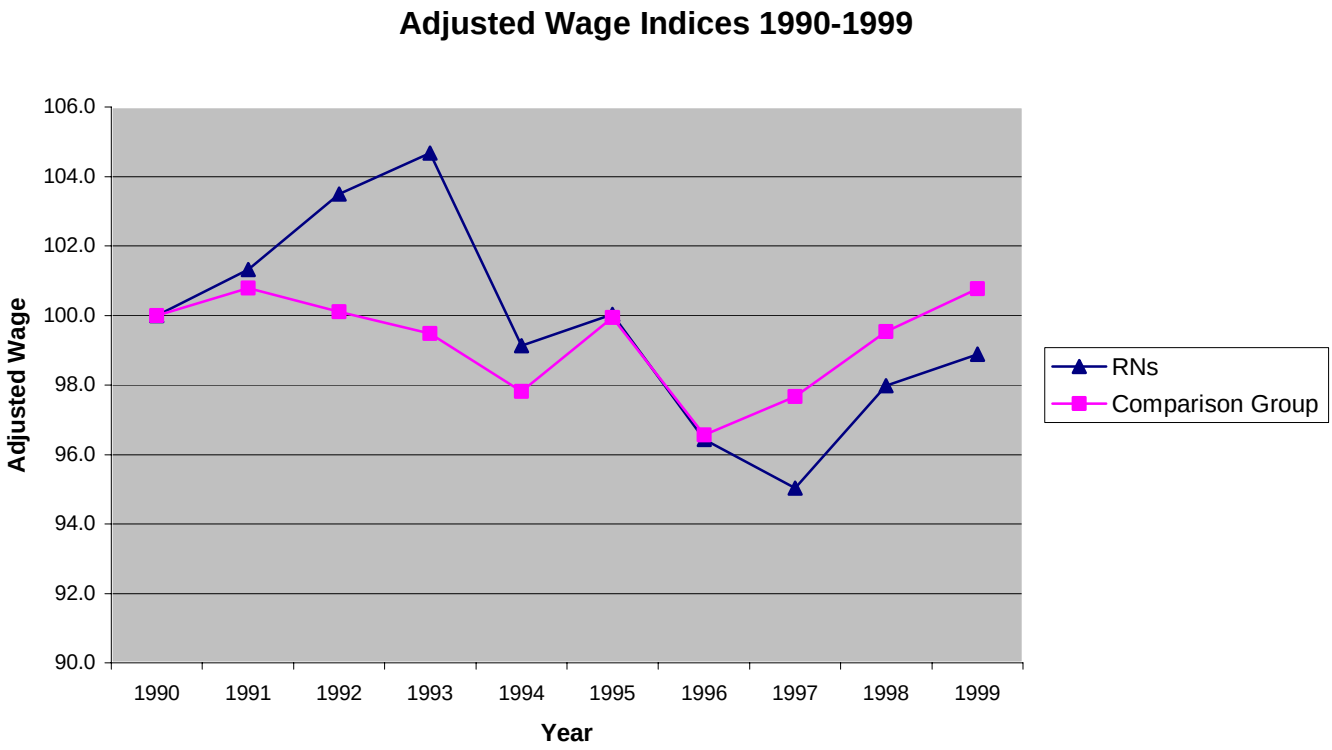
Table 1
Descriptive Statistics For RN's and the Health Care Comparison Group

	RN's (N=30,428)		Comparison (N=130,482)	
Variable	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**
Real Logwage	2.919	.3916	2.4323	0.5376
Real Wage	19.844	7.366	13.385	9.581
Female	.942	.234	.790	.407
Union	.160	.366	.094	.292
School	15.092	1.496	13.596	2.495
Married	.689	.463	.585	.493
Previously Married	.177	.382	.197	.397
Experience	19.902	10.436	19.537	12.289
Part-time	.286	.452	.225	.417
Hispanic	.026	.156	.064	.242
Black	.068	.253	.140	.347
Other	.055	.229	.045	.207
Mid Atlantic	.164	.371	.168	.374
East North Central	.160	.367	.158	.365
West North Central	.102	.303	.110	.313
South Atlantic	.157	.364	.154	.361
East South Central	.051	.219	.050	.218
West South Central	.068	.251	.080	.271
Mountain	.084	.278	.081	.272
Pacific	.105	.307	.101	.301
Year 90	.102	.302	.102	.302
Year 91	.102	.302	.104	.306
Year 92	.104	.305	.105	.307
Year 93	.105	.306	.107	.309
Year 94	.106	.307	.102	.302
Year 95	.104	.306	.103	.304
Year 96	.093	.291	.093	.290
Year 97	.095	.293	.095	.294
Year 98	.094	.292	.095	.293
Year 99	.097	.296	.094	.293
MSA Population >100,000	.702	.458	.687	.464

Figure 1



Source: CPS ORG files January 1990 through December 1999. The indices are derived from a separate log wage equation for each group including controls for years of schooling, potential experience and its square, and dummy variables for city size, gender, race, ethnic group, part-time status, marital status, region and year. The coefficients on the year dummies are converted to a percentage index by: exp(β)*100 where β is the coefficient.

Table 2
Log-Wage Differentials: 1990-1999

RNs and the Health Care Comparison Group

	All RN	
Year	**Coefficient**	**SE**
1990	.326	.008
1991	.331	.008
1992	.360	.008
1993	.375	.008
1994	.322	.009
1995	.313	.009
1996	.306	.010
1997	.280	.010
1998	.286	.009
1999	.270	.009

Source: CPS ORG files January 1990 through December 1999. Shown are the Coefficients on a nursing dummy variable where each nursing group is pooled with Their respective comparison group. Separate regressions are run for each year. Other Variables included in the regressions were years of schooling, potential experience and its square, and dummy variables for city size, gender, race, ethnic group, part-time status, marital status, and region.

Table 3
Descriptive Statistics for HMO Data

Variable	Mean	St Dev	Min	Max
MSA Coefficient – RNs (a)	.007	.159	-.159	.708
MSA Coefficient – Comparison Group (a)	-.004	.153	-.611	.359
MSA Population (b)	750,766	954,206	97,566	6,463,253
HMO Market Share (b)	.156	.112	0	.634
Per Capita Admissions (c)	.161	.061	.027	.529
Per Capita MD's (c)	2.555	1.576	.536	14.567

(a) Coefficient on the MSA dummy variables from CPS ORG files
(b) MSA data from Laurence Baker
(c) Data from Area Resource Files

Table 4
The Effects of Managed Care on RN Wages

	1		2	
Variable	**RN's**	**Comparison Group**	**RN's**	**Comparison Group**
HMO Market Share	-.10357	-.07768	-.12269	-.02998
	(.05681)	(.03637)	(.15211)	(.08148)
Per Capita Admission	-.21137	-.09087	.22293	.37052
	(.16087)	(.10411)	(.72742)	(.38303)
(Per Capita MD's)*1000	.00995	.00613	-.03013	-.0089
	(.00611)	(.00395)	(.04534)	(.02426)
Log Population	.02652	.04181	-.20059	.11664
	(.00616)	(.00393)	(.20391)	(.10794)
Year 1993-1995	.16557	.25433	.18151	.2553
	(.01199)	(.00762)	(.0169)	(.00892)
Year 1996-1998	.1363	.25659	.17133	.25754
	(.01276)	(.00806)	(.02959)	(.01569)
MSA dummies	No	No	Yes	Yes
R^2	.3303	.7726	.4658	.8716

Results presented are from a second step weighted least squares regression where the coefficient on the MSA dummy variable interacted with the three year group dummies is the dependent variable. The inverse of the standard error from this first step coefficient is the weight.

Table 5
The HMO Effect Over Time

	1		2	
	RN's	**Comp**	**RN's**	**Comp**
HMO Market Share * (1990-1992)	-.04968	.04018	-.10345	.07583
	(.08582)	(.05453)	(.17132)	(.09148)
HMO Market Share * (1993-1995)	-.11463	-.08158	-.1066	-.00444
	(.08457)	(.0533)	(.16857)	(.08934)
HMO Market Share * (1996-1998)	-.13832	-.17045	-.13232	-.05867
	(.08057)	(.05116)	(.15573)	(.08255)
R^2	.3286	.7760	.4628	.8732

The regression is a second-step regression similar to that presented in Table 5, except the HMO market share variable is interacted with the three year group dummies. The other variables included in the regression were per capita hospital admissions, per capita MDs and the log of the population all interacted with the year group dummies, as well as two of the three year group dummies.