

**THE SUPPLY OF LABOR TO
FULL-TIME AND PART-TIME NURSING**

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ABSTRACT

A model incorporating a discrete full-time/part-time/do not work labor choice and decomposing labor supply into its full-time and part-time components was used to examine the increase in labor supplied by nurses (the increase *per nurse* on average) over the 1977-88 period. Both full-time and part-time supply increased. Full-time supply increased because the percentage of nurses who chose to work full-time increased (full-time hours worked, conditional on working full-time, stayed the same). Conversely, part-time supply increased because part-time hours worked, conditional on working part-time, increased (the percentage of nurses who chose to work part-time stayed the same).

I. INTRODUCTION

Two major changes that have occurred in the United States labor force over the past twenty years have been the increase in the labor force participation rate of women and the increase in the number and percentage of people working part-time^{1,2}. The nursing profession is ideal for studying both increases.

The nursing labor force is approximately 97 percent female and has historically had high percentages of women³. Nursing employers, mainly hospitals and temporary nursing agencies, provide nurses with a great many opportunities to either work less than forty hours a week or to work some weeks and not others. Part-time and full-time nursing are essentially homogeneous commodities, since no significant differences exist in the functions performed by part-time and full-time nurses. Nursing is a regulated profession, with highly-skilled part-time workers. In contrast, most other industries employ part-time labor which is unskilled and moves to different firms and locations often. "Involuntary" part-time employment, which has increased rapidly in many industries over the past fifteen years, is absent in the nursing profession⁴.

The labor supply of registered nurses has increased over the past twenty years due to two factors. Both the overall nursing population and the amount of labor being supplied by that population increased⁵. In other words, the number of registered nurses increased, and in addition, each nurse on average supplied more hours. The average nurse supplied fifteen percent more labor by the late 1980's than did the average nurse in the mid-1970's.

The analysis of nursing labor supply presented in this paper uses four large cross-section surveys of registered nurses taken in the years 1977, 1980, 1984 and 1988 (National Sample Survey of Registered Nurses) and examines the second factor in the increase - the increase in

participation and hours worked by the population over the 1977 to 1988 period (not the increase in the overall nursing population).

Nursing labor supply is examined under the stipulation that nurses make the single, discrete choice (1) not to work, (2) to work part-time, or (3) to work full-time. The labor supply choice is estimated using an ordered-probit model, and full-time and part-time hours and wage equations are estimated. The system of equations decomposes the increase in labor supply into its full-time and part-time components.

The results of the analysis with regard to both labor supply and the full-time/part-time decomposition are informative. Four factors largely explain the increase in participation and hours worked over the period. First, factors which had a negative effect on participation in 1977 were less of a deterrent to participation in later periods. The decrease in the negative effect of preschool children (0-6 years old) in the household and children (0-18 years old) in the household accounted for about 45 percent of the increase in average labor supplied over the period. In addition, marriage, which had no effect on participation in 1977, had a positive effect in the 1980's. Second, education levels went up over the period. Wages increased with the level of education. Wages have a positive effect on both participation and on the number of full-time hours supplied if the nurse has decided to work full-time. So the increase in education led to higher wages and consequently to greater participation and hours worked. Third, wage elasticities increased over the period, so that higher wages had an even greater positive impact on total hours to labor supply. Fourth, characteristics of the nursing population in addition to education and wages changed over the period and were partially responsible for the increase.

Looking at the part-time/full-time decomposition, the supply of labor to both full-time and

part-time nursing increased over the 1977 to 1988 period. The increases, however, were for different reasons. The percentage of nurses who were working full-time increased dramatically, and this increase was offset by a decrease in the percentage of nurses who were not working. The percentage of nurses working part-time stayed constant over the period. With regard to hours worked, conditional on deciding to work full-time, the number of hours worked stayed about the same. However, conditional on working part-time, hours worked increased.

Thus, the supply of labor to full-time nursing increased because the percentage of the nursing population working full-time increased, not because hours worked, once they decided to work full-time, increased. A higher percentage of nurses were participating, and it was full-time. The main reason for the increase in the participation rate was that the presence of children in the household became less of a deterrent to full-time participation.

In contrast, the supply of labor to part-time nursing increased, not because the percentage of the nursing population working part-time increased, but because hours worked, once they decided to work part-time, increased.

The results with regard to full-time and part-time labor supply are broadly consistent with what occurred in the economy in general. The participation rate of women, as mentioned above, increased between the mid-1970's and late 1980's. The percentage of women working part-time did not change much over the period. It was the part-time participation rate of men that increased substantially. The increase in the part-time rate of men is responsible for the general trend in the economy toward greater part-time employment⁶.

The paper is divided into four sections. Section one provides information about the nursing industry. Section two presents the econometric model and the rationale behind its

construction, and then presents the data. Section three discusses the results of the analysis, in particular decompositions which provide insight into the labor supply changes that occurred over the period. Section four is a brief summary.

II. THE NURSING PROFESSION

A. Use of Part-Time Workers

Employers of nurses have a part-time work force in addition to their full-time staff. Part-time workers give employers more flexibility over scheduling and hours. The part-time work force consists of three types of workers. One group is hired by the hospital to work a set, steady number of hours each week. The group functions essentially like full-time employees, working regular but fewer hours.

A second group is hired by employers from agencies, usually referred to as temporary nursing services or supplemental staffing agencies. These nurses work for an agency or a number of agencies, and work a variable number of hours per week, if in fact they choose to work at all in a given week. They have greater flexibility than do their part-time counterparts who work a regular, set number of hours. Agency nurses are on call to work, specifying to the agency what is their preferred part of the day or week to work. They have the option to accept or reject assignments as they are notified.

Nurses who work for these temporary services are used predominantly by hospitals and

other employers to fill in on short notice for either unanticipated increases in demand or because nurses scheduled to work are unable to do so. Employers have relied more heavily on temporary nurses services in the past few years^{7,8}.

The third group used by employers also work a variable number of hours per week. The group is referred to as an in-house per-diem pool. Pools were created in response to the lack of control when they using temporary nursing services, and possibly because of the high cost of using these services^{9,10}. The in-house per-diem pool is simply a pool of nurses hired by employers who are on call and available to work, but with the option to accept or reject an assignment. As with temporary nursing service nurses, they are used when unforeseen contingencies occur.

It can be difficult to keep an in-house per-diem pool, because the pool must have enough nurses to be reliable source for contingencies. Attracting many nurses to work exclusively for the employer on an on-call basis is difficult, especially if the employer does not use very many nurses in general, like a small hospital or nursing home. In some cases, hospitals have responded to the difficulty by forming joint pools with other hospitals. The nurses in the pool then work for a number of different hospitals.

Another factor to take account of is the effect that the change by Medicare and Medicaid from a retrospective to a prospective reimbursement system has had on nursing. About half of hospital revenue comes from Medicare spending, while about 10% of revenue comes from Medicaid spending¹¹. The introduction of Diagnostic Related Groups (DRG's) has led hospitals to admit more intensely ill patients because they are paid a set fee for the service performed¹² and DRG regulation requires that each nursing hour be justified for billing purposes¹³.

Consequently, the mix of full-time and part-time nurses employed may have been altered because of the reimbursement change.

B. The Nursing Labor Force

The tables presented were constructed using data compiled from the National Sample Survey of Registered Nurses for the years 1977, 1980, 1984, and 1988. It is instructive to look at the breakdown in nursing employment between not working, working part-time, and working full-time. Table 1 presents the breakdown for the samples of registered nurses. The group not working is further broken down into those seeking and not seeking nursing employment.

[Table 1 here]

The percentage of registered nurses in the not working category fell by about 8.5% from 1977 to 1988. At the same time, the percentage working full-time increased by about the same percentage (9%) as the fall in the percentage not working. What is interesting is that the percentage working part-time over the period stayed basically the same. The result was robust over all definitions of part-time work. The stability in the part-time percentage was true regardless of whether part-time was defined as working less than 1,400 annual hours, less than 1,600 annual hours, or less than 1,800 annual hours, and regardless of whether total annual hours were determined by using hours for all jobs or just using hours from the primary job. The rise in the participation rate of nurses can be compared with that of women nationally. Table 1 presents participation rates both for women 16 and over and women between the ages of 24 and 64.

The distribution of hours per week for all registered nurses whether they were employed

or not is illustrated in Figure 1 for the years 1977 and 1988. The distribution of weeks per year stayed the same over the period with close to 90 percent of nurses who were employed working 48 weeks per year or greater.

[Figure 1 here]

A rough measure of the degree of homogeneity between full-time and part-time nursing employment is a comparison of the percentage of time full-time and part-time nurses spend working in specific areas. Table 2 presents averages for the percentages of a nurse's time spent performing seven different types of work during a usual work week for 1977 and 1988. The seven areas of work are (1) administration, (2) consultation with agencies and/or professionals, (3) direct patient care, (4) research, (5) supervision, (6) teaching nursing, and (7) other (all else).

[Table 2 here]

The breakdown between part-time and full-time employment (part-time employment is defined as 1,400 annual hours or less) is done for all nurses and also for the subset of nurses who are either staff nurses or charge nurses. The table shows that part-time nurses engage in more direct patient care than do full-time nurses. Full-time nurses on average spend more of their time in each of administration, consultation, teaching, and supervision. For staff nurses and charge nurses only, these differences between full-time and part-time nurses are smaller than for all nurses taken together.

A summary of demographic characteristics and education levels of the registered nurse population are presented in Table 3, which lists the percentages of nurses in each of a number of categories for the four years 1977, 1980, 1984, and 1988. The demographic characteristics have remained relatively constant over the period. Registered nurses are still both

overwhelmingly white and female. In addition, the percentages that are married, that have preschool children, and that have children under 18 have not varied much over the period.

[Table 3 here]

The stability of demographic characteristics is contrasted by a large change in what constitutes the highest education level attained by nurses. The highest degree attained is a diploma (usually a one-year program), associate's (usually a two-year program), bachelor's, or master's (or higher) degree. The percentage of nurses whose highest degree was a diploma degree fell from about 65% in 1977 to under 40% by 1988. At the same time, the percentage earning associate's degrees increased from 12% to 26% and percentage earning bachelor's degrees increased from 19% and 28%.

Figure 2 presents the mean starting salary and the mean maximum salary (in 1989 dollars) for staff nurses for the thirteen years from 1977 through 1989. The starting salary and the maximum salary are a good gauge of wage movements throughout the profession¹⁴. The gap between the starting salary and the maximum salary increased over the period, particularly during the last few years. The nursing profession has been historically characterized as one with low returns to experience, the usual explanation being that women left the workforce for extended periods during child-rearing years¹⁵. The increasing gap may indicate that wage compression is now less a characteristic of the nursing labor market than it once was.

[Figure 2 here]

III. MODEL CONSTRUCTION

The model assumes that a nurse first makes a single decision (1) not to work, (2) to work part-time, or (3) to work full-time. The trivariate choice has implications when considering how changes in wages affect the number of hours a nurse will ultimately choose to work.

The labor supply choice over these three possible options is modelled as an ordered-probit decision and is estimated using an ordered-probit model. Full-time and part-time hours and wage equations are estimated, correcting the missing wage problem and including the selectivity corrections implied by the ordered probit. The equations provide a decomposition of the increase in hours worked by nurses over the period into its full-time and part-time components.

A. Description of the Model

Instead of estimating a single hours equation, two hours equations are estimated: a full-time hours equation conditional on working full-time (E1) and a part-time hours equation conditional on working part-time (E2). Because of the endogeneity between hours and wages, the actual wage is not used as a regressor in the hours equations. A full-time wage equation (E3) is estimated to obtain a fitted full-time wage to be used in the full-time hours equation and a part-time wage equation (E4) is estimated to obtain a fitted part-time wage to be used in the part-time hours equation.

In order to determine the probability of each nurse being in each of the three categories ((1) not working, (2) working part-time, and (3) working full-time), an ordered-probit participation equation (E5) is estimated. 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 (E6).

All three wage equations (E3, E4, E6) will have inconsistent estimates if a traditional ordinary least squares approach is used because the wage equations are estimated using only those nurses who work. In order to correct for the bias, selectivity correction terms are constructed (Heckman, 1980). A reduced-form, ordered-probit, participation equation (E7) is estimated and the coefficients from the equation used to construct the correction terms. Seven equations thus make up the system:

$$(E1) \quad h_f = X_h \beta_{hf} + \hat{W}_f \delta_{hf} + H_f \Theta_{hf} + \varepsilon_{hf} \quad , \quad \varepsilon_{hf} \sim N(0,1) .$$

$$(E2) \quad h_p = X_h \beta_{hp} + \hat{W}_p \delta_{hp} + H_p \Theta_{hp} + \varepsilon_{hp} \quad , \quad \varepsilon_{hp} \sim N(0,1) .$$

X_h is the vector of variables affecting hours and is given in Table 4¹⁶. \hat{W}_f and \hat{W}_p are the fitted full-time and part-time wages for the nurse. H_f and H_p are the selectivity correction terms.

[Table 4 here]

$$(E3) \quad W_f = X_w \beta_{wf} + H_f \Theta_{wf} + \varepsilon_{wf} \quad , \quad \varepsilon_{wf} \sim N(0,1) .$$

$$(E4) \quad W_p = X_w \beta_{wp} + H_p \Theta_{wp} + \varepsilon_{wp} \quad , \quad \varepsilon_{wp} \sim N(0,1) ^{20} .$$

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

$$(E5) \quad h^* = X_h \alpha_{h^*} + \hat{W}_b \delta_b + \varepsilon_{h^*} \quad , \quad \varepsilon_{h^*} \sim N(0, \sigma_{h^*}) .$$

\hat{W}_b is the fitted wage for the nurse, obtained from the pooled wage equation (E6). 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 year¹⁷. 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 nurses.

The consistent coefficient estimates from equation (E5) are used to estimate, for each 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 single fitted wage used in (E5) 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:

$$(E6) \quad W_b = X_w \beta_{wb} + D_{\text{full}} \Gamma_{\text{full}} + H_b \Theta_{wb} + \varepsilon_{wb}, \quad \varepsilon_{wb} \sim N(0,1).$$

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_f if the nurse works full-time and equals H_p if the nurse works part-time. To obtain estimated coefficients to construct the selectivity correction terms, the reduced-form ordered-probit equation is run:

$$(E7) \quad h^{**} = X_h \alpha_{h^{**}} + X_w \alpha_{w^{**}} + \varepsilon_{h^{**}}, \quad \varepsilon_{h^{**}} \sim N(0,1).$$

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

$$H_f = \frac{\phi(X_* \alpha_* - T)}{1 - \Phi(T - X_* \alpha_*)}, \text{ the denominator is the probability of working full-time.}$$

$$H_p = \frac{\phi(-X_* \alpha_*) - \phi(X_* \alpha_* - T)}{\Phi(T - X_* \alpha_*) - \Phi(-X_* \alpha_*)}, \text{ the denominator is the probability of working part-time.}$$

Expected hours for each nurse are calculated using the consistent estimates for probabilities and hours: $E(\text{hours}) = [P(\text{Not Work}) * E(\text{hours} | \text{Not Work})] + [(P(\text{Part-Time}) * E(\text{hours} | \text{Part-Time}))] + [(P(\text{Full-Time}) * E(\text{hours} | \text{Full-Time}))]$. Since the first term is equal to 0, expected hours is: $E(\text{hours}) = [P(\text{Part-Time}) * \hat{h}_p] + [P(\text{Full-Time}) * \hat{h}_f]$.

The effects of increasing or decreasing wages on expected hours can be measured by

increasing or decreasing each nurse's set of three fitted wages, \hat{W}_f , \hat{W}_p , and \hat{W}_b , by a given percentage. Changing \hat{W}_f will change \hat{h}_f , changing \hat{W}_p will change \hat{h}_p , and changing \hat{W}_b will change P(Part-Time) and P(Full-Time). The elasticity is constructed using the mean values of expected hours for the sample. The wage elasticity is the percentage increase in the mean value due to the wage increase, divided by the percentage increase in the wage.

B. The Data

The data sets used in the analysis are four National Sample Surveys of Registered Nurses (a series of four 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 December 1977, November 1980, November 1984, and March 1988 by means of a mail questionnaire or telephone interview.

The eligible population for the surveys consisted of all people who had a current license (or licenses) 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. In 1977, 20,400 questionnaires were mailed out and the response rate was 82.2%. In 1980 the numbers were 38,800 and 79.0%, in 1984, 40,000 and 80.0%, and in 1988, 42,300 and 80.7%.

All of the dependent variables and most of the independent variables used in the seven equations were derived from responses to the questions from the National Sample Surveys of Registered Nurses. The description of the vector of variables which affect hours worked, the description of the vector of variables which effect wages, and discussion of variable construction in each of the seven equations is presented in Appendix A.

IV. THE RESULTS

The system of equations was estimated for each of 1988, 1984, 1980, and 1977. The basic regression results are presented in Tables 5 through 7. Tables 5 and 6 present the full-time (E1) and part-time (E2) hours equations, and Table 7 presents the ordered-probit participation equation (E5). The full-time (E3), part-time (E4), and pooled (E6) wage equations and the reduced-form ordered-probit participation equation (E7) are presented in Appendix B.

[Tables 5, 6, and 7 here]

The results suggest two reasons why a substantial rise in participation and hours worked was observed over the 1977 to 1988 period. Factors which had negative effects on participation in 1977 were less of a deterrent to participation as time went on — in particular, the presence of preschool children and the presence of children. The marriage coefficient actually went from no effect in 1977 to a positive effect in the latter half of the period.

In addition, education levels went up over the period, from the diploma degree (usually a one-year program) to associate's (usually two years) and bachelor's degrees. The increase in education resulted in higher wages. Wages have a positive affect on participation and on full-time hours conditional on working full-time. Hence the increase in education resulted in higher wages, and consequently in greater participation and hours.

A. Variables Affecting Labor Supply Over the Period

The presence of a preschool child in the household (CHILD UNDER 6) has a negative effect on participation which decreases over the period. A nurse is more likely to work despite

having preschool children in the mid-to-late 1980's than in 1977. It has a negative effect on both hours worked conditional on working part-time and hours worked conditional on working full-time in all but one case.

The presence of children in the household (CHILD UNDER 18) also has a negative effect on participation, though not nearly to the degree as preschool children. As with preschool children, the negative effect decreases over time. The effect is negative on hours conditional on working full-time, but *positive* on hours conditional on working part-time. A possibility for the positive effect on part-time hours may be that a nurse, if working part-time, is likely to be doing so to finance a specific item or items. A nurse with children should have more such items to finance than a nurse without children (for instance, future college education expenses). Hence once the decision is made to work part-time, she is inclined to work more part-time hours than a nurse without children.

Marriage (MARRIED) has basically no effect on participation in 1977 and a negative effect in 1980, but a positive effect in 1984 and 1988. The negative effect in the 1980 estimation may be because spousal income was not available as a variable, so that marriage picks up part of the spousal income effect. The effect of marriage is negative on hours conditional on working full-time, but less so over time. However, the effect is *positive* on hours conditional on working part-time, possibly for the same reason as that identified above for the presence of children in the household.

The coefficient on the fitted wage in the participation equation is positive, and appears stable over time, though it becomes more significant over time. The effect of the fitted full-time wage in the full-time hours equation is positive and generally increases over time. The effect

of the fitted part-time wage in the part-time hours equation is negative (with the exception of 1988). Again, a possible explanation for the negative coefficient is that nurses who are working part-time are doing so to make a specific amount of money (for instance to finance a college education). With a higher wage, the nurse would be more likely to work fewer hours, since she can reach the specific amount in fewer hours.

B. Wage Elasticities

Table 8 presents wage elasticities for each of the four years (both for the entire sample and for women only). The elasticities were estimated for a 10% increase in wage. Wage elasticities increased over the period, which is another reason why the supply of labor increased from 1977 to 1988. Wages increased over the period, which *combined with the increase in wage elasticity*, led to a substantial rise in labor supply. The actual elasticity measures were 0.23 in 1977, 0.33 in 1980, 0.54 in 1984, and 0.41 in 1988 (for the entire sample).

[Table 8 here]

C. Full-time/Part-time Decomposition Over the Period

The mean value of expected hours for the sample increases by 15.14% over the 1977 to 1988 period. The mean value increases by 6.85% from 1977 to 1980, by 3.19% from 1980 to 1984, and by 4.43% from 1984 to 1988. Table 9 presents a breakdown of each of the components of expected hours.

[Table 9 here]

The mean values of both expected part-time hours and expected full-time hours increased from 1977 to 1988 - part-time by 2.80% and full-time by 17.04%. But the increases were for

different reasons. Part-time increased because expected hours conditional on working part-time increased, not because the probability of working part-time increased. Expected hours conditional on working part-time increased by 5.64%, while the probability of working part-time actually *decreased* by 1.46%. On the other hand, the full-time value increased not because expected hours conditional on working full-time increased, but because the probability of working full-time increased. The probability of working full-time increased by 18.31%, while expected hours conditional on working full-time time actually *decreased* by 1.77%.

The decomposition illustrates what occurred in the nursing labor market over the 1977 to 1988 period. Part-time labor supply increased because those nurses who chose to work part-time were putting in more part-time hours, not because a greater percentage of nurses were choosing to work part-time. Full-time labor supply increased because a greater percentage of nurses were choosing to work full-time, not because those nurses who chose to work full-time were putting in more full-time hours.

D. Coefficients/Characteristics Decomposition Over the Period

The reasons for the increase in labor supply over the 1977 to 1988 period involve, of course, both changes in coefficients and in the nurse population characteristics. The major coefficient changes are that the presence of a preschool child and the presence of a child in a household became less of a deterrent to participation over the period, and that marriage went from having essentially no effect on participation in 1977 to a positive effect in 1988. The major characteristic change in the population was the increase in education levels.

To measure the extent of the impact that the shift in the characteristics of the population

had on the increase in labor supply over the period, expected hours were estimated for the 1988 sample using the estimated coefficients from 1977 and for the 1977 sample using the estimated coefficients from 1988. The mean of expected hours for the 1988 sample using 1977 coefficients was 4.0% higher (1320 hours) than for the 1977 sample itself (1270 hours). The mean of expected hours for the 1977 sample using 1988 coefficients was 6.9% lower (1362 hours) than for the 1988 sample itself (1462 hours). The results indicate that a change in characteristics of the nursing population is partially responsible for the increase in labor supply.

A decomposition of the labor supply increase into the amount due to coefficient and characteristic changes can be accomplished using the following equation (Oaxaca 1973):

$$\begin{array}{rcl}
 [X_{88}\hat{\beta}_{88} - X_{77}\hat{\beta}_{77}] & = & [X_{88}(\hat{\beta}_{88} - \hat{\beta}_{77})] \quad + \quad [(X_{88} - X_{77})\hat{\beta}_{77}] \\
 \text{Total Effect} & = & \text{Effect of change} \quad + \quad \text{Effect of change} \\
 & & \text{in the coefficients} \quad \quad \quad \text{in the characteristics}
 \end{array}$$

The change in the characteristics explain 26.34% of the increase. The increase in labor supply due to education levels increasing and consequently to wages increasing would be part of the 26.34% (as would the fact that wage elasticities increased). The change in the coefficients explain the other 73.66%.

To measure the extent changes in the coefficients for the three most important factors - preschool children, children, and marriage - had on the increase in labor supply, a comparison was made using the estimates of expected hours for the 1977 and 1988 samples. Expected hours were estimated for the 1977 sample using the 1977 coefficients for all variables except the presence of preschool children in the household (CHILD UNDER 6) in which case the 1988 coefficients were used. The change in the preschool children coefficients explained 3.82% of the

increase in expected hours between 1977 and 1988. Expected hours were then estimated for the 1988 sample using the 1988 coefficients for all variables except the presence of preschool children in the household (CHILD UNDER 6) in which case the 1977 coefficients were used. The change in the preschool children coefficients explained 2.15% of the increase in expected hours between 1977 and 1988.

The same two procedures were carried out for both children (CHILD UNDER 18) and whether or not the nurse is married (MARRIED). The change in the children coefficients explained a very large 43.99% of the increase in expected hours between 1977 and 1988 when using the 1977 sample and 41.49% when using the 1988 sample. The change in the marriage coefficients explained, respectively, 28.31% and 24.70% of the increase.

Taken together, the changes in the coefficients for the presence of preschool children, the presence of children, and marriage account for 74.34% of the increase in expected hours between 1977 and 1988 when using the 1977 sample, and account for 70.92% of the increase when using the 1988 sample. Since the effect of the change in all of the coefficients using the 1988 sample, $[X_{88}(\beta_{88} - \beta_{77})]$, accounted for 73.66% of the increase, changes in the preschool children, children, and marriage coefficients account for almost all of the increase due to coefficient changes.

E. Effect of Demographic Characteristics Changes on Labor Supply

The impact of the presence of children on labor supply is illustrated by examining the changes to labor supply caused by adding a preschool child to the household of each nurse and by adding a child to the household of each nurse. Both exercises provide further evidence that

the decrease over time in the negative effects preschool children and children had on participation was a major reason for the increase in nursing labor supply over the period. The results of the analysis are presented in Table 10. The change in the mean value of expected hours due to changes in the demographic characteristics was used to measure the effect each of the demographic characteristics had on labor supply.

[Table 10 here]

In the first case a preschool child is added to the household of each nurse and the effect on expected hours is measured¹⁹. For each of the four years, adding a preschool child to the household of each nurse decreases the mean value of expected hours significantly (by 24.58% in 1977, 22.92% in 1980, 17.21% in 1984, and 18.08% in 1988 (see Table 10)). Looking at the breakdown, expected part-time hours increase somewhat while expected full-time hours *decrease substantially*. Since expected full-time hours conditional on working full-time and part-time hours conditional on working part-time both change very little, changes in the probabilities of being in the three work categories are responsible for the overall decrease in expected hours. The probability of working full-time *decreases* by at least 20% in each of the years, while the probabilities of both working part-time and not working increase (in the case of not working by at least 50% in each of the years). Preschool children cause less of a fall in expected hours in the latter half of the period (1984 and 1988) as compared with the earlier half (1977 and 1980), primarily because the decrease in the probability of working full time is smaller over time.

The analysis was carried out in an analogous manner for the case of the presence of children in the household (CHILD UNDER 18). The percentage changes are less extreme than those for adding a preschool child. Adding a child to the household of each nurse decreases the

mean value of expected hours by 6.39% in 1977, 5.87% in 1980, 2.32% in 1984, and 0.94% in 1988 (see Table 10). Children cause less of a fall in expected hours over time and the decrease is negligible by 1988. The decrease in the probability of working full-time due to adding a child was almost 8% in 1977 but under 1% in 1988.

V. SUMMARY

Under the stipulation that nurses make the single, discrete choice (1) not to work, (2) to work part-time or (3) to work full-time, labor supply was examined using a random sample of nurses in each of four years (1977, 1980, 1984, and 1988). The analysis explained the increase in total hours supplied per nurse over the 1977-1988 period and decomposed the increase into its full-time and part-time components. There were four main reasons for the increase.

First, factors which had negative effects on participation in 1977 were less of a deterrent to participation as time went on — specifically, the presence of preschool children in the household and the presence of children in the household. Marriage actually went from having a negative effect to a positive one. Second, education levels went up over the period. Wages increased with the level of education. Wages have a positive effect on participation and full-time hours. Thus, the increase in education led to higher wages and consequently to greater participation and hours. Third, wage elasticities increased over the period, so that higher wages had an even greater positive impact on total hours to labor supply. Fourth, characteristics of the

nursing population in addition to education and wages changed over the period and were partially responsible for the increase.

The full-time/part-time decomposition informed that over the period, the nursing labor market was characterized by increases in both part-time and full-time supply. The increases were for different reasons however. The supply of labor to part-time nursing increased because hours worked conditional on working part-time increased, not because the percentage of nurses working part-time increased. The supply of labor to full-time nursing increased not because hours worked conditional on working full-time increased, but because the percentage of nurses working full-time increased.

TABLE 1: PERCENTAGE OF REGISTERED NURSES WORKING FULL-TIME, PART-TIME, OR NOT AT ALL AND COMPARISON WITH THE NATIONAL FEMALE LABOR FORCE PARTICIPATION RATE, 1977, 1980, 1984, AND 1988

	1977	1980	1984	1988
Not Working:	27.49	23.80	19.61	18.93
Seeking Work as a Nurse	2.86	2.07	1.99	1.52
Not Seeking Work as a Nurse	24.63	21.73	17.62	17.41
Working:	72.51	76.20	80.39	81.07
Part-Time	19.21	20.06	20.05	18.79
Full-Time	53.30	56.14	60.34	62.29
National Female Labor Force Participation Rate:				
Age 16 and Over	48.0	51.1	53.2	55.9
Age 25 to 64	55.2	59.5	63.7	67.1

Part-Time is defined as working less than 1,400 hours per year.

TABLE 2: PERCENTAGE OF TIME NURSES SPENT WORKING
 IN SPECIFIC AREAS IN A USUAL WORK WEEK
 BY PART-TIME AND FULL-TIME, 1977 AND 1988

	1977 Part-Time	1977 Full-time	1988 Part-Time	1988 Full-Time
All Nurses:				
Administration	3.80	10.13	5.00	12.06
Consultation	3.87	6.03	5.08	6.71
Direct Patient Care	72.08	55.01	75.93	61.24
Research	1.06	1.60	1.08	1.69
Supervision	11.62	17.87	8.03	12.61
Teaching Nursing	5.97	7.23	4.49	5.26
Other	1.71	2.22	0.37	0.38
	100.00	100.00	100.00	100.00
	1977 Part-Time	1977 Full-time	1988 Part-Time	1988 Full-Time
Staff Nurses:				
Administration	2.42	3.84	2.48	3.38
Consultation	2.56	3.98	3.39	4.29
Direct Patient Care	80.51	74.00	85.62	80.56
Research	0.69	1.04	0.64	0.87
Supervision	10.91	13.00	6.41	8.55
Teaching Nursing	1.34	1.48	1.33	2.25
Other	1.59	1.79	0.09	0.06
	100.00	100.00	100.00	100.00

TABLE 3: PERCENTAGE OF NURSES IN VARIOUS
 DEMOGRAPHIC AND EDUCATION CATEGORIES,
 1977, 1980, 1984, AND 1988

Demographic Categories:	1977	1980	1984	1988
Female	98.07	97.24	96.80	96.43
White	94.41	93.89	92.90	93.44
Married	73.63	73.62	71.15	72.08
With Children Under 6	22.66	22.61	24.46	22.55
With Children Under 18	52.93	56.60	57.14	55.90
Education Categories	1977	1980	1984	1988
Diploma Degree	64.68	53.36	43.64	39.15
Associate's Degree	12.01	18.38	23.61	26.20
Bachelor's Degree	19.08	23.28	26.83	28.44
Master's Degree or Higher	4.23	4.98	5.97	6.21
	100.00	100.00	100.00	100.00
Comparison With Female Population:	1977	1980	1984	1988
White	87.93	87.64	87.28	86.97
Married	65.3	63.0	60.8	60.4

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
PROSPECTIVE PAYMENT
UNEMPLOYMENT RATE
RESIDE IN SMSA

TABLE 5: FULL-TIME HOURS EQUATION (OLS)
 RESULTS FOR 1988, 1984, 1980, 1977
 (Standard Errors in Parentheses)

Dependent Variable: Total Annual Hours of Work

	1988	1984	1980	1977
CHILD UNDER 6	-36.5 (12.1)	-22.6 (11.4)	-32.0 (13.6)	-14.6 (15.0)
CHILD UNDER 18	-16.4 (5.9)	-20.3 (6.0)	-25.5 (7.9)	-20.9 (8.9)
MARRIED	-23.0 (7.3)	-22.0 (6.4)	-13.6 (8.1)	-28.1 (7.8)
Spouse Income (Thousands)	-1.4 (0.4)	-1.3 (0.4)		-1.0 (0.7)
White	-48.4 (9.2)	-19.0 (8.4)	-3.3 (10.5)	-11.5 (12.0)
Age	10.5 (3.7)	7.8 (3.3)	7.0 (2.9)	7.2 (4.1)
Age Squared	-0.12 (0.05)	-0.09 (0.04)	-9.06 (0.04)	-0.07 (0.05)
Years Since Graduation	-2.0 (1.4)	-2.6 (1.4)	-2.5 (1.4)	-4.6 (1.8)
Years Since Graduation Squared	-0.02 (0.03)	0.004 (0.033)	0.03 (0.03)	0.08 (0.05)
FITTED FULL-TIME WAGE	9.5 (2.5)	11.5 (2.9)	1.2 (3.4)	3.1 (4.9)
Selectivity Correction Term	41.6 (35.9)	19.2 (34.4)	-91.9 (34.4)	-41.5 (31.6)
Observations	18873	16076	14459	7253
R Squared	0.021	0.021	0.015	0.027
Corrected R Squared	0.020	0.021	0.014	0.026
Standard Error	312.6	272.0	267.1	233.8
Mean Dependent Variable	2051.3	2037.2	2046.8	2029.9

TABLE 6: PART-TIME HOURS EQUATION (OLS)
RESULTS FOR 1988, 1984, 1980, 1977
(Standard Errors in Parentheses)

Dependent Variable: Total Annual Hours of Work

	1988	1984	1980	1977
CHILD UNDER 6	-91.6 (26.7)	-13.3 (25.4)	-17.0 (27.3)	-46.2 (35.0)
CHILD UNDER 18	44.0 (13.1)	45.1 (14.6)	28.3 (18.4)	19.2 (24.3)
MARRIED	87.2 (16.1)	65.0 (16.9)	35.9 (31.3)	60.3 (26.1)
Spouse Income (Thousands)	-1.9 (0.7)	0.1 (0.8)		-1.3 (1.5)
White	50.0 (25.6)	-7.3 (28.3)	-45.0 (32.5)	-39.8 (44.1)
Age	32.4 (8.6)	14.9 (8.2)	22.6 (6.6)	11.1 (12.6)
Age Squared	-0.4 (0.1)	-0.17 (0.11)	-0.27 (0.08)	-0.14 (0.16)
Years Since Graduation	-9.1 (2.8)	-7.6 (3.0)	-8.0 (3.2)	-5.0 (5.3)
Years Since Graduation Squared	0.17 (0.07)	0.22 (0.07)	0.23 (0.07)	0.14 (0.14)
FITTED PART-TIME WAGE	1.3 (4.1)	-9.7 (5.3)	-16.5 (5.4)	-5.2 (7.2)
Selectivity Correction Term	-37.0 (43.9)	-154.9 (42.7)	-80.0 (40.9)	-74.7 (46.0)
Observations	5648	5344	5104	2605
R Squared	0.086	0.058	0.020	0.037
Corrected R Squared	0.084	0.056	0.018	0.033
Standard Error	314.6	317.6	326.9	324.5
Mean Dependent Variable	946.7	945.6	917.8	905.3

TABLE 7: PARTICIPATION EQUATION (ORDERED PROBIT)
RESULTS FOR 1988, 1984, 1980, 1977
(Standard Errors in Parentheses)

Dependent Variable: Not Work/Part-Time/Full-Time

	1988	1984	1980	1977
CHILD UNDER 6	-0.566 (0.022)	-0.528 (0.023)	-0.599 (0.023)	-0.657 (0.032)
CHILD UNDER 18	-0.062 (0.020)	-0.122 (0.021)	-0.264 (0.022)	-0.298 (0.031)
MARRIED	0.105 (0.022)	0.043 (0.023)	-0.352 (0.032)	0.0013 (0.0337)
Spouse Income (Thousands)	-0.0158 (0.0003)	-0.0190 (0.0004)		-0.0317 (0.0009)
White	-0.251 (0.035)	-0.193 (0.035)	-0.356 (0.037)	-0.399 (0.053)
Age	0.154 (0.008)	0.132 (0.009)	0.089 (0.008)	0.150 (0.013)
Age Squared	-0.0021 (0.0002)	-0.0018 (0.0001)	-0.0012 (0.0001)	-0.0019 (0.0002)
Years Since Graduation	-0.054 (0.004)	-0.052 (0.004)	-0.059 (0.004)	-0.057 (0.007)
Years Since Graduation Squared	0.0009 (0.0001)	0.0008 (0.0001)	0.0008 (0.0001)	0.0007 (0.0002)
FITTED WAGE	0.076 (0.007)	0.111 (0.008)	0.078 (0.010)	0.071 (0.017)
Observations	29844	26679	25771	13608
% Correctly Predicted	68.8	66.3	59.05	64.17

TABLE 8: WAGE ELASTICITIES CALCULATED FOR
A TEN PERCENT INCREASE IN WAGE
1977, 1980, 1984, 1988

	Entire Sample	Women Only
1977	0.2287	0.2100
1980	0.3311	0.3154
1984	0.5442	0.5234
1988	0.4108	0.3970

TABLE 9: PERCENTAGE CHANGES IN THE MEAN VALUES
OF THE COMPONENTS OF THE EXPECTED HOURS EQUATION
OVER VARIOUS PERIODS

	1977-1988	1977-1980	1980-1984	1984-1988
E(Hours)	15.14	6.85	3.19	4.43
E(Part-Time Hours)	2.80	2.96	-0.36	0.21
E(Full-Time Hours)	17.04	7.45	3.71	5.03
Prob(Not Working)	-35.04	-11.51	-19.14	-9.20
Prob(Part-Time)	-1.46	2.65	1.71	-5.62
Prob(Full-Time)	18.31	4.89	7.60	4.82
E(Hours Part-Time)	5.64	-0.12	-2.79	8.80
E(Hours Full-Time)	-1.77	2.87	-4.55	0.03

TABLE 10: PERCENTAGE CHANGES IN THE MEAN VALUES OF THE COMPONENTS OF THE EXPECTED HOURS EQUATION FOR VARIOUS CHANGES IN DEMOGRAPHIC CHARACTERISTICS, 1977, 1980, 1984, 1988

Preschool Child Added:	1977	1980	1984	1988
E(Hours)	-24.58	-22.92	-17.21	-18.08
E(Part-Time Hours)	5.65	8.08	14.82	12.56
E(Full-Time Hours)	-29.25	-27.50	-21.76	-22.24
Prob(Not Working)	51.73	58.08	49.55	55.46
Prob(Part-Time)	9.62	9.95	15.81	19.55
Prob(Full-Time)	-29.70	-28.36	-21.18	-21.29
E(Hours Part-Time)	-4.04	-1.49	0.03	-7.55
E(Hours Full-Time)	0.55	1.18	-0.90	-1.40
Child Added:	1977	1980	1984	1988
E(Hours)	-6.39	-5.87	-2.32	-0.94
E(Part-Time Hours)	5.59	5.54	4.49	3.26
E(Full-Time Hours)	-8.24	-7.56	-3.29	-1.51
Prob(Not Working)	12.00	12.75	5.87	2.86
Prob(Part-Time)	4.57	4.45	2.69	1.25
Prob(Full-Time)	-7.73	-7.02	-2.78	-1.17
E(Hours Part-Time)	1.03	1.39	2.25	2.05
E(Hours Full-Time)	-0.48	-0.52	-0.52	-0.36

FOOTNOTES

1. Female labor force as a percentage of female population increased from 46% in 1975 to 56% in 1988 for the population 16 years old and older, and increased from 52.3% in 1975 to 67.1% in 1988 for the population between 25 and 64 years of age. From the Statistical Abstract 1990.
2. The percentage of the work force employed part-time increased from 15.9% to 17.2%. From the Statistical Abstract, 1992.
3. "One More Time — Solutions to the Nursing Shortage," Theodore Helmer and Patricia McKnight, *Journal of Nursing Administration*, November 1988.
4. "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.
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10. "Supplemental Staffing: Can it be Cost-Effective?," Donald Thompson, *Hospitals*, March 1981.
11. Interview with David Cutler.
12. Greiner, 1988, pp. 29, 41.
13. Greiner, 1988, p. 41.
14. "What Does a BS Degree Buy? An Economist's View," Charles Link, *American Journal of Nursing*, December 1987 and Greiner, 1988, p. 39. "The Shortage of Hospital Nurses: A New Perspective," Linda Aiken, Robert Blendon, David Rogers, *American Journal of Nursing*, September 1981, p. 1616.
15. The figures came from the Annual Salary Update issues of the *American Journal of Nursing*. The journal reported the source of the salary figures as the annual National Survey of Hospital and Medical School Salaries (which is carried out by the University of Texas Medical Branch in Galveston, Texas).
16. 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.
17. 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.
18. The procedure was done by setting the CHILD UNDER 6 dummy variable equal to one for all respondents and using the previously estimated coefficients for that year to measure the new level of predicted hours. The approach actually gave each nurse in the sample *the mean*

number of preschool children conditional on having preschool children rather than actually adding one preschool child. The analysis actually measures the change in expected hours that occur when each nurse in the sample is given the mean number of preschool children conditional on having preschool children.

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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 5). 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 5). The vector contains variables related to both wage supply and wage demand. It contains the following thirteen variables, eight related to supply and five 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.

(12) UNEMPLOYMENT RATE: Set equal to the unemployment rate in the state in which the nurse works (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.

(13) PROSPECTIVE: Set = 1 if the nurse works in a state whose basic method of hospital inpatient Medicaid reimbursement is a prospective payment system, rather than some method of payment which is retrospective, and set = 0 otherwise. This variable is not used the 1977 and 1980 analyses because no states were using a prospective payment system at that time. The source of the 1988 values was the *Medicaid Source Book: Background Data and Analysis* (November 1988). The source of the 1984 values was *Health Care Financing Program Statistics, Analysis of State Medicaid Program Characteristics*, 1984 (August 1985).

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 (E2) is TOTAL HOURS. The total annual hours figure (the variable TOTAL HOURS) is arrived at 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 (E3) and in the part-time wage equation (E4) 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 (E5), the participation equation, 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 (E6) is WAGE PER HOUR. For equation (E7), the reduced-form participation equation, the dependent variable is HOURS012.

The seven equation system was estimated for each of the four 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.

APPENDIX B: RESULTS OF EQUATIONS (E3), (E4), (E6) AND (E7)

TABLE B1: FULL-TIME WAGE EQUATION (OLS)
RESULTS FOR 1988, 1984, 1980, 1977
(Standard Errors in Parentheses)

	Dependent Variable: Wage Per Hour			
	1988	1984	1980	1977
White	-0.57 (0.09)	-0.38 (0.08)	-0.22 (0.08)	-0.29 (0.07)
Age	0.001 (0.029)	0.01 (0.03)	0.05 (0.02)	0.02 (0.02)
Age Squared	-0.00004 (0.00040)	-0.00004 (0.00030)	-0.00045 (0.00020)	-0.0001 (0.0003)
Years Since Graduation	0.21 (0.01)	0.20 (0.01)	0.11 (0.01)	0.09 (0.01)
Years Since Graduation Squared	-0.0040 (0.0003)	-0.0038 (0.0003)	-0.0019 (0.0002)	-0.0018 (0.0003)
Associate	0.25 (0.08)	0.25 (0.07)	0.16 (0.07)	0.11 (0.07)
Bachelor	0.96 (0.07)	0.81 (0.06)	0.66 (0.05)	0.65 (0.05)
Masters	3.22 (0.11)	2.87 (0.10)	2.47 (0.09)	2.34 (0.09)
California	3.00 (0.12)	2.17 (0.11)	1.32 (0.10)	0.51 (0.10)
Northeast	0.84 (0.08)	-0.21 (0.06)	-0.28 (0.05)	-0.31 (0.06)
Prospective Payment	0.66 (0.09)	0.05 (0.05)		
Unemployment Rate	0.076 (0.016)	0.043 (0.011)	0.066 (0.013)	0.138 (0.015)
Reside in SMSA		1.08 (0.05)	0.69 (0.05)	
Selectivity Correction Term	-0.36 (0.12)	-0.06 (0.10)	-0.42 (0.11)	-0.17 (0.07)
Observations	18873	16076	14459	7253
R Squared	0.147	0.179	0.146	0.170
Corrected R Squared	0.146	0.178	0.145	0.169
Standard Error	3.491	2.869	2.440	1.639
Mean Dependent Variable	13.53	11.25	8.38	6.16

TABLE B2: PART-TIME WAGE EQUATION (OLS)
RESULTS FOR 1988, 1984, 1980, 1977
(Standard Errors in Parentheses)

	Dependent Variable: Wage Per Hour			
	1988	1984	1980	1977
White	-2.53 (0.43)	-4.13 (0.48)	-3.77 (0.57)	-1.75 (0.70)
Age	-0.28 (0.09)	-0.35 (0.10)	-0.05 (0.12)	-0.08 (0.19)
Age Squared	0.0032 (0.0011)	0.0045 (0.0013)	0.0003 (0.0015)	0.0009 (0.0025)
Years Since Graduation	0.12 (0.04)	0.18 (0.05)	0.063 (0.060)	0.056 (0.088)
Years Since Graduation Squared	-0.0027 (0.0011)	-0.0038 (0.0013)	0.0004 (0.0014)	-0.0001 (0.0025)
Associate	0.73 (0.24)	0.43 (0.28)	0.21 (0.35)	0.37 (0.43)
Bachelor	0.96 (0.20)	1.19 (0.24)	1.23 (0.27)	1.40 (0.32)
Masters	5.16 (0.38)	3.98 (0.47)	4.27 (0.56)	4.51 (0.66)
California	3.98 (0.38)	2.18 (0.46)	1.92 (0.56)	0.80 (0.64)
Northeast	0.89 (0.21)	-0.22 (0.22)	-0.45 (0.24)	-0.49 (0.32)
Prospective Payment	0.82 (0.25)	0.55 (0.21)		
Unemployment Rate	0.14 (0.05)	0.13 (0.05)	0.054 (0.062)	0.18 (0.09)
Reside in SMSA		0.90 (0.21)	0.40 (0.22)	
Selectivity Correction Term	-0.99 (0.15)	-1.20 (0.19)	-1.56 (0.32)	-0.23 (0.22)
Observations	5648	5344	5104	2605
R Squared	0.083	0.067	0.048	0.040
Corrected R Squared	0.081	0.064	0.045	0.036
Standard Error	5.757	6.600	7.173	5.748
Mean Dependent Variable	14.16	12.12	9.44	6.79

TABLE B3: POOLED WAGE EQUATION (OLS)
 RESULTS FOR 1988, 1984, 1980, 1977
 (Standard Errors in Parentheses)

	Dependent Variable: Wage Per Hour			
	1988	1984	1980	1977
White	-0.76 (0.10)	-0.85 (0.11)	-0.67 (0.12)	-0.46 (0.14)
Age	-0.083 (0.030)	-0.100 (0.032)	0.002 (0.030)	-0.001 (0.042)
Age Squared	0.0010 (0.0004)	-0.0014 (0.0004)	-0.00008 (0.00040)	0.0002 (0.0005)
Years Since Graduation	0.207 (0.013)	0.197 (0.015)	0.115 (0.015)	0.066 (0.021)
Years Since Graduation Squared	-0.0040 (0.0004)	-0.0038 (0.0004)	-0.0016 (0.0004)	-0.0011 (0.0006)
Associate	0.41 (0.08)	0.35 (0.09)	0.24 (0.10)	0.18 (0.12)
Bachelor	0.97 (0.07)	0.91 (0.08)	0.83 (0.08)	0.82 (0.09)
Masters	3.60 (0.12)	3.08 (0.12)	2.80 (0.14)	2.76 (0.16)
California	3.15 (0.13)	2.08 (0.14)	1.36 (0.15)	0.55 (0.17)
Northeast	0.84 (0.08)	-0.23 (0.07)	-0.35 (0.08)	-0.39 (0.10)
Prospective Payment	0.71 (0.09)	0.19 (0.06)		
Unemployment Rate	0.087 (0.018)	0.063 (0.014)	0.064 (0.019)	0.154 (0.026)
Reside in SMSA		1.00 (0.07)	0.57 (0.07)	
Work Full-Time (Dummy)	0.26 (0.11)	-0.08 (0.11)	0.06 (0.15)	-0.50 (0.11)
Selectivity Correction Term	-0.87 (0.09)	-0.85 (0.09)	-1.20 (0.13)	-0.26 (0.09)
Observations	24521	21420	19563	9848
R Squared	0.111	0.104	0.073	0.065
Corrected R Squared	0.111	0.103	0.072	0.063
Standard Error	4.150	4.156	4.244	3.280
Mean Dependent Variable	13.67	11.47	8.66	6.33

TABLE B4: PARTICIPATION EQUATION (ORDERED PROBIT)
RESULTS FOR 1988, 1984, 1980, 1977
(Standard Errors in Parentheses)

	Dependent Variable: Not Work/Part-Time/Full-Time			
	1988	1984	1980	1977
Child Under 6	-0.566 (0.022)	-0.528 (0.023)	-0.598 (0.023)	-0.656 (0.033)
Child Under 18	-0.056 (0.020)	-0.122 (0.022)	-0.263 (0.022)	-0.300 (0.031)
Married	0.100 (0.022)	0.034 (0.023)	-0.365 (0.032)	0.002 (0.036)
Spouse Income (Thousands)	-0.0158 (0.0003)	-0.0190 (0.0004)		-0.0316 (0.0009)
White	-0.297 (0.034)	-0.279 (0.034)	-0.406 (0.036)	-0.429 (0.052)
Age	0.147 (0.009)	0.118 (0.009)	0.088 (0.008)	0.152 (0.014)
Age Squared	-0.0020 (0.0001)	-0.0016 (0.0001)	-0.0012 (0.0001)	-0.0019 (0.0002)
Years Since Graduation	-0.040 (0.004)	-0.031 (0.004)	-0.052 (0.004)	-0.055 (0.007)
Years Since Graduation Squared	0.0006 (0.0001)	0.0004 (0.0001)	0.0007 (0.0001)	0.0007 (0.0002)
Associate	-0.042 (0.024)	-0.002 (0.025)	-0.018 (0.027)	0.001 (0.041)
Bachelor	0.015 (0.020)	0.027 (0.021)	-0.066 (0.021)	-0.007 (0.0300)
Masters	0.262 (0.034)	0.353 (0.036)	0.169 (0.038)	0.217 (0.057)
California	0.512 (0.044)	0.561 (0.047)	0.615 (0.048)	0.761 (0.072)
Northeast	-0.121 (0.021)	-0.136 (0.020)	-0.087 (0.019)	-0.014 (0.030)
Prospective Payment	-0.025 (0.025)	-0.070 (0.018)		
Unemployment Rate	0.0063 (0.0050)	-0.0016 (0.0039)	-0.0074 (0.0047)	-0.0354 (0.0083)
Reside in SMSA		0.055 (0.018)	0.014 (0.017)	
Observations	29844	26679	25771	13608
% Correctly Predicted	68.98	66.42	59.09	64.65