

**THE EFFECT OF TEMPORARY NURSING
SERVICES ON THE SUPPLY
OF LABOR TO NURSING**

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ABSTRACT

Do temporary nursing agencies cause labor supply to nursing to be greater or less than it otherwise would be? Using cross-section survey data from 1984, 1988, and 1992, this question is examined within a nine-equation system capable of estimating hours that would be supplied in the absence of the agency option. Results indicate that 6% to 8% more labor would be supplied by nurses who work exclusively for agencies if that option no longer existed. This is essentially because it is more likely that these nurses will decide to work full-time rather than work part-time or not at all.

JEL classification: I11; J44; J22.

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I. INTRODUCTION

Is labor supply to nursing in the presence of temporary nursing services greater or less than it would otherwise be in their absence? Does the existence of these agencies act to increase or decrease labor supply? Agencies argue that they provide nurses with an additional employment option and as such provide nurses with an opportunity to participate in the labor force that would not otherwise exist in their absence.¹ Conversely, hospital administrators point out the lack of control they have over temporary nursing services and claim that nurses who would otherwise take full-time positions and work more hours have cut back on supply because of the degree of flexibility that agencies provide.²

The effect that agencies have on labor supply is of importance to the planning and forecasting of nurse labor supply by health care providers. However, the effects of temporary services on labor supply to nursing are not well understood.³ Information pertaining to labor supply behavior in the presence of agencies is lacking, yet would be quite valuable to health care planners.

This paper examines whether the existence of the temporary agency option causes an increase or a decrease in nursing labor supply, using data from the National Sample Survey of Registered Nurses for the years 1984, 1988, and 1992. The approach is to estimate, or simulate, the hours of labor that would be supplied by an agency nurse in the absence of the agency option.

The results indicate that for nurses who work *exclusively for agencies*, the absence of agencies would result in 6% to 8% more labor being supplied by these nurses. The model estimates that total hours worked by nurses who chose the agency option would have been 6.22%

higher in 1984, 6.50% higher in 1988, and 7.65% higher in 1992. Because such a large percentage of the nurse labor force is now opting to participate full-time, these results suggest that most of the agency effect is to allow nurses to cut back a little below a full-time schedule of 40-hours per week --- it is not to entice them to work when they otherwise would not.

The paper is divided into four sections. Section one provides some institutional background on the role of temporary nursing services and part-time nursing, including information on labor supply and demographic characteristics of agency and non-agency nurses. Section two presents and motivates an econometric model, and then presents the data. Section three contains and discusses the results of the analysis. Section four summarizes the findings.

II. TEMPORARY NURSING SERVICES

A. Use of Temporary Nursing Services

In addition to their full-time and part-time staff, health care providers hire registered nurses who work for temporary agencies. The nurses can work for one or a number of agencies. They can work a variable number of hours per week or can choose not to work at all for a given week (or weeks). Agency nurses are on call to work, and indicate to the agency their preferred parts of the day or week to work. They have the option to accept or reject assignments from the agency as they are notified.

These nurses are used predominantly by hospitals and other employers to fill in on short notice, either because of unanticipated increases in demand or because nurses scheduled to work

are unable to do so. Circumstances do exist where longer-range contracts have been set up between employers and agencies, generally when employers have determined their shift schedules far in advance.

A hospital administrator's decision to use temporary nursing services must balance the benefits of flexibility that the use of agency nurses provide against the loss of control. In response to the lack of control, some employers have tried to create in-house per-diem pools,⁴ which function like in-house temporary agencies. However, it may be difficult for an employer to keep an in-house pool because the pool must have enough nurses to be a reliable source for contingencies.

By the early 1980's, utilization of agency nurses began to increase noticeably, spurring the Division of Nursing at the Department of Health and Human Services to commission a study to gauge the impact of agency use on the provision of health care.⁵ Hospital and other employers began to rely more heavily on agencies to fill shifts. The increase in reliance was even referred to as an "addiction" by many alarmed critics of agencies.⁶

The percentage of nurses working exclusively for agencies increased through the 1980's, as did the average number of hours worked by an agency nurse.⁷ For the purpose of illustrating the change in participation over time, Table 1 was constructed using data compiled from the National Sample Survey of Registered Nurses for the years 1984, 1988, and 1992. The table breaks the nurse labor force into four mutually exclusive categories: (1) nurses who do not work, (2) nurses who work exclusively for agencies, (3) nurses who work part-time, defined as less than 1,400 hours per year, but not for an agency, (4) nurses who work full-time, defined as greater than 1,400 hours per year, but not for an agency.⁸

[Table 1 here]

Participation has continued to increase, to the point where in 1992 over 84 percent of the nurse population choose to work either for a regular employer of nurses or for an agency. The percentage of nurses working exclusively for agencies increased from 1.54% to 2.24% from 1984 to 1988, and then fell back down to 1.68% in 1992. The average hours worked by an agency nurse increased over the period. In 1984, nurses working exclusively for agencies averaged 1,441 hours per year, by 1988 the average was up to 1,552 hours, and by 1992 it had further increased to 1,604 hours.⁹

B. Comparison of Agency Nurses with the Rest of the Nurse Population

The Tables 2 and 3 were also constructed using data from the National Sample Survey. Table 2 presents demographic, education, and employment characteristics by category for 1992.

[Table 2 here]

The agency group is much less female and much less white than the rest of the population, particularly in comparison with nurses who do not work and or work part-time. The percentage of the agency population that is married is also in sharp contrast with the rest of the population. Just over half of agency nurses are married, while about two-thirds of full-time nurses, three-fourths of nurses who do not work, and nine-tenths of part-time nurses are married.

With regard to children in the household, it is the part-time work force that differs markedly from the other three groups. Part-timers are much more likely to have preschool children in their household. About 37% of part-time nurses have preschool children as compared with only 17% for nurses who do not work, 20.5% for agency nurses, and 18.5% for full-timers.

The situation is similar with regard to children under 18 in the household. About 72% of part-time nurses have children, as compared with only 40% for nurses who do not work and 42% for agency nurses. Full-time nurses are in the middle of the 72%-40% contrast with 56% having children in their household.

There is a clear correlation between age and participation. The average age of nurses who do not work is about 52 years old, which is much higher than that of agency nurses with an average age of about 40, full-timers at about 41, and part-timers at about 42. Even when considering only nurses younger than 65 years old, nurses who do not work are still substantially older than those who participate. The average age falls to 47.59 for those not working, while the averages for the other three groups remain about the same.

The National Sample Survey of Registered Nurses categorizes nurses by their highest level of attainment. These categories are the one-year diploma degree, the two-year associate's degree, the four-year bachelor's degree, or master's degree (or higher). The part of the labor force that is not working is much older and has a high percentage of nurses who earned only a one-year diploma degree. All three of the other groups have about the same percentage of nurses who earned a four-year bachelor's degree.

With regard to employment patterns, the comparison of agency nurses to part-time nurses is quite illuminating. Agency nurses averaged 1,604 hours per year as compared with only 949 for part-time nurses. The decomposition into hours per week and weeks per year highlights the huge difference in hours per year. Agency nurses averaged many more hours per week than did part-time nurses, 35.82 to 21.19, but actually averaged fewer weeks per year, 45.37 to 46.27. In fact, only about 64% of the agency work force worked at least 48 weeks per year, while about

74% of the part-time force did.

From these data, we can draw profiles of the different groups of nurses. In contrast to agency nurses, part-time nurses are more likely to be female and white, and much more likely to be married and have children, particularly preschool children. Part-time nurses work many fewer hours per year than agency nurses. They work many fewer hours per week --- almost two 8-hour shifts fewer --- but they work slightly more weeks per year. Full-time nurses are actually "in between" agency and part-time nurses in a number of demographic characteristics, including the percentage who are female, white, married, and have children. Nurses who do not work are much older, even when considering only nurses under 65.

One final comparison which is instructive is that of the percentage of time on average that each of the four groups spends working in specific areas. Table 3 presents data for seven different types of work during a usual work week for 1992. The seven areas of work are (1) administration, (2) consultation with professionals, (3) direct patient care, (4) research, (5) supervision, (6) teaching nursing, and (7) other (all else). The breakdown is done for the three of the four groups that in fact do work - (1) agency, (2) part-time, and (3) full-time nurses.

[Table 3 here]

In regard to specific work performed, agency and part-time nurses are quite similar, in contrast to full-time nurses. Agency and part-time nurses are much more likely to engage in direct patient care and less likely to be involved in administration and supervision than are full-time nurses. Agency and part-time nurses do differ slightly, with agency nurses performing more direct patient care (4.5% more), while doing less supervision and teaching (1.8% and 2.5% less). The differences are even smaller when considering only staff nurses.

III. MODEL CONSTRUCTION

The model is designed to determine whether nurses who work exclusively for agencies would supply more or less labor if they did not have the option of working for an agency. A nine-equation system provides an estimate, or simulation, of the expected hours of labor that would be supplied by an agency nurse in the absence of the choice. The system is similar to one I used to decompose labor supply into its full-time and part-time components to study the increase in labor supplied by nurses over the 1977-88 period (Bellemore 1994).

I assume that an agency nurse, minus the agency option, makes a single decision whether (1) to work full-time for a regular employer of nurses, (2) to work part-time for a regular employer of nurses, or (3) not to work at all. For each nurse, the probabilities of choosing each of the three possibilities are estimated. The supply of full-time hours conditional on working full-time for a regular employer and the supply of part-time hours conditional on working part-time for a regular employer are also estimated for each nurse. The estimated probabilities and hours are then used to calculate expected hours of labor supplied in the absence of the agency option. A comparison of actual hours worked for agencies with expected hours worked in their absence is made to determine whether the existence of agencies causes labor supply to be greater or less than it would be otherwise.

A. Description of the Model

A full-time hours equation (1), conditional on working full-time for a regular employer, is estimated. Wage is a regressor in the hours equation, but an actual full-time wage for an

agency nurse does not exist. Because there is no full-time regular employer wage for an agency nurse, a full-time wage equation (2) is estimated to obtain a fitted full-time wage to be used in the hours equation. These full-time hours and wage equations will have inconsistent estimates because they are estimated using only those nurses who work full-time for regular employers. In order to correct for the bias, selectivity correction terms are constructed (Heckman 1980). A probit equation (3) on whether the nurse works for an agency or works full-time with a regular employer is estimated and the coefficients from the equation used to construct the correction terms.

The estimation is identical for part-time labor supply. A part-time hours equation (4), conditional on working part-time for a regular employer, is estimated, as is a part-time wage equation (5). A probit equation (6) on whether the nurse works for an agency or works part-time with a regular employer is estimated, the coefficients from which are used to construct the correction terms.

In order to determine the probability of each agency nurse being in each of the three categories (not working, working part-time for a regular employer, working full-time for a regular employer), an ordered-probit participation equation (7) is estimated using all non-agency nurses, whether they are employed or not. The equation contains wage as a regressor and because a wage value does not exist for nurses who are not employed, a fitted wage is obtained to use by estimating a pooled wage equation (8). The wage equation will of course have inconsistent estimates if a traditional ordinary least squares approach is used because it is estimated using only nurses who work. In order to construct selectivity terms to correct for the bias, a reduced-form, ordered-probit participation equation (9) is estimated and the coefficients from the equation

used to construct the correction terms.

The nine equations which make up the system are as follows:

$$(1) \text{ Full-time Hours: } h_f = X_h \beta_{hf} + \hat{W}_f \delta_{hf} + H_f \Theta_{hf} + \epsilon_{hf}.$$

X_h is the vector of variables affecting hours and is given in Table 4.¹⁰ \hat{W}_f is the fitted full-time wage for the nurse estimated from equation (2). H_f is the selectivity correction term constructed from the coefficients from equation (3).

[Table 4 here]

$$(2) \text{ Full-time Wage: } W_f = X_w \beta_{wf} + H_f \Theta_{wf} + \epsilon_{wf}.$$

The three wage equations in the system are reduced-form equations. X_w is the vector of variables affecting wages and is given in Table 4.

$$(3) \text{ Full-time Probit: } C_f = X_h G_{hf} + X_w G_{wf} + \epsilon_{cf}.$$

Equation (3) is run using all agency nurses and all full-time nurses. C_f is a dummy variable set equal to 1 if the nurse is a full-time non-agency nurse and set equal to 0 if she is an agency nurse. Defining $\hat{C}_f = X_h \hat{G}_{hf} + X_w \hat{G}_{wf}$, the correction term is:

$$H_f = \frac{\phi(\hat{C}_f)}{\Phi(\hat{C}_f)}$$

$$(4) \text{ Part-time Hours: } h_p = X_h \beta_{hp} + \hat{W}_p \delta_{hp} + H_p \Theta_{hp} + \epsilon_{hp}.$$

\hat{W}_p is the fitted part-time wage for the nurse estimated from equation (5). H_p is the selectivity correction term constructed from the coefficients from equation (6).

$$(5) \text{ Part-time Wage: } W_p = X_w \beta_{wp} + H_p \Theta_{wp} + \epsilon_{wp}.$$

$$(6) \text{ Part-time Probit: } C_p = X_h \beta_{hp} + X_w \beta_{wp} + \epsilon_{cp}.$$

Equation (6) is run using all agency nurses and all part-time nurses. The construction of H_p is parallel to that of H_f .

(7) Ordered Probit Participation: $h^* = X_h \alpha_{h^*} + \hat{W}_b \delta_b + \varepsilon_{h^*}$.

\hat{W}_b is the fitted wage for the nurse, obtained from the pooled wage equation (8). h^* is desired hours. If $h^* \leq 0$, the nurse does not work; if $0 < h^* \leq T$, the nurse works part-time; if $h^* > T$, the nurse works full-time. T for the analysis is 1400 hours per year.¹¹ h^* is desired hours, but the observed variable for h^* is the discrete choice of whether: (1) not to work, (2) to work part-time, or (3) to work full-time. The equation is estimated using all non-agency nurses whether employed or not.

The consistent coefficient estimates from equation (7) are used to estimate, for each agency nurse, the probabilities of being in each of the three categories. The estimated probabilities are $P(\text{Not Work}) = \Phi(-\hat{h}^*)$, $P(\text{Part-Time}) = \Phi(T-\hat{h}^*) - \Phi(-\hat{h}^*)$, and $P(\text{Full-Time}) = 1 - \Phi(T-\hat{h}^*)$. The fitted wage used in (7) is derived by estimating an equation using both full-time and part-time nurses, and constraining the value of the β 's to be the same for both types:

(8) Pooled Wage: $W_b = X_w \beta_{wb} + D_{\text{full}} \Gamma_{\text{full}} + H_b \Theta_{wb} + \varepsilon_{wb}$.

W_b is the wage, the full-time wage for full-time nurses and the part-time wage for part-time nurses. D_{full} is a dummy variable, set equal to 1 if the nurse works full-time and set equal to 0 if the nurse works part-time. H_b is the selectivity correction term and equals H_{fg} if the nurse works full-time and equals H_{pg} if the nurse works part-time. To construct the selectivity correction terms, the ordered-probit equation (9) is run to obtain the estimated coefficients.

(9) Ordered Probit: $h^{**} = X_h \alpha_{h^{**}} + X_w \alpha_{w^{**}} + \varepsilon_{h^{**}}$.

Defining $X_* \hat{\alpha}_* = X_h \hat{\alpha}_{h^{**}} + X_w \hat{\alpha}_{w^{**}}$, the correction terms are:

$$H_{\text{fg}} = \frac{\phi(X_* \hat{\alpha}_* - T)}{1 - \Phi(T - X_* \hat{\alpha}_*)}$$

, the denominator is the probability of working full-time.

$$H_{p8} = \frac{\phi(-X*\hat{\alpha}_*) - \phi(X*\hat{\alpha}_* - T)}{\Phi(T - X*\hat{\alpha}_*) - \Phi(-X*\hat{\alpha}_*)}$$
, the denominator is the probability of working part-time.

Expected hours for each nurse are calculated using the consistent estimates for the probabilities and hours: $E(\text{hours}) = [P(\text{Part-Time}) * \hat{h}_p] + [P(\text{Full-Time}) * \hat{h}_f]$.

For completeness and comparison, I also ran a six-equation system that does not make the full-time/part-time hours distinction. For this simpler system, there is one hours equation rather than two, and a "not work/work" probit equation rather than a "not work/part-time/full-time" ordered-probit equation. Expected hours for each nurse are calculated as: $E(\text{hours}) = [P(\text{Work}) * \hat{h}_w]$, where \hat{h}_w is the estimate of expected hours worked (conditional on working).¹²

B. The Data

The data sets used in the analysis are three National Sample Surveys of Registered Nurses, which are a series of surveys conducted by the Division of Nursing, Bureau of Health Professions, Health Resources and Services Administration, Public Health Service, United States Department of Health and Human Services. The studies were conducted in November 1984, March 1988, and March 1992 by means of a mail questionnaire or telephone interview.

The eligible population for the surveys consisted of all people currently licensed to practice as a registered nurse in the United States. The random sample was selected from the licensing rolls of all fifty states and the District of Columbia. The 1984 sample contains 31,626 observations, the 1988 sample contains 33,047, and the 1992 sample contains 32,510.

All of the variables used in the nine equations, with the exception of the unemployment rate, were derived from responses to the questions from the National Sample Surveys of Registered Nurses. A description of the vector of variables which affect hours worked, a

description of the vector of variables which effect wages, and a discussion of variable construction in each of the nine equations is presented in Appendix A.

IV. RESULTS

The system of nine-equations was estimated for each of 1984, 1988, and 1992.¹³ Table 5 presents the main results. The table contains the average number of hours it is estimated that agency nurses would work in the absence of the agency option and contrasts that with the average number of hours they actually did work. The table also contains a breakdown of the components which made up the estimate of expected hours worked in the absence of the option. The breakdown includes the averages for the estimates of (1) the probability of not working, (2) the probability of working part-time, (3) the probability of working full-time, (4) the number of part-time hours worked conditional on working part-time, and (5) the number of full-time hours worked conditional on working full-time.

[Table 5 here]

For the 1984 analysis, the average number of expected hours in the absence of the option is 6.22% greater than the average number of hours that the nurses actually worked for agencies. In 1988, the average expected hours is 7.65% greater, and in 1992, it is 6.50% greater. The decomposition into the five components is instructive. Note what is driving the result: it is much more likely that the nurse will decide to work full-time rather than work part-time or not at all. If they were to lose the agency option, these nurses are much more likely to plunge into the full-time labor force. Recall from Table 2 that they are averaging about 35 hours per week, while

full-timers average about 41 hours and part-timers about 21 hours. In general, the move up to 40 is preferred to the fall down to 20. For agency nurses, adding about a shift per week, and a few more weeks per year, is preferable to dropping two-shifts per week.

Why is this so? Why do we find that, absent the agency option, these nurses are more likely to work full-time than to work part-time or not at all? To that end, Table 6 reformulates information from Tables 1 and 5, and may provide some insight.

[Table 6 here]

The table presents a comparison of the averages of the three predicted probabilities for agency nurses with the actual percentages for the non-agency population. Note that in 1992 about 65% of the of the actual non-agency population worked full-time, but the agency population prediction is much higher - that 74.3% will work full-time (average probability of 74.30%). Also, about 19% of the actual non-agency population worked part-time, but the agency population prediction is lower - that only 16% will work part-time (average probability is 16.04%). Likewise, about 16% of the actual non-agency population did not work, but the agency population prediction is much lower - that only 9.66% will not work (average probability is 9.66%). The results are similar for 1984 and 1988.

The main point of the illustration is that, with the loss of the agency option, the agency population is much more receptive to full-time employment and much less receptive to not working than is the rest of the population. Consequently, they would be expected to supply more hours in the absence of their preferred option of working for an agency. The implication of this comparison is that the agencies allow nurses the option of cutting back from a full-time schedule without having to drop down to part-time hours or drop out of the work force. Agencies do little

to entice nurses into the workforce that would otherwise not work.

This analysis looks only at nurses who worked exclusively for agencies. If full-time nurses who worked a second job with an agency in order to work more hours were considered, then in this regard the existence of agencies would act to increase the supply of labor. However, full-time nurses are not the type of nurses that agencies claim they allow to increase supply.

V. SUMMARY

The question of whether the existence of the temporary agency option causes the supply of labor to nursing to be greater or less than it would otherwise be was examined using three cross-section surveys of registered nurses taken in the years 1984, 1988, and 1992. The results indicate that nurses who work *exclusively for agencies* would supply 6% to 8% more labor if such agencies did not exist. Total hours worked by nurses who chose the agency option would have been 6.22% higher in 1984, 6.50% higher in 1988, and 7.65% higher in 1992.

Given the loss of the agency option, it is much more likely that the nurse will decide to work full-time rather than work part-time or not at all. For agency nurses, adding about a shift per week, and a few more weeks per year, is preferable to dropping two-shifts per week. With the loss of the agency option, the agency population is more receptive to full-time employment and much less receptive to not working than is the rest of the nursing population. Consequently, they would be expected to supply more hours in the absence of their preferred option of working for an agency.

The implication of these results is that agencies allow nurses the option of cutting back from a full-time schedule without having to drop down to part-time hours or drop out of the work force. Agencies do little to entice nurses into the workforce that would otherwise not work.

TABLE 1: PERCENTAGE OF NURSES (1) NOT WORKING, (2) WORKING FOR AN AGENCY, (3) WORKING PART-TIME BUT NOT FOR AN AGENCY, AND (4) WORKING FULL-TIME BUT NOT FOR AN AGENCY, 1984, 1988, 1992

	Not Working	Agency	Part-time, Not Agency	Full-Time, Not Agency
1984	19.61	1.54	19.62	59.23
1988	18.93	2.24	18.33	60.50
1992	15.64	1.68	19.00	63.68

TABLE 2: PERCENTAGES AND AVERAGES FOR NURSES IN VARIOUS DEMOGRAPHIC, EDUCATION, AND EMPLOYMENT CATEGORIES BY EMPLOYMENT CATEGORY, 1992

DEMOGRAPHIC:	Not Working	Agency	Part-time, Not Agency	Full-Time, Not Agency
% Female	97.37	92.00	98.61	94.58
% White	94.97	88.12	95.94	90.53
% Married	74.78	52.30	88.38	67.81
% With Children Under 6	17.00	20.50	37.38	18.56
% With Children Under 18	40.65	41.95	71.66	56.25
Average Age	52.09	39.69	41.84	40.77

EDUCATION (HIGHEST DEGREE):	Not Working	Agency	Part-time, Not Agency	Full-Time, Not Agency
% Diploma (one year)	49.08	27.95	34.39	27.71
% Associate's (two years)	16.13	37.07	26.85	32.75
% Bachelor's (four years)	26.61	31.94	32.56	31.11
% Master's or Higher	8.17	3.04	6.20	8.43

EMPLOYMENT:	Not Working	Agency	Part-time, Not Agency	Full-Time, Not Agency
Average Hours Per Year	-----	1604.3	949.4	2043.4
Average Hours Per Week	-----	35.82	21.19	40.78
Average Weeks Per Year	-----	45.37	46.27	51.05
% Working at Least 48 Weeks	-----	64.45	73.87	94.60

TABLE 3: PERCENTAGE OF TIME ON AVERAGE THAT NURSES SPENT
 WORKING IN SPECIFIC AREAS DURING A USUAL WORK
 WEEK, BY EMPLOYMENT CATEGORY, 1992

All Nurses:	Agency	Part-Time, Not Agency	Full-Time, Not Agency
Administration	8.6	8.6	16.2
Consultation	5.4	5.3	7.3
Direct Patient Care	77.4	72.9	58.3
Research	0.9	1.1	1.7
Supervision	5.4	7.2	11.3
Teaching Nursing	2.2	4.7	5.0
Other	0.1	0.2	0.2
	100.0	100.0	100.0

Staff Nurses Only:	Agency	Part-Time, Not Agency	Full-Time, Not Agency
Administration	5.8	6.3	7.5
Consultation	4.6	4.1	4.9
Direct Patient Care	81.4	82.0	76.8
Research	0.9	0.6	0.8
Supervision	5.3	5.3	7.6
Teaching Nursing	2.0	1.5	2.3
Other	0.02	0.2	0.1
	100.0	100.0	100.0

TABLE 4: LIST OF VARIABLES IN THE VECTORS
AFFECTING HOURS AND WAGES

VECTOR OF
VARIABLES AFFECTING HOURS

CHILD UNDER 6
CHILD UNDER 18
SPOUSAL INCOME
MARRIED
WHITE
YEARS SINCE GRADUATION
YEARS SINCE GRADUATION ²
AGE
AGE ²

VECTOR OF
VARIABLES AFFECTING WAGES

ASSOCIATE
BACHELOR
MASTERS
WHITE
YEARS SINCE GRADUATION
YEARS SINCE GRADUATION ²
AGE
AGE ²
CALIFORNIA
NORTHEAST
UNEMPLOYMENT RATE
RESIDE IN SMSA

TABLE 5: COMPARISON OF EXPECTED HOURS WORKED IN THE
 ABSENCE OF THE AGENCY OPTION WITH ACTUAL HOURS
 WORKED FOR AGENCIES, 1984, 1988, 1992

AVERAGES OF THE ESTIMATES FOR THE AGENCY NURSE POPULATION

Comparison of Hours Worked:	1984	1988	1992
Expected Hours Worked in Absence	1530.34	1670.93	1708.52
Actual Hours Worked for Agencies	1440.67	1552.14	1604.30
Percentage Increase	6.22%	7.65%	6.50%

Components of Expected Hours:	1984	1988	1992
Probability of Not Working	16.32	12.18	9.66
Probability of Working Part-Time	18.07	16.08	16.04
Probability of Working Full-Time	65.61	71.74	74.30
Part-Time Hours	975	971	1020
Full-Time Hours	2055	2104	2077

TABLE 6: COMPARISON OF PREDICTED PROBABILITIES FOR
 AGENCY NURSES WITH THE NON-AGENCY
 POPULATION, 1984, 1988, 1992

Average Predicted Probability for Agency Nurses:	1984	1988	1992
Probability of Not Working	16.32	12.18	9.66
Probability of Working Part-Time	18.07	16.08	16.04
Probability of Working Full-Time	65.61	71.74	74.30
 For the Non-Agency Population:	 1984	 1988	 1992
Percentage Not Working	19.92	19.36	15.91
Percentage Working Part-Time	19.93	18.75	19.32
Percentage Working Full-Time	60.16	61.89	64.77

FOOTNOTES

1. Interviews with: Dolores Polito of Kimberly Quality Care (an agency) in San Antonio Texas in February 1991; Jim Keefe of Kimberly Quality Care in Boston in March 1992; Barbara Kehrer in July 1991; and Natan Szapiro August 1991. Kehrer and Szapiro had authored "*A Study of the Utilization and Effects of Temporary Nursing Services*" in February 1983. Kehrer and Szapiro, at Mathematica Policy Research at the time, wrote the report for the Division of Nursing of the Department of Health and Human Services. I had informative conversations with both authors.
2. *The Great White Lie: How America's Hospitals Betray Our Trust and Endanger Our Lives*, Walt Bogdanich, Simon & Schuster, 1991. "Hospitals Try New Tactics to Cut Agency Rates," *American Journal of Nursing*, February 1989. Also, ABC-TV program "20/20" on November 1, 1991 devoted an entire segment to the issue of Temporary Nursing Service. Also, Bogdanich, 1991, where almost an entire chapter is devoted to "horror story" anecdotes, such as an agency in Florida (All-Care) that 'sent out a secretary, a construction worker, and a commercial spray-painter to render nursing care.' "Massachusetts Moves to Limit Agency Charges," *American Journal of Nursing*, April 1989. pp. 552-553. "Court Socks Hospitals for 'Boycotting' Agencies," *American Journal of Nursing*, June 1989. pp. 864-865. "The Nursing Shortage and Its Relationship to Part-time and Temporary Employment Growth: How Should Unions Respond?," Ann Claire Greiner, Master's Thesis for degree of Master of City Planning at MIT, May 1988.
3. Interviews with: Polito, Keefe, Kehrer, and Szapiro.

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6. Bogdanich, 1991 and "Danger in White: The Shadowy World of 'Temp' Nurses," Walt Bogdanich, *Wall Street Journal*, November 1, 1991. Also, "Solid Gains Behind, Leaner Times Ahead," Patricia Brider, *American Journal of Nursing*, February 1991 mentions " 'licking the agency addiction' that's costing us \$42-\$60 an hour," as the aim of hospitals.
7. The figures are reported in Tables 1, 5, and 7.
8. Nurses who worked full-time but not for an agency in their primary position and had a secondary position with an agency were put into the fourth category. Only 38 nurses out of the 32,510 in the sample were nurses who worked part-time but not for an agency in their primary position and had a secondary position with an agency. The 38 were excluded from the analysis.
9. These actual average hours worked figures for agency nurses are reported as part of Table 5 of the results.
10. The full-time equation and the part-time equation contain the same wage vector. This does not have to be the case, but in this instance no data was obtained for the analysis which could be used to create variables that would be appropriate for one of the vectors (part-time or full-time) but not the other.
11. The analysis was also performed using 1,200 and 1,600 hours per year as cut-offs. The results were similar to those using 1,400 hours per year.

12. This six-equation system estimates that total hours worked by nurses who chose the agency option would have been 6.72% higher in 1984, 8.21% higher in 1988, and 7.13% higher in 1992.

These results are in an appendix available from the author upon request.

13. The 1984, 1988, and 1992 regression results for equations (1) to (9) are not reported. They are in an appendix available from the author upon request.

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APPENDIX A: DESCRIPTION OF VARIABLES

A.1. Description of the Variables Affecting Hours Worked

The vector of independent variables related to hours worked is X_h (see Table 4). The vector contains the following nine variables:

- (1) CHILD UNDER 6: Dummy variable set = 1 if there are children under six years old in the household, and set = 0 otherwise.
- (2) CHILD UNDER 18: Dummy variable set = 1 if there are children under eighteen years old in the household, and set = 0 otherwise.
- (3) MARRIED: Dummy variable set = 1 if the nurse is married, and set = 0 otherwise.
- (4) SPOUSE INCOME: The total household income was available only in bracketed amounts. The SPOUSE INCOME amount was calculated at by taking the midpoint of the nurse's bracketed response and subtracting out the nurses total earnings from her principal position, which was given exactly, and then subtracting out her earnings from all other positions, if there were any. The variable was set = 0 if the nurse was not married. This variable was not available for 1980 and consequently was not used in that year's analysis.
- (5) WHITE: Dummy variable set = 1 if the nurse's racial/ethnic background is "white but not of hispanic origin", and set = 0 otherwise.
- (6) AGE: Age of the nurse.
- (7) AGE SQ: AGE squared.
- (8) YEARS SINCE GRADUATION: The number of years since the nurse earned her nursing degree.

(9) YEARS SINCE SQ: YEARS SINCE GRADUATION squared.

A.2. Description of the Variables Affecting Wages

The vector of independent variables related to wages is X_w (see Table 4). The vector contains variables related to both wage supply and wage demand. It contains the following twelve variables, eight related to supply and four related to demand:

Supply:

(1) ASSOCIATE: Dummy variable set = 1 if the nurse's highest degree earned was an Associate's Degree (usually a two-year program), and set = 0 otherwise.

(2) BACHELOR: Dummy variable set = 1 if the nurse's highest degree earned was a Bachelor's Degree (usually a four-year program), and set = 0 otherwise.

(3) MASTERS: Dummy variable set = 1 if the nurse's highest degree earned was a Master's Degree or higher, and set = 0 otherwise.

Since all nurses must have either a Diploma, Associate's, Bachelor's, or Master's or higher, Diploma (usually a one-year program) was left out.

(4) WHITE, (5) AGE, (6) AGE SQ, (7) YEARS SINCE GRADUATION, (8) YEARS SINCE SQ are the same as those defined above for the X_h vector.

Demand:

(9) CALIFORNIA: Dummy variable set = 1 if the nurse resides in California and set = 0 otherwise.

(10) NORTHEAST: Dummy variable set = 1 if the nurse resides in Pennsylvania, New Jersey, New York, Connecticut, Rhode Island, Massachusetts, Maine, New Hampshire, or Vermont, set

= 0 otherwise.

(11) SMSA: Dummy variable set = 1 if the nurse resides in an SMSA, set = 0 otherwise. This variable is not available for 1988 or 1992.

(12) UNEMPLOYMENT RATE: Set equal to the unemployment rate in the state in which the nurse works or resides (annual average of monthly figures of total unemployment as a percent of the civilian labor force). The data was obtained from the Statistical Abstract of the United States.

A.3. Description of the Variables in Each of the Equations

The dependent variable in the full-time hours equation (E1) and in the part-time hours equation (E4) is TOTAL HOURS. TOTAL HOURS is calculated by multiplying the hours per week spent working at the principal nursing position by the weeks per year spent working at the principal nursing position. If the nurse holds more than one position, the product of the hours per week spent at all other (secondary) nursing positions multiplied by the weeks per year spent at all other nursing positions is then added to this amount.

The dependent variable in the full-time wage equation (E2) and in the part-time wage equation (E5) is WAGE PER HOUR. This variable is derived by dividing total annual earnings (earnings from both primary and secondary positions) by total annual hours (TOTAL HOURS).

For equation (E3), the probit equation, the dependent variable, TNSORFT, is set = 0 if the nurse works exclusively for an agency, and set = 1 if she does not work for an agency and her total annual hours of work is greater than 1400. For equation (E6), another probit equation, the dependent variable, TNSORPT, is set = 0 if the nurse works exclusively for an agency, and

set = 1 if she does not work for an agency and her total annual hours of work is greater than 0 and less than or equal to 1400.

Equation (E7), the participation equation, uses only nurses who do not work for agencies (whether they work or not). The dependent variable, HOURS012 is set = 0 if the nurse does not work, set = 1 if total annual hours of work is greater than 0 and less than or equal to 1400, and set = 2 if total annual hours is greater than 1400. The dependent variable in the pooled wage equation (E8) is WAGE PER HOUR. For equation (E9), the reduced-form participation equation, the dependent variable is HOURS012.

The nine equation system was estimated for each of the three years of the survey, using the variables described. Any observation which had a response that was used as a variable (or a response that was used to create a variable) coded as unknown or refused, was deleted from the sample. Any observation for which the TOTAL HOURS value was greater than 4000 was deleted from the sample. Any observation for which WAGE PER HOUR was less than \$1 or greater than \$60 was deleted from the sample.