FACTORS AFFECTING THE LABOR SUPPLY FOR REGISTERED NURSES IN THE US

by

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ABSTRACT

Many countries, including the US have been facing a severe shortage of registered nurses (RNs) for a long time. Labor supply models for RNs have been estimated by marital status (for women) and gender for the 2004 and 2008 data from the National Sample Survey of Registered Nurses. This study is built on earlier work by Link and Chiha, which estimated labor supply models for 1992, 1996 and 2000 data from the same survey. The empirical literature on RN labor supply is brought together for the last forty years, because the methodology and variables used in the current analysis are similar to those used by Chiha and Link. Comparisons are made with other studies in the literature of the labor supply of females in the general population and nurses. The RNs (predicted) own wage had slight, but statistically insignificant effects on both participation in the labor force and hours per year, given participation. Consistency in results for the key variables over the different datasets and earlier work by Chiha and Link, has been found. These results are relevant to policy makers, who are concerned with the current nursing shortage.

Chapter 1

INTRODUCTION

Shortages in the labor market for RNs have existed in the U.S. since World War II. A considerable amount of economic research had been devoted to understanding the shortage and predicting the labor supply of nurses. In the late 1970's a national survey was implemented by the Department of Health and Human Services (DHHS) and the Health Resources and Services Administration (HRSA). Since its inception, this National Sample Survey of Registered Nurses (NSSRN) has provided greater understating of the shortage and better tools to predict the labor supply. Since the vast majority of nurses are women, this study examines the information if the nursing labor supply parallels the female labor supply.

The objective of this paper is to estimate labor supply models for registered nurses (RNs) in the United States. Specific data for this research has been taken from the 2004 and 2008 National Sample Survey of Registered Nurses (NSSRN), which is conducted every four years by the U.S. Department of Health and Human Services. State level market data is gathered from other sources. The same methodology and model specifications are employed as were used by Link, with some enhancements,

which were obtained from large micro datasets for 1960, 1970, 1977, 1980, 1984, and 1988. Comparisons will be made with other studies of RN labor supply in the U.S. The motive is to look for consistencies in key determinants of the labor supply of RNs in the U.S. over the period 1960 to 2008. Since increases in RN wages are potentially a major part of any policy proposal for alleviating RN shortages in the U.S. or abroad, including the current shortage, the own-wage is one of the key variables highlighted.

The HRSA identified many trends affecting the nursing population in its findings for the 2004 national sample survey. Many gains were made toward expanding the nursing population from 2000 to 2004. The HRSA indicated that the RN population has grown significantly from 2000 to 2004 (8 percent), after a slump in population growth from 1996 to 2000 (HRSA, 2004, p. 7). Also the participation rates increased from 81.7 to reach its highest level of 83.2 percent (HRSA, 2004 p. 7) and to the current highest of 88% as found in this study. The high level of participation observed in the 2004 NSSRN study corresponds with a substantial increase in real wages. According to the HRSA, the 14 percent increase in real wages from 2000 to 2004 is the largest increase in a four year period since the inception of the NSSRN studies (HRSA, 2004, p. 21).

The degree of the nursing shortages changes greatly over time as with many other economic phenomena. The RN vacancy rate from 1979 to 2006 varied between 4% and 14% (Long at al., 2008). The recent economic downturn has helped to slightly abate the current nursing shortage in the U.S., because fewer people seek medical care, but the shortages are still a major downside risk for the healthcare industry. These

shortages are of concern because RNs are the most prominent occupation in the healthcare field and provide direct assistance to physicians. Hospitals, specialty care clinics, nursing homes and research labs, just to name a few, depend on individuals with RN training. The number of vacancies in RN positions was approximately 135,000 in 2008 (ACCN, 2011), according to the American Healthcare Association. Because of the expected increased demand for healthcare from the aging American population, the current shortage is only expected to get worse.

Labor supply elasticities with respect to the RN wage are important in the context of nurse shortages. In the short term, the own wage can have at least two effects on the labor supply of currently trained nurses. Higher wages may prompt nurses who are currently out of the labor force to return to work. Wage increases may also induce nurses who are currently in the labor force to work more hours. Standard supply and demand analysis demonstrates that the more elastic the labor supply function with respect to changes in wages, the greater will be the increase in the labor supplied by RNs for a specific percentage change in wages. High wage elasticities indicate that policies increasing wages will be a relatively inexpensive way to increase the work effort from currently trained RNs. On the other hand, low wage elasticities indicate a small response, and large increases in wages are unlikely to cause significant increases in the labor supply of currently trained RNs. In the longer term, higher wages are likely to play an instrumental role in assuaging a nurse shortage by attracting additional people to the nursing profession. Estimates are provided for the effects of RN wages on the decision to participate in the nursing labor supply in the

U.S, in order to shed light on this longer term issue.

In the next section of the paper, a compilation of the relevant literature on nursing labor supply will be reviewed. Then the methodology will be discussed. Following the data and modeling discussion, the results and implications of the current analysis will be included in the final section of the paper.

Chapter 2

SURVEY OF RELEVANT LITERATURE

Given the long-lasting, dynamic shortage of registered nurses in the US, factors that affect this population's participation and number of hours to work are critical to policy makers. In examining the progression of labor economic empirical analysis, fundamental changes in the interpretation and estimation of wage and labor supply models have evolved. In his 1993 overview of empirical labor economics research, Heckman suggests that much of the earlier research in the 1960's and 1970's on labor economics was misleading. Heckman argued that earlier studies ignored a significant econometric problem of selection bias, which is prevalent in labor supply equations. Selection bias essentially is a problem of ignoring the unobserved reservation wages of non-workers and combining the decision to participate in the labor market with the decision to work a given number of hours. Early attempts at tackling this problem utilized the very restrictive Tobit model. However, the structural restrictions of Tobit yielded results which suggested a high level of income and wage sensitivity in models for hours worked and participation, particularly for married females. The implications of not correcting for selectivity manifest in overestimates of the responsiveness of the labor force to changes in wages and income. Thus, policy makers may overestimate the impact of raised wages on increasing the supply of labor if sample selectivity is not accounted for. In the last forty years, there has been considerable research on the topic. A survey of the

research is presented here.

Because of the unique nursing labor market, several factors were investigated which could have an impact on nursing wages. The influences of monopsony and unionization on nurses' salaries were estimated by Link and Landon (1975) using a linear model. The market power of hospitals that had a high concentration of available beds in a given city was manifested in a strong negative impact on starting wages for nurses. Nurses with bachelor's degrees were less dependent on the local unionization support for higher starting salaries versus diploma nurses (based on the interaction variable). Overall, unionization was found to have a strong impact on nurses' starting salaries.

In another study on the nursing labor force, Link and Settle (1979) investigated wage elasticities of the nursing labor supply based on results found in another paper by Sloan and Richupan (1975). Link and Settle suspected that the Sloan-Richupan result overestimated wage elasticities (Sloan and Richupan found a wage elasticity of 2.8). Because of the important policy implications, Link and Settle further studied nurse wage elasticity. They also enhanced their model by adding the presence of a disability into their supply equation, which was expected to substantially reduce a nurse's hours worked. Recognizing the selectivity bias issue, the authors utilized the Tobit model to try to obtain efficient and consistent parameter estimates. The authors' results indicate relatively small wage elasticity for married nurses of 0.38 and 0.58 when health attributes are included in the model (Link and Settle, 1979, p. 264).In addition, the authors found that the presence of young children tended to discourage

hours worked in the nursing market. As expected, the presence of a disability was found to reduce hours worked per year significantly. Respondents with more than a high school diploma, but less than 16 years of education were shown to work more hours. Since the job type (head nurse or general duty nurse) was not available, the authors caveat the impact of education. They suggest that job type differences may have been reflected in the coefficients of education. Finally, although the authors found an inelastic labor supply, they did not find evidence of a backward bending labor supply.

Link and Settle (1981) again analyzed the nursing labor supply (for married registered nurses). In this study, the authors used a simultaneous model to analyze the female labor supply. Three simultaneous linear equations were estimated to understand the variation in the nurse labor supply, fertility and market wages using three stage least squares. Though wage was found to have a positive impact on labor participation, it did not significantly affect either the labor supply or fertility behavior of nurses. Consistent with Link and Settle's previous 1979 study, wage elasticity was estimated to be 0.4 (Link and Settle, 1981, p.984). Surprisingly, though fertility had the predicted negative coefficient in the hours and wage equations, it did not significantly impact wages or hours worked. As predicted by Link and Settle, husbands' earnings had a negative impact on female nurses' labor participation. However, nurse wages did not have a significant impact on their fertility behavior. The market wage equation was not significantly impacted by the labor participation rate (nursing labor supply) or fertility decisions. Though some evidence of

simultaneity exists, the similarity of the results of this study's results with Link and Settle's previous 1979 analysis (in terms of elasticities of wage, non-labor income and husband's income) suggests that simultaneity creates only a minor problem, which would not significantly impact conclusions from previous empirical results by these authors.

Another two-stage model to estimate the nursing labor supply was estimated by Buerhaus (1991) utilizing the National Sample Survey of Registered Nurses 1984 data. Buerhaus also restricted the sample to nurses who spent at least half of their time on direct patient care. The author derived a wage rate in the first stage. The sample was then divided by marital status and estimated separately (married RNs, widowed/divorced/separated or never married). To estimate the number of hours worked, the derived wage was used. There was not a separate regression run to estimate the decision to work; thus, a selectivity corrected model was not used. The RN wage elasticity with annual hours worked was estimated at 0.49 for the whole sample, which suggests a relatively inelastic labor supply curve (Buerhaus, 1991, p. 323). For married RNs, increased wages did not have a significant impact on annual hours worked (no wage elasticity was calculated for this group). There was also no evidence of a backward bending supply (of annual hours worked) for this group, as the wages squared term was not significant. For unmarried nurses, the effect of wages was significantly positive on annual hours worked. The wage elasticity for unmarried nurses was 0.89, (Buerhaus, 1991, p. 325) which suggests an inelastic supply curve for unmarried nurses. In fact this group was estimated to have a backward bending supply

curve (as evidenced by the negative significant coefficient of the wage squared term in the annual hours worked equation for single nurses). Not surprisingly, for married women, family income played a significant role in determining annual hours worked, though the expected negative effect was only observed for cases in excess of $75,000 (Buerhaus, 1991, p.323). For single nurses, lower family incomes encouraged nurses to work significantly more hours annually. While age had an increasingly negative impact on married nurses' annual hours worked, it had a positive impact on annual hours worked for widowed, separated or divorced nurses (although, as these nurses got older the positive impact declined). Overall, the inelastic supply curve of the combined sample is consistent with much of the previous research on nursing labor supply (in the 70's and 80's). This suggests that the shortage of nurses will likely take a long time to resolve.

In 1995, Phillips used a selectivity corrected model for the supply of nursing using a sample of British nurses. Phillips first estimated wages with ordinary least squares. Then he estimated the probability of participation in the labor force using a Probit model (with predicted wages). Then using a conditional ordinary least squares model (as in the Heckman two-stage selection corrected model), Phillips estimated the labor supply of nurses in hours. Phillips found that the UK labor supply of registered nurses is more elastic than the US labor supply. However, Phillips analysis also suggests that wage increases in the UK for nurses would likely be unsuccessful at increasing hours worked by nurses. In the wage equation, higher education had a positive impact on wages. Potential experience also had a small positive impact on

wages. However, having more than one occupation had a negative impact on wages. Phillips did not find evidence of selection bias for the sample. As expected, an increase in children, non-labor income, and holding an advanced degree all reduce the number of hours worked. However, Phillips found that as age increases, the likeliness of participation in the labor force increases (but reduces the number of hours worked). A surprising result was that holding an advanced degree discouraged participation in the nursing field. Phillips suggests that unmet expectations may be causing this result. Overall, Phillips found that wages can significantly impact British nurses' participation, but not the labor supply of hours worked for nurses.

A later study by Brewer (1996) did not use the selectivity correction. Not surprisingly, this led to much higher estimates of wage elasticity compared to previous research (Link and Settle, 1979 and Phillips, 1995). For the participation decision, a Logit regression was estimated. Annual hours worked was estimated via ordinary least squares, with no selectivity correction. The wage used in these equations was the result of an instrumental regression, allowing for a predicted wage for working and non-working nurses. Brewer had three main research hypotheses. The first of which was that the slopes of the labor supply would not change from 1984 to 1988 resulting in a steeper more inelastic supply curve (with smaller wage elasticities).This was not supported for female nurses; Brewer found relatively larger wage elasticities for female nurses compared to Link and Phillips. Brewer's estimated wage elasticities with hours worked ranged from 0.59 to 3.48 in 1984 and from 1.21 to 2.61 in 1988 (1996, p. 352). The second hypothesis was that there would be significant differences

between male and female labor supply curves in the 1984 and 1988, which was generally supported. The third hypothesis was that there is no backward bending supply curve for the majority of nurses. The third hypothesis was supported for females but not for males. However, the results for male nurses were obtained from a fairly small sample size (less than 1000). Overall, Brewer's results must be viewed with caution, given that the author did not test or correct for selection bias. The implications of not correcting for this bias (as suggest by Heckman, 1993) are that the author's estimated high wage elasticities for annual hours worked are likely overstated.

In a more recent paper by Chiha and Link (2003), the nursing supply was again examined. The data were drawn from the National Sample Survey of Registered Nurses in the US (for the years 1992, 1996 and 2000). In estimating the nursing labor supply in log of annual hours worked, Chiha and Link utilized the Heckman two-step selectivity correction (using a Probit functional form for the selection equation). In addition, the authors utilized a predicted wage in the labor supply equation, which was also obtained from a selectivity corrected estimation. In all estimations for predicted wages, selectivity was found and corrected for to obtain a selectivity-corrected predicted wage. However, in the labor supply equations, the same set of independent variables were used (the authors relied on functional form for identification of the models). The results indicated that the effect of the RN's own wage was minimal in the participation decision. Further, in the 1992 and 1996 samples, a nurse's own wage did not impact the amount of hours she worked per year. However, in the 2000 sample,

significant, positive wage elasticity of 0.2 was found with respect to hours worked (Chiha and Link, 2003, p. 358). Though the authors tested for the presence of a backward bending supply curve with dummy variable regressions (to avoid imposing a functional form as with a quadratic wage term), no compelling evidence was observed. Chiha and Link concluded that the responsiveness of the hours to changes in nurse wages is inelastic but not backward bending. Overall, this implies that wage increases will not stimulate large increases in hours worked by currently working nurses. A small income effect was observed from other family income, which was shown to have a negative impact on hours worked and on the probability of participation by nurses. Family composition was also shown to have a significant impact on both the participation decision and hours worked. Female nurses with children under the age of six had a lower predicted probability of participation and fewer predicted hours worked per annum. The Heckman selection procedure helped to identify positive selection for the 1992 and 2000 single female nurse samples as well as the 1992 sample for married males. This positive selectivity suggested that these workers worked more hours than would have been worked by their non-working cohorts had the non-workers been working. Had this selectivity not been corrected for, then the predicted hours worked would have been overstated for these three cohorts.

Though much of the discussed research focuses on the impact of wages, in terms of increasing supply, it does not discuss the effect of wages on market efficiency. Heyes (2005) addressed this issue. He theorized that increases in wages encourage a less talented and dedicated applicant pool to enter the nursing market,

using an adverse selection argument. His theory is based on his definition of vocation as a career sought for purposes of serving the community, suggesting that nurses who view their jobs as a vocation are intrinsically motivated to enter that career. Thus, nursing candidates who are intrinsically motivated would likely enter the nursing market for other reasons besides pay, while nursing candidates who are not intrinsically motivated toward nursing may only be driven by increased wages to enter the nursing market. Heyes argued that the latter would offer a lower quality of service than the former. Consequently, he modeled vocation as an indicator variable of intrinsic motivation. Using a theoretical framework, the author derived two propositions. The first derived result was that, all things being equal, increasing wages of nurses will decrease the proportion of nurses which have a vocation (intrinsic motivation). Thus, increasing wages will encourage less motivated and perhaps lower quality nurses to enter the nursing labor market. The second proposition he derived was that if nurses are intrinsically motivated, then they should be paid less and given more direct time with patients. This second proposition suggests that letting nurses focus on direct patient care (which highly motivated nurses would like to do) and paying them less would encourage only very dedicated nurses to the nursing labor market. The author in this study refers to the British health system often. Thus, it is limited in some ways. However, the analysis provides insight about the efficiency consequences of the labor supplied when wages are increased. Given the derived result of lowering wages as an incentive to encourage dedicated nurses, the author questioned his result. However, Taylor (2007) addressed this concern. Taylor

suggested that nurses in Britain are currently underpaid. Consequently, he argued that Heyes model did not hold for wages which are below an efficient level. Thus, Taylor suggested that since nurses in Britain are currently underpaid, their wages should be raised.

With the continued shortage of registered nurses, Shields (2004) reviewed a few key research studies with an emphasis on what has been learned from econometric analysis over that last thirty years. Overall, the author points out some of the flaws of past research and indicates some possible future direction for nursing labor supply research. One of the first major flaws he discussed was ignoring selection bias (as was done with earlier studies on the nursing market). The author also pointed out issues with identification that arose in some studies from using the same variables in both the selection and outcome equations when correcting for selectivity bias. Shields then cited the "lack of natural experiment" (Shields, 2004, p F491) or the lack of evidence to establish causation of wage's effects on the labor supply. In addition, he also noted the lack of available variables, which could control for individual heterogeneity (intrinsic motivation, skill level and other character traits). Since weak instruments can cause significantly biased results, Shields advised caution in interpreting models utilizing instruments. He pointed out that there has been little consistency in the variables included in the supply estimation model and as such, they are difficult to compare directly. In addition, very few longitudinal studies have been conducted which would shed more light on the inter-temporal behavior of nurses. The author indicated(similar to Heckman, 1993) that longitudinal research that has been

conducted on nursing labor behavior is sparse and in its early stages of development. Finally, the author cited the lack of research outside the US as a problem, since the nursing shortage is a global concern.

One of the key areas that Shields highlighted in his 2004 review of econometric research relating to the nursing supply was the need for further exploration of variables which account for individual heterogeneity. These variables include measures of individual motivation, satisfaction and skill level. A recent study by Brewer, et. al. (2006) addressed at least part of this concern by incorporating levels of satisfaction and variables which could impact intrinsic motivation. In addition, this study also analyzed the impact of market level factors on both labor participation and working behavior (working part time or full time). Using the 2000 National Sample Survey of Registered Nurses, the authors estimated a selection corrected Bivariate Probit model of nurse working behavior for women. The modeling strategy is a departure from previous nursing studies; instead of modeling the labor supply in terms of log of hours worked, the authors modeled the labor supply decision to work full time or part time with a Probit regression. Using the Bivariate Probit model adjusts for a relationship between the decision to work and whether or not the nurse chooses to work full or part time. In addition, a selectivity adjusted ordinary least squares regression was estimated to predict nursing wages. Predicted wages for working and non-working nurses were then incorporated into the labor behavior regressions. Several market level metropolitan statistical area or MSA factors were added to the traditional participation decision model (unemployment rate, insurance coverage,

HMO competition index). The outcome equation, conditioned on whether the nurse works, was estimated from a different composition of variables. The use of alternative variables (which were allowed to differ between the participation and decision to work full time) were added to provide an understanding of the impact of job environmental characteristics of the current nursing employment and help with identification of the model. Examples of these types of variables include work setting variables and current position type in nursing.

Though the results of the Brewer et al, 2006 study yielded some consistent conclusions about nursing labor behavior (observed from previous research), there were also some surprising results. Not surprisingly, the authors found a significant relationship between the decision to participate in the nursing labor force and the decision to work full time or part time. This suggests that the relationship must be tested and adjusted for in labor supply modeling. As was expected, other income had a small significant negative impact on the probability of participation. Age also had a negative impact on participation, although only for older nurses. Similar to other research on the nursing labor supply, the presence of small children significantly decreased the probability of participating in the RN market and the probability of working full time. However, previous experience in a health occupation had a positive impact on the probability of working and the likelihood of working full time. Interestingly, in addition to affecting the participation decision, HMO and managed care institutional characteristics of a given city were also found to impact nursing labor behavior.

Another, innovation of this study was the inclusion of work environmental factors of the RNs into the work behavior equation. As expected, decreased job satisfaction versus the year prior had a significant negative impact on the likelihood of working fulltime (for married RNs). The authors caveat this result by indicating that the result may reflect reverse causation, i.e. that part time jobs are less satisfying. Differences in work setting had a significant impact on the decision to work fulltime or part time (for married nurses). Consistent with previous research in the literature (Link and Chiha, 2003), the authors found evidence that wages do not impact participation, as well as the decision to supply full time or part time labor hours. Generally, the results suggested that wages are neither a powerful lever to bring workers in the RN market nor to increase the supply of hours worked.

Given the results of the Brewer et al 2006 study, Brewer conducted another research study which took a closer look at the work environment utilizing both economic labor theory and organizational behavior theory to understand factors that affect the nursing labor supply (2008). The authors conducted two national surveys over a two year period, which resulted in approximately 1200 usable observations. Using this dataset, the researchers' wanted to gain a better understanding of the role of environmental factors on intentions to quit and work behaviors. Multivariate regression was used to determine the impact of demographic, environmental, movement opportunity and work factors on the desire to quit working. To estimate working behavior (full time or part time) a selection corrected Bivariate Probit model was used, although in this study, estimations for married and single female samples

were not estimated separately. Respondent claimed full time/ part time response were used to develop the full time part time variable. Again, a selectivity adjusted two-stage regression was used to predict wages (OLS was used for the log of wages equation). An N-Logit model was also estimated for the dependent variable "intent to work". For the selectivity Probit (work/not work) and work full time/part time equation, some additional variables were added to the outcome equation. The additional variables added to the work full time/part time equation were work environment variables (i.e. worked in a hospital, level of benefits, position, preferred hours, work transfer, and attitudinal variables such as satisfaction, importance of benefits and organizational commitment).

This 2008 study by Brewer, et al indicate that environmental factors do play a role in work behavior. The study also yielded some surprising results, especially with regards to nurses with young children. Several of these factors were found to contribute to the desire to quit a nursing position, such as higher education (BS or Master's degrees), small city size, HMO penetration, having other job opportunities, having a non-nursing job opportunity and work-family conflict. Thus, having advanced degrees and the opportunity to leave the current job in tandem with work-life balance issues was found to contribute to the chances of a high nurse turnover rate. In contrast to much of the prior research on the nursing labor supply, nurses with young children (less than 6 years old), indicated that they believed they had advancement opportunities, showed increased levels of satisfaction and commitment with their organization and showed less overall desire to quit their current position.

This is interesting given the historical research which indicated that the presence of small children usually have a negative impact on market participation (at least for married female RNs). In the intent to work logistic regression, probabilities of continued desire to work in nursing were reduced by higher education (BA) if she was black or Asian, if she worked in a non-hospital setting or if she had minimal direct patient care as a portion of her responsibilities, if she wanted to work fewer hours in the future, if she had more benefits, and experienced work-family conflict. However, nurses were more likely to want to continue their work in nursing if they had young children (less than 6 years), had higher wages, had better medical insurance, thought that benefits were less important, and were more motivated to work. The Bivariate Probit labor supply behavioral regression analyzes determinants of full time versus part time decisions conditioned on working or not working. In this analysis, having young children decreased the probability of working full-time. Several work factors impacted working behavior such as higher levels of direct patient care, having an advanced nursing position, increased benefits, having higher organizational commitment and higher quantitative workload. Contrary to the 2006 result, Brewer et al found that wages significantly impacted the decision to participate in nursing, but did affect the decision to work full time or part time. Overall the authors concluded that factors that determine whether or not people choose to work in nursing are fundamentally different from how much they work.

One important question should arise from the significant disparities in methodology and modeling techniques with regards to econometric analyses of the

female labor supply. How sensitive are the female labor supply results to the methodology and included variables in the model? One researcher specifically conducted a sensitivity analysis to answer this specific question (Mroz, 1987). Mroz used a simple female labor supply model and a single data source to test for the sensitivity of results to statistical methodology used. There were three key issues being tested for which included exogeneity assumptions, control for selection bias and the impact of incorporating taxes into the model. To test the functional form sensitivity of the model, he used Tobit, conditional Tobit, generalized Tobit, as well as ordinary least squares. Several distributional assumptions were tested by using various structural specifications (normal and logistic functional form of residuals). The author found considerable evidence of selection bias where "experience" was included in the independent variables. In addition, the Tobit model assumptions were rejected in this empirical analysis which suggested a more general model is preferred in labor supply modeling (as in Heckman's two-step process). The implications of using Tobit can be exaggerated Wage and Income effects. Overall, the study finds relatively inelastic labor supply for working married women. It also suggests that modeling choice does have an impact on the conclusions that are obtained from estimates, and as such some caution should be used in comparing results across methodologies.

Chapter 3

DATA & METHODOLOGY

3.1 Data

The current estimation samples are based on the 2004 and 2008 National Sample Survey of Registered Nurses (NSSRN). This survey has been conducted on regular intervals from 1977 by the Health Resources and Services Administration (HRSA). The labor supply models were estimated separately for men, married women, and single women (the sample of males was not large enough to separate by marital status). The age of nurses was also restricted to include only nurses aged 19-65 to be comparable with contemporary literature. Generally, missing values were represented with dummy variable categories in lieu of deletion, wherever possible. In addition, nurses who worked only outside nursing were excluded from the sample to focus on nurses who were truly unemployed. This seemed reasonable, given that the nurses who worked strictly outside of nursing were generally retired and working outside of nursing part time or changed careers and working full time in some position outside of nursing. In 2004, 6.8 percent of RNs did not specify their ethnicity (HRSA, 2004, p. 14). Missing values for race were included in the estimation sample, with a dummy variable of RACE_MISS=1, if it is missing. Similarly, missing values for education were included in the estimation sample, with a dummy variable of ED_MISS=1, if it is missing. Overall, the final sample sizes of RNs are as follows: 2004 - Males (n=1,140), Married Females (n=12,324), and Single Females (n=5,181);2008 - Males (n=1,671), Married Females (n=18,718), and Single Females (n=6,209).

Besides the NSSRN data, the Statistical Abstract of the United States and the Bureau of Labor Statistics were utilized to obtain state level market statistics for the years 2004 and 2008. Thus, the following variables utilized this data (for the RNs 2004 and 2008 state of residence): percent unionization, health insurance coverage, physicians per 100,000 population and nurses per 100,000 population.

Sample Means

The sample means of the full samples of 2004 and 2008 datasets, as well as the Males, Married Females and Single Females for each of these years are presented and discussed here.

Variable	Mean	Max	Min	Std Dev
Principal Salary	43971.77	103000.00	0.00	24239.16
Household INC	85458.17	200000.00	7500.00	43026.93
OTHINC	40856.22	200000.00	0.00	44957.16
Gender	0.06	1.00	0.00	0.24
MARRIED	0.70	1.00	0.00	0.46
age	45.65	65.00	19.00	10.25
DIPL	0.15	1.00	0.00	0.36
ASSOC	0.36	1.00	0.00	0.48
BACC	0.36	1.00	0.00	0.48
PhD_MS	0.13	1.00	0.00	0.34
ED_MISS	0.00	1.00	0.00	0.05
FOREIGN	0.03	1.00	0.00	0.17
LPN	0.18	1.00	0.00	0.39
CH_NO	0.56	1.00	0.00	0.50
CH_ALL	0.06	1.00	0.00	0.24
CH_GE6	0.29	1.00	0.00	0.46
CH_LE6	0.08	1.00	0.00	0.27
RACE_MISS	0.05	1.00	0.00	0.22
WHITE	0.85	1.00	0.00	0.36
HISP	0.01	1.00	0.00	0.12
ASIAN	0.03	1.00	0.00	0.16
AFRAMER	0.04	1.00	0.00	0.19
OTHRACE	0.02	1.00	0.00	0.14
NE	0.19	1.00	0.00	0.39
SOUTH	0.33	1.00	0.00	0.47
MIDWST	0.24	1.00	0.00	0.43
WEST	0.24	1.00	0.00	0.43
RESMSA	0.78	1.00	0.00	0.41
POTEXP	19.37	48.00	0.00	11.48
WAGE_RT	22.06	78.13	0.00	12.13
WAGED	0.83	1.00	0.00	0.37
hrs_yr	1675.95	2700.00	0.00	789.85
LNWAGE_RT	2.69	4.36	-4.83	1.24
LNHRS_YR	6.34	7.90	0.00	2.82
WORK_FT	0.74	1.00	0.00	0.44
WORK_PT	0.09	1.00	0.00	0.29
PCT_UNION	13.05	26.40	3.60	5.77
PHYS per 1k	261.24	798.00	169.00	66.79
N	18645			

Table 1: **Variable Means for the Full Sample - 2004**

Variable	Mean	Max	Min	Std Dev
Principal Salary	48963.13	117000.00	0.00	26861.17
Household INC	98362.73	250000.00	10000.00	50668.27
OTHINC	47176.44	250000.00	0.00	50783.16
Gender	0.06	1.00	0.00	0.24
MARRIED	0.75	1.00	0.00	0.43
age	46.51	65.00	20.00	10.89
DIPL	0.13	1.00	0.00	0.33
ASSOC	0.37	1.00	0.00	0.48
BACC	0.38	1.00	0.00	0.49
PhD_MS	0.12	1.00	0.00	0.33
ED_MISS	-	-	-	-
FOREIGN	0.04	1.00	0.00	0.20
LPN	0.19	1.00	0.00	0.39
CH_NO	0.58	1.00	0.00	0.49
CH_ALL	0.06	1.00	0.00	0.24
CH_GE6	0.27	1.00	0.00	0.44
CH_LE6	0.09	1.00	0.00	0.28
RACE_MISS	-	-	-	-
WHITE	0.86	1.00	0.00	0.35
HISP	0.03	1.00	0.00	0.16
ASIAN	0.04	1.00	0.00	0.20
AFRAMER	0.05	1.00	0.00	0.21
OTHRACE	0.02	1.00	0.00	0.15
NE	0.20	1.00	0.00	0.40
SOUTH	0.44	1.00	0.00	0.50
MIDWST	0.14	1.00	0.00	0.35
WEST	0.22	1.00	0.00	0.41
RESMSA	0.75	1.00	0.00	0.43
POTEXP	19.90	47.00	0.00	11.97
WAGE_RT	27.05	528.85	0.00	14.77
WAGED	0.88	1.00	0.00	0.32
hrs_yr	1625.25	2667.00	0.00	774.74
LNWAGE_RT	2.97	6.27	0.00	1.13
LNHRS_YR	6.57	7.89	0.00	2.44
WORK_FT	0.65	1.00	0.00	0.48
WORK_PT	0.23	1.00	0.00	0.42
PCT_UNION	13.15	26.60	4.60	5.80
PHYS per 1k	269.35	813.29	167.40	71.57
N	26619			

Table 2:**Variable Means for the Full Sample - 2008**

Variable	Mean	Max	Min	Std Dev
Principal Salary	50736.55	102000.00	0.00	23629.98
Household INC	84254.39	200000.00	7500.00	37747.47
OTHINC	32081.03	200000.00	0.00	38476.23
Gender	1.00	1.00	1.00	0.00
MARRIED	0.69	1.00	0.00	0.46
age	44.16	65.00	21.00	9.43
DIPL	0.08	1.00	0.00	0.27
ASSOC	0.43	1.00	0.00	0.50
BACC	0.37	1.00	0.00	0.48
PhD_MS	0.11	1.00	0.00	0.32
ED_MISS	0.01	1.00	0.00	0.09
FOREIGN	0.04	1.00	0.00	0.19
LPN	0.18	1.00	0.00	0.39
CH_NO	0.54	1.00	0.00	0.50
CH_ALL	0.08	1.00	0.00	0.27
CH_GE6	0.27	1.00	0.00	0.44
CH_LE6	0.11	1.00	0.00	0.31
RACE_MISS	0.07	1.00	0.00	0.25
WHITE	0.82	1.00	0.00	0.39
HISP	0.02	1.00	0.00	0.14
ASIAN	0.04	1.00	0.00	0.18
AFRAMER	0.03	1.00	0.00	0.17
OTHRACE	0.03	1.00	0.00	0.18
NE	0.17	1.00	0.00	0.38
SOUTH	0.32	1.00	0.00	0.47
MIDWST	0.21	1.00	0.00	0.41
WEST	0.30	1.00	0.00	0.46
RESMSA	0.81	1.00	0.00	0.39
POTEXP	13.95	43.00	0.00	8.72
WAGE_RT	24.69	55.56	0.00	11.58
WAGED	0.88	1.00	0.00	0.33
hrs_yr	1814.31	2700.00	0.00	729.18
LNWAGE_RT	2.89	4.02	0.00	1.12
LNHRS_YR	6.68	7.90	0.00	2.52
WORK_FT	0.83	1.00	0.00	0.37
WORK_PT	0.04	1.00	0.00	0.20
PCT_UNION	13.25	26.40	3.60	5.93
PHYS per 1k	260.84	798.00	169.00	72.69
N	1140			

Table 3: **Variable Means for MALES - 2004**

Variable	Mean	Max	Min	Std Dev
Principal Salary	57955.57	102000.00	6000.00	14802.07
Household INC	84666.83	200000.00	7500.00	34420.56
OTHINC	25070.01	168000.00	0.00	29233.32
Gender	1.00	1.00	1.00	0.00
MARRIED	0.69	1.00	0.00	0.46
age	43.41	65.00	21.00	9.19
DIPL	0.08	1.00	0.00	0.26
ASSOC	0.44	1.00	0.00	0.50
BACC	0.36	1.00	0.00	0.48
PhD_MS	0.11	1.00	0.00	0.32
ED_MISS	0.01	1.00	0.00	0.08
FOREIGN	0.04	1.00	0.00	0.20
LPN	0.19	1.00	0.00	0.39
CH_NO	0.53	1.00	0.00	0.50
CH_ALL	0.08	1.00	0.00	0.27
CH_GE6	0.27	1.00	0.00	0.44
CH_LE6	0.11	1.00	0.00	0.32
RACE_MISS	0.07	1.00	0.00	0.25
WHITE	0.80	1.00	0.00	0.40
HISP	0.02	1.00	0.00	0.14
ASIAN	0.04	1.00	0.00	0.20
AFRAMER	0.03	1.00	0.00	0.18
OTHRACE	0.03	1.00	0.00	0.18
NE	0.18	1.00	0.00	0.38
SOUTH	0.32	1.00	0.00	0.47
MIDWST	0.21	1.00	0.00	0.40
WEST	0.30	1.00	0.00	0.46
RESMSA	0.81	1.00	0.00	0.39
POTEXP	13.18	43.00	0.00	8.31
WAGE_RT	28.20	55.56	3.85	7.36
WAGED	1.00	1.00	1.00	0.00
hrs_yr	2072.46	2700.00	1200.00	268.13
LNWAGE_RT	3.30	4.02	1.35	0.27
LNHRS_YR	7.63	7.90	7.09	0.13
WORK_FT	0.95	1.00	0.00	0.22
WORK_PT	0.05	1.00	0.00	0.22
PCT_UNION	13.24	26.40	3.60	5.92
PHYS per 1k	261.16	798.00	169.00	72.59
N	998			

Table 4: **Variable Means for WORKING MALES - 2004**

Variable	Mean	Max	Min	Std Dev
Principal	41941.51	103000.00	0.00	24710.31
Household	96156.48	200000.00	7500.00	44284.99
OTHINC	53296.64	200000.00	0.00	46585.06
Gender	2.00	2.00	2.00	0.00
MARRIED	1.00	1.00	1.00	0.00
age	45.64	65.00	21.00	9.93
DIPL	0.16	1.00	0.00	0.37
ASSOC	0.35	1.00	0.00	0.48
BACC	0.36	1.00	0.00	0.48
PhD_MS	0.13	1.00	0.00	0.34
ED_MISS	0.00	1.00	0.00	0.05
FOREIGN	0.03	1.00	0.00	0.17
LPN	0.18	1.00	0.00	0.38
CH_NO	0.50	1.00	0.00	0.50
CH_ALL	0.07	1.00	0.00	0.26
CH_GE6	0.33	1.00	0.00	0.47
CH_LE6	0.10	1.00	0.00	0.29
RACE_MISS	0.04	1.00	0.00	0.20
WHITE	0.86	1.00	0.00	0.34
HISP	0.01	1.00	0.00	0.12
ASIAN	0.03	1.00	0.00	0.17
AFRAMER	0.03	1.00	0.00	0.18
OTHRACE	0.02	1.00	0.00	0.13
NE	0.19	1.00	0.00	0.39
SOUTH	0.33	1.00	0.00	0.47
MIDWST	0.26	1.00	0.00	0.44
WEST	0.23	1.00	0.00	0.42
RESMSA	0.76	1.00	0.00	0.43
POTEXP	19.89	46.00	0.00	11.25
WAGE_RT	21.17	78.13	0.00	12.41
WAGED	0.81	1.00	0.00	0.39
hrs_yr	1620.98	2700.00	0.00	821.79
LNWAGE_RT	2.61	4.36	-4.83	1.29
LNHRS_YR	6.16	7.90	0.00	2.97
WORK_FT	0.70	1.00	0.00	0.46
WORK_PT	0.11	1.00	0.00	0.31
PCT_UNION	12.98	26.40	3.60	5.74
PHYS per 1k	259.76	798.00	169.00	63.93
N	12324			

Table 5: **Variable Means for MARRIED FEMALES - 2004**

Variable	Mean	Max	Min	Std Dev
Principal	51626.76	103000.00	20.00	15860.22
Household	95565.82	200000.00	7500.00	40017.21
OTHINC	42808.66	196000.00	0.00	35694.79
Gender	2.00	2.00	2.00	0.00
MARRIED	1.00	1.00	1.00	0.00
age	44.83	65.00	21.00	9.61
DIPL	0.15	1.00	0.00	0.35
ASSOC	0.37	1.00	0.00	0.48
BACC	0.35	1.00	0.00	0.48
PhD_MS	0.13	1.00	0.00	0.34
ED_MISS	0.00	1.00	0.00	0.04
FOREIGN	0.03	1.00	0.00	0.18
LPN	0.19	1.00	0.00	0.39
CH_NO	0.49	1.00	0.00	0.50
CH_ALL	0.07	1.00	0.00	0.25
CH_GE6	0.34	1.00	0.00	0.47
CH_LE6	0.09	1.00	0.00	0.29
RACE_MISS	0.05	1.00	0.00	0.21
WHITE	0.85	1.00	0.00	0.35
HISP	0.01	1.00	0.00	0.12
ASIAN	0.03	1.00	0.00	0.18
AFRAMER	0.03	1.00	0.00	0.18
OTHRACE	0.02	1.00	0.00	0.13
NE	0.19	1.00	0.00	0.39
SOUTH	0.33	1.00	0.00	0.47
MIDWST	0.26	1.00	0.00	0.44
WEST	0.22	1.00	0.00	0.42
RESMSA	0.76	1.00	0.00	0.43
POTEXP	18.81	46.00	0.00	10.93
WAGE_RT	26.06	78.13	0.01	7.88
WAGED	1.00	1.00	1.00	0.00
hrs_yr	1995.30	2700.00	1170.00	290.44
LNWAGE_RT	3.21	4.36	-4.83	0.35
LNHRS_YR	7.59	7.90	7.06	0.15
WORK_FT	0.86	1.00	0.00	0.34
WORK_PT	0.14	1.00	0.00	0.34
PCT_UNION	12.91	26.40	3.60	5.68
PHYS per 1k	259.27	798.00	169.00	63.67

Table 6: **Variable Means for WORKING MARRIED FEMALES - 2004**

Variable	Mean	Max	Min	Std Dev
Principal	47312.64	103000.00	0.00	22544.82
Household	60275.04	200000.00	7500.00	27884.62
OTHINC	13195.12	200000.00	0.00	25216.47
Gender	2.00	2.00	2.00	0.00
MARRIED	0.00	0.00	0.00	0.00
age	45.99	65.00	19.00	11.09
DIPL	0.15	1.00	0.00	0.36
ASSOC	0.36	1.00	0.00	0.48
BACC	0.35	1.00	0.00	0.48
PhD_MS	0.14	1.00	0.00	0.35
ED_MISS	0.00	1.00	0.00	0.05
FOREIGN	0.02	1.00	0.00	0.15
LPN	0.19	1.00	0.00	0.39
CH_NO	0.71	1.00	0.00	0.45
CH_ALL	0.02	1.00	0.00	0.16
CH_GE6	0.23	1.00	0.00	0.42
CH_LE6	0.03	1.00	0.00	0.17
RACE_MISS	0.06	1.00	0.00	0.23
WHITE	0.82	1.00	0.00	0.38
HISP	0.01	1.00	0.00	0.11
ASIAN	0.02	1.00	0.00	0.14
AFRAMER	0.06	1.00	0.00	0.23
OTHRACE	0.03	1.00	0.00	0.16
NE	0.20	1.00	0.00	0.40
SOUTH	0.32	1.00	0.00	0.47
MIDWST	0.22	1.00	0.00	0.41
WEST	0.26	1.00	0.00	0.44
RESMSA	0.83	1.00	0.00	0.38
POTEXP	19.32	48.00	0.00	12.23
WAGE_RT	23.61	73.53	0.00	11.30
WAGED	0.88	1.00	0.00	0.33
hrs_yr	1776.27	2700.00	0.00	707.40
LNWAGE_RT	2.86	4.30	-0.22	1.10
LNHRS_YR	6.68	7.90	0.00	2.48
WORK_FT	0.81	1.00	0.00	0.39
WORK_PT	0.07	1.00	0.00	0.25
PCT_UNION	13.16	26.40	3.60	5.81
PHYS per 1k	264.87	798.00	169.00	71.77
N	5181			

Table 7: **Variable Means for SINGLE FEMALES - 2004**

Variable	Mean	Max	Min	Std Dev
Principal	53838.53	103000.00	1500.00	15065.50
Household	62376.46	200000.00	7500.00	25683.69
OTHINC	8802.75	170000.00	0.00	19381.99
Gender	2.00	2.00	2.00	0.00
MARRIED	0.00	0.00	0.00	0.00
age	45.01	65.00	19.00	10.97
DIPL	0.13	1.00	0.00	0.34
ASSOC	0.37	1.00	0.00	0.48
BACC	0.36	1.00	0.00	0.48
PhD_MS	0.13	1.00	0.00	0.34
ED_MISS	0.00	1.00	0.00	0.05
FOREIGN	0.03	1.00	0.00	0.16
LPN	0.19	1.00	0.00	0.39
CH_NO	0.70	1.00	0.00	0.46
CH_ALL	0.03	1.00	0.00	0.16
CH_GE6	0.24	1.00	0.00	0.42
CH_LE6	0.03	1.00	0.00	0.18
RACE_MISS	0.06	1.00	0.00	0.24
WHITE	0.82	1.00	0.00	0.38
HISP	0.01	1.00	0.00	0.12
ASIAN	0.02	1.00	0.00	0.14
AFRAMER	0.06	1.00	0.00	0.24
OTHRACE	0.03	1.00	0.00	0.16
NE	0.19	1.00	0.00	0.39
SOUTH	0.33	1.00	0.00	0.47
MIDWST	0.22	1.00	0.00	0.42
WEST	0.26	1.00	0.00	0.44
RESMSA	0.83	1.00	0.00	0.38
POTEXP	18.20	48.00	0.00	11.87
WAGE_RT	26.87	73.53	0.80	7.60
WAGED	1.00	1.00	1.00	0.00
hrs_yr	2021.27	2700.00	1200.00	272.26
LNWAGE_RT	3.25	4.30	-0.22	0.29
LNHRS_YR	7.60	7.90	7.09	0.13
WORK_FT	0.92	1.00	0.00	0.27
WORK_PT	0.08	1.00	0.00	0.27
PCT_UNION	13.10	26.40	3.60	5.75
PHYS per 1k	264.19	798.00	169.00	70.31
N	4553			

Table 8: **Variable Means for WORKING SINGLE FEMALES - 2004**

Variable	Mean	Max	Min	Std Dev
Principal	58485.91	117000.00	0.00	26962.95
Household	98239.08	250000.00	10000.00	46828.13
OTHINC	35738.55	250000.00	0.00	41039.26
Gender	1.00	1.00	1.00	0.00
MARRIED	0.75	1.00	0.00	0.43
age	45.25	65.00	21.00	10.54
DIPL	0.07	1.00	0.00	0.26
ASSOC	0.45	1.00	0.00	0.50
BACC	0.38	1.00	0.00	0.48
PhD_MS	0.10	1.00	0.00	0.30
FOREIGN	0.06	1.00	0.00	0.23
LPN	0.20	1.00	0.00	0.40
CH_NO	0.57	1.00	0.00	0.50
CH_ALL	0.07	1.00	0.00	0.26
CH_GE6	0.25	1.00	0.00	0.44
CH_LE6	0.10	1.00	0.00	0.30
WHITE	0.81	1.00	0.00	0.39
HISP	0.05	1.00	0.00	0.22
ASIAN	0.06	1.00	0.00	0.24
AFRAMER	0.04	1.00	0.00	0.20
OTHRACE	0.04	1.00	0.00	0.19
NE	0.16	1.00	0.00	0.37
SOUTH	0.39	1.00	0.00	0.49
MIDWST	0.17	1.00	0.00	0.38
WEST	0.27	1.00	0.00	0.44
RESMSA	0.76	1.00	0.00	0.43
POTEXP	14.57	44.00	0.00	9.71
WAGE_RT	29.22	153.85	0.00	13.89
WAGED	0.90	1.00	0.00	0.30
hrs_yr	1837.45	2667.00	0.00	722.21
LNWAGE_RT	3.10	5.04	0.00	1.05
LNHRS_YR	6.85	7.89	0.00	2.26
WORK_FT	0.81	1.00	0.00	0.39
WORK_PT	0.09	1.00	0.00	0.29
PCT_UNION	13.09	26.60	4.60	6.03
PHYS per 1k	266.04	813.29	167.40	79.87
N	1671			

Table 9: **Variable Means for MALES - 2008**

Variable	Mean	Max	Min	Std Dev
Principal	64721.82	117000.00	1000.00	20017.47
Household	99667.22	250000.00	10000.00	44853.61
OTHINC	33414.38	236000.00	0.00	37949.21
Gender	1.00	1.00	1.00	0.00
MARRIED	0.76	1.00	0.00	0.43
age	45.03	65.00	22.00	10.39
DIPL	0.07	1.00	0.00	0.25
ASSOC	0.47	1.00	0.00	0.50
BACC	0.37	1.00	0.00	0.48
PhD_MS	0.10	1.00	0.00	0.30
FOREIGN	0.06	1.00	0.00	0.23
LPN	0.21	1.00	0.00	0.41
CH_NO	0.56	1.00	0.00	0.50
CH_ALL	0.07	1.00	0.00	0.26
CH_GE6	0.26	1.00	0.00	0.44
CH_LE6	0.10	1.00	0.00	0.30
WHITE	0.80	1.00	0.00	0.40
HISP	0.05	1.00	0.00	0.22
ASIAN	0.06	1.00	0.00	0.24
AFRAMER	0.04	1.00	0.00	0.21
OTHRACE	0.04	1.00	0.00	0.20
NE	0.16	1.00	0.00	0.37
SOUTH	0.39	1.00	0.00	0.49
MIDWST	0.16	1.00	0.00	0.37
WEST	0.28	1.00	0.00	0.45
RESMSA	0.76	1.00	0.00	0.43
POTEXP	14.28	41.00	0.00	9.59
WAGE_RT	32.34	153.85	4.38	10.62
WAGED	1.00	1.00	1.00	0.00
hrs_yr	2033.37	2667.00	130.00	422.62
LNWAGE_RT	3.43	5.04	1.48	0.31
LNHRS_YR	7.58	7.89	4.87	0.33
WORK_FT	0.90	1.00	0.00	0.30
WORK_PT	0.10	1.00	0.00	0.30
PCT_UNION	13.10	26.60	4.60	5.99
PHYS per 1k	266.38	813.29	167.40	80.35
N	1510			

Table 10: **Variable Means for WORKING MALES - 2008**

Variable	Mean	Max	Min	Std Dev
Principal	46891.61	117000.00	0.00	26853.39
Household	108955.82	250000.00	10000.00	51736.82
OTHINC	59463.51	250000.00	0.00	52472.00
Gender	2.00	2.00	2.00	0.00
MARRIED	1.00	1.00	1.00	0.00
age	46.50	65.00	20.00	10.52
DIPL	0.14	1.00	0.00	0.34
ASSOC	0.36	1.00	0.00	0.48
BACC	0.38	1.00	0.00	0.49
PhD_MS	0.12	1.00	0.00	0.33
FOREIGN	0.04	1.00	0.00	0.20
LPN	0.19	1.00	0.00	0.39
CH_NO	0.52	1.00	0.00	0.50
CH_ALL	0.08	1.00	0.00	0.27
CH_GE6	0.30	1.00	0.00	0.46
CH_LE6	0.11	1.00	0.00	0.31
WHITE	0.88	1.00	0.00	0.33
HISP	0.03	1.00	0.00	0.16
ASIAN	0.04	1.00	0.00	0.20
AFRAMER	0.04	1.00	0.00	0.19
OTHRACE	0.02	1.00	0.00	0.15
NE	0.21	1.00	0.00	0.40
SOUTH	0.44	1.00	0.00	0.50
MIDWST	0.14	1.00	0.00	0.35
WEST	0.21	1.00	0.00	0.41
RESMSA	0.74	1.00	0.00	0.44
POTEXP	20.47	47.00	0.00	11.76
WAGE_RT	26.74	528.85	0.00	14.91
WAGED	0.88	1.00	0.00	0.33
hrs_yr	1564.45	2667.00	0.00	785.06
LNWAGE_RT	2.94	6.27	0.00	1.15
LNHRS_YR	6.48	7.89	0.00	2.49
WORK_FT	0.61	1.00	0.00	0.49
WORK_PT	0.27	1.00	0.00	0.44
PCT_UNION	13.08	26.60	4.60	5.74
PHYS per 1k	268.30	813.29	167.40	69.05
N	18718			

Table 11: **Variable Means for MARRIED FEMALES - 2008**

Variable	Mean	Max	Min	Std Dev
Principal	53565.06	117000.00	200.00	21592.82
Household	108838.80	250000.00	10000.00	49232.27
OTHINC	53799.82	249200.00	0.00	47424.50
Gender	2.00	2.00	2.00	0.00
MARRIED	1.00	1.00	1.00	0.00
age	45.93	65.00	20.00	10.41
DIPL	0.13	1.00	0.00	0.34
ASSOC	0.37	1.00	0.00	0.48
BACC	0.38	1.00	0.00	0.49
PhD_MS	0.12	1.00	0.00	0.33
FOREIGN	0.04	1.00	0.00	0.20
LPN	0.19	1.00	0.00	0.39
CH_NO	0.51	1.00	0.00	0.50
CH_ALL	0.08	1.00	0.00	0.27
CH_GE6	0.31	1.00	0.00	0.46
CH_LE6	0.11	1.00	0.00	0.31
WHITE	0.87	1.00	0.00	0.33
HISP	0.03	1.00	0.00	0.16
ASIAN	0.04	1.00	0.00	0.20
AFRAMER	0.04	1.00	0.00	0.19
OTHRACE	0.02	1.00	0.00	0.15
NE	0.21	1.00	0.00	0.41
SOUTH	0.44	1.00	0.00	0.50
MIDWST	0.14	1.00	0.00	0.35
WEST	0.21	1.00	0.00	0.41
RESMSA	0.74	1.00	0.00	0.44
POTEXP	19.77	46.00	0.00	11.61
WAGE_RT	30.54	528.85	1.60	11.74
WAGED	1.00	1.00	1.00	0.00
hrs_yr	1787.10	2667.00	4.00	553.28
LNWAGE_RT	3.36	6.27	0.47	0.34
LNHRS_YR	7.41	7.89	1.39	0.50
WORK_FT	0.69	1.00	0.00	0.46
WORK_PT	0.31	1.00	0.00	0.46
PCT_UNION	13.13	26.60	4.60	5.69
PHYS per 1k	268.66	813.29	167.40	69.33
N	16386			

Table 12: **Variable Means for WORKING MARRIED FEMALES - 2008**

Variable	Mean	Max	Min	Std Dev
Principal	52635.66	117000.00	0.00	25913.58
Household	66474.47	250000.00	10000.00	31330.99
OTHINC	13224.68	250000.00	0.00	25505.63
Gender	2.00	2.00	2.00	0.00
MARRIED	0.00	0.00	0.00	0.00
age	46.89	65.00	21.00	11.98
DIPL	0.12	1.00	0.00	0.32
ASSOC	0.37	1.00	0.00	0.48
BACC	0.38	1.00	0.00	0.49
PhD_MS	0.13	1.00	0.00	0.33
FOREIGN	0.04	1.00	0.00	0.18
LPN	0.20	1.00	0.00	0.40
CH_NO	0.76	1.00	0.00	0.43
CH_ALL	0.02	1.00	0.00	0.15
CH_GE6	0.19	1.00	0.00	0.39
CH_LE6	0.03	1.00	0.00	0.17
WHITE	0.83	1.00	0.00	0.38
HISP	0.03	1.00	0.00	0.16
ASIAN	0.04	1.00	0.00	0.19
AFRAMER	0.08	1.00	0.00	0.27
OTHRACE	0.03	1.00	0.00	0.16
NE	0.20	1.00	0.00	0.40
SOUTH	0.43	1.00	0.00	0.49
MIDWST	0.14	1.00	0.00	0.35
WEST	0.23	1.00	0.00	0.42
RESMSA	0.78	1.00	0.00	0.41
POTEXP	19.62	47.00	0.00	12.78
WAGE_RT	27.35	132.21	0.00	13.33
WAGED	0.90	1.00	0.00	0.30
hrs_yr	1751.42	2650.00	0.00	731.25
LNWAGE_RT	3.02	4.88	0.00	1.07
LNHRS_YR	6.75	7.88	0.00	2.32
WORK_FT	0.76	1.00	0.00	0.43
WORK_PT	0.14	1.00	0.00	0.34
PCT_UNION	13.37	26.60	4.60	5.90
PHYS per 1k	273.39	813.29	167.40	76.36
N	6209			

Table 13: **Variable Means for SINGLE FEMALES - 2008**

Variable	Mean	Max	Min	Std Dev
Principal	58716.28	117000.00	1000.00	19799.17
Household	68193.95	250000.00	10000.00	29289.43
OTHINC	10227.83	240000.00	0.00	21035.78
Gender	2.00	2.00	2.00	0.00
MARRIED	0.00	0.00	0.00	0.00
age	46.22	65.00	21.00	11.92
DIPL	0.11	1.00	0.00	0.32
ASSOC	0.38	1.00	0.00	0.49
BACC	0.38	1.00	0.00	0.49
PhD_MS	0.12	1.00	0.00	0.33
FOREIGN	0.04	1.00	0.00	0.18
LPN	0.20	1.00	0.00	0.40
CH_NO	0.75	1.00	0.00	0.43
CH_ALL	0.02	1.00	0.00	0.15
CH_GE6	0.19	1.00	0.00	0.40
CH_LE6	0.03	1.00	0.00	0.18
WHITE	0.83	1.00	0.00	0.38
HISP	0.03	1.00	0.00	0.17
ASIAN	0.04	1.00	0.00	0.19
AFRAMER	0.08	1.00	0.00	0.27
OTHRACE	0.03	1.00	0.00	0.16
NE	0.20	1.00	0.00	0.40
SOUTH	0.42	1.00	0.00	0.49
MIDWST	0.14	1.00	0.00	0.35
WEST	0.23	1.00	0.00	0.42
RESMSA	0.78	1.00	0.00	0.41
POTEXP	18.85	47.00	0.00	12.59
WAGE_RT	30.51	132.21	5.39	10.08
WAGED	1.00	1.00	1.00	0.00
hrs_yr	1953.75	2650.00	35.00	448.48
LNWAGE_RT	3.37	4.88	1.68	0.32
LNHRS_YR	7.53	7.88	3.56	0.37
WORK_FT	0.85	1.00	0.00	0.36
WORK_PT	0.15	1.00	0.00	0.36
PCT_UNION	13.34	26.60	4.60	5.86
PHYS per 1k	273.21	813.29	167.40	76.55
N	5566			

Table 14: **Variable Means for WORKING SINGLE FEMALES - 2008**

The means of the estimation samples in Tables 1 and 2 suggest that the current nursing shortage will very likely continue to be a problem. The observed RN labor participation rate for the 2004 and 2008 full estimation samples are roughly 83% and 88% respectively. Thus, with such high participation, this group can safely assumed to be near full utilization. In addition, most nurses are in their mid-forties. The average age of the nursing population suggests that in ten to fifteen years, the nursing labor force will need a major replenishment of new nurses to compensate for retiring nurses leaving the labor force. As with previous NSSRN studies, the current estimation sample is composed primarily of women. Nearly three quarters of this sample are also married.

The current observed sample participation rates are comparable with the NSSRN 2000 estimation sample of Chiha and Link. The 2004 estimation sample participation rates are 88 percent for men, 81.0 percent for married women, and 88 percent for single women. The 2008 estimation sample participation rates are 90 percent for men, 88.0 percent for married women, and 90 percent for single women. However, Chiha and Link observed participation rates of 89.5-90.2% for men, 84.2% for married women, and 89.4% for single women (Chiha and Link, 2003, p. p359-361). In particular, married female RNs' participation rates have grown significantly more than male and single female RNs' participation rates from 2004 to 2008. Thus, the growth in the participation rate of married female RNs seems to be driving the overall growth of the participation rate. The continued increase in participation over time will likely impact the estimation strategy (essentially, whether or not selectivity is

an issue), in this study as well as in future ones.

Approximately 3% of nurses in the 2004 and 4% in the 2008 sample received their training in a foreign country, suggesting that foreign born RNs are rather under-utilized in the current labor force. Why is this true? Approximately one fifth of current RNs previously held positions as an LPN in both datasets, which is a pretty high portion. This number could be increased if it is determined that RNs with previous LPN experience typically work more. The vast majority of the RNs in the sample, almost 85% are White in both datasets. The small portion, roughly 1% of nurses in 2004 and 3% in 2008, with Hispanic background provides evidence that the group is under represented in the RN labor force relative to the high number of Hispanics living the in the U.S.

A Staff RN is by far the most populated position, accounting for almost 60% of the full sample. Hospitals are by far the most common setting of employment, employing up to 56% of the full sample. There is a higher portion of males working as RNs in hospitals, with 67% of the sample. Ambulatory care is the next most common employment setting with 13% of the total sample. Male RNs hold more positions that involve time with direct care with patients, 68% opposed to approximately 56% of female RNs that work directly with patients.

Male RNs in the sample earn a higher wage than females, taking in almost $29 an hour opposed to approximately $27 an hour. This could be a premium paid to get more males to join the RN labor force and alleviate nursing shortages by getting an under-represented group more involved. It could also just be due to the gender wage

gap that is still somewhat prevalent in the U.S. A high average of the hours worked variable indicates that according to this sample, the available workforce is highly utilized. Any attempts to curb a nursing shortage would have to involve the training of more new RNs as most current RNs are already participating in the labor force.

Despite this growth in participation rates, less than one quarter of the full sample in 2004 and less than one tenth in 2008 work part time. When looking at married female RNs, less than two thirds work full time. On the other hand, 81 (76) percent of single female and 83 (81) percent of male RNs work full time in 2004 (2008). Consequently, even with the increase of married female RNs' participation in the nursing labor force, a large portion of this group only works part time.

As might be expected with the aging nurse population, nurses had graduated from their initial nursing program nearly 18 years prior to the survey. Single nurses had graduated roughly 17 years prior. However, men had graduated only 13 years prior. Since the average age of men is only slightly less than that of women, this suggests that men may be entering the field of nursing at an older age, possibly after shifting careers. Most nurses finished their highest level of education with either an associates or baccalaureate degree. In the 2004 NSSRN findings, the HRSA observed a trend in educational attainment away from diplomas (in a review of trends from previous NSSRN studies). About half of nurses complete a baccalaureate or higher degree, which does not vary by married women, single women or men. On the other hand slightly higher proportions of men complete a Masters degree or higher compared to women. Less than 3 percent of RNs are trained in a foreign country.

Almost one fifth of RNs have ever been a Licensed Practical Nurse (LPN). Comparatively, more single women have been an LPN than married women or men.

Predicted hourly wages are comparable to wage predictions obtained from previous studies utilizing the NSSRN data with a selectivity corrected model (Brewer et al, 2006). Predicted nurses' average hourly wage hovers around $25/hour. Male RNs make about $2/hour more than their female counter parts. Men also have a comparatively higher annual salary than women (which partially reflects their higher full time work participation). On the other hand, single female RN's had somewhat similar full time participation rates as male RNs and still earned considerably less than their male counterparts. Quite predictably, other family income for RNs (excluding their own salary) was greatest for female married nurses, given their spouses' potential to contribute to household income. Male RNs had roughly half of the other family income that female married nurses had, while single nurses had less than a quarter of other family income compared to married nurses.

Several environmental, work setting and position variables were also included in the current analysis. Coverage in a union (in the RN's primary nursing position) was limited to 13-13.15 percent of the RN population overall for both datasets. On average, RNs spend over half of their time in a day on direct patient care. Male RNs spend more time on direct patient care (60%) than their female counter parts do (married females spend 53 percent and single females spend 56 percent). Of possible work settings, most nurses work in a hospital setting (53 percent). The 2004 findings of the NSSRN by the HRSA indicate that some other highly represented work settings

are ambulatory care, public/community health settings, extended care facilities or other settings (i.e. nurse educator). However, the HRSA notes a slight reduction in the proportion of RNs employed in a hospital setting, even though the overall number of RNs employed in hospitals increased (from observations of previous NSSRN findings). More men worked in the hospital setting compared to women (more single women worked in a hospital setting than married women). Most RNs, who are employed, hold a position as a staff nurse, with single women and men being more likely than married women to hold this position. Though the staff nurse position is by far the most common position among nurses, head nurse positions, administrative positions and patient coordinators also arise as the next most common positions held. Of these other positions, the patient coordinators differ most between men and women. Almost twice as many women are patient coordinators versus men. Single women were the most likely to change jobs with 15 percent having changed positions in the past year. Men were slightly less likely to switch jobs with (14 percent switched), followed by married women (11 percent).

The observed demographic statistics are comparable to previous studies using the NSSRN sample (Brewer, et al, 2006). The vast majority of RNs in the sample are women (94 percent). While three quarters of the full sample are married, roughly 70 percent of men are married. The average age of nurses is 46 years old (the observed average age of RNs is the oldest since the NSSRN's inception in 1977 according to the HRSA). Men are slightly younger (44.6 years old). Roughly 90 percent of RNs are white, though the number should be reviewed with some caution given the large

number of missing values for this question. About half of RNs have children, though less than 10 percent have small children under six. Roughly a third of RNs lived in the Southern Census region. Most RNs also live in a metropolitan statistical area.

In addition, some market level variables were also analyzed on the state level such as health insurance coverage, percent union coverage, hourly manufacturing wage and physician and nurse rates per 100,000 (also based on data obtained for 2004 and 2008 from the statistical abstract of the US). Clearly differences across single women, married women and men are driven by geographic location, thus there was not much variation between these groups for these variables. On average, RNs resided in a state with 85 percent health coverage and 13 percent union representation. The average manufacturing wage that RNs faced in the state in which they resided was about $16 dollars per hour. Per 100,000 people in the RN home state, there were 261 physicians and 869 nurses.

3.2 Models and Theoretical Framework

Key economic variables include the own wage and family income in any model of labor supply. The predicted sign of the own wage variable in the participation equation is positive, but ambiguous in the hours equation. There is only a substitution effect in the participation equation. Therefore, the own wage should have a positive impact on the labor force participation. Results in the literature surveyed show evidence of the above a priori expectation. However, in the hours equation, an increase in the wage may or may not increase the hours worked because as the RN wage increases, the income effect reduces hours of work, while the substitution effect increases hours of work.

Economic theory suggests that the other family income (OTHINC) has a pure income effect on hours worked. Because leisure time is treated as a normal good, it should negatively affect hours worked, a result found in previous studies.

Studies show evidence that family composition has an important effect on the labor supply decisions of married women. An increase in the number of young children in the home is likely to raise a woman's reservation wage and therefore reduce the probability she will work. The presence of younger children in the household is therefore expected to negatively affect hours worked and labor force participation.

Because not all nurses work, it is important to test for errors in the wage estimation based on sample selectivity. Sample selectivity arises in a sample when non-randomly selected samples are analyzed for relationships. For example, observed

positive wages and observed positive hours may be non-randomly selected from a population of potential workers. Estimating wages or hours among workers without adjusting for this problem could lead to biased, inconsistent estimates of wages and hours. Heckman (1979) proposed a two-stage estimation procedure to correct for this problem. In the first stage, instruments are used to estimate the probability of being selected (i.e. probability of working). For the current analysis, the probability of working was assumed to follow a normal distribution. The selection adjustment allows for the possibility that there exist unobservable variables that affect both the decision to work and the wage rate given that the individual does work. Link used the well-known methodology developed by Heckman [41] to obtain consistent estimates associated with the predicted wage. While the Heckman estimates are consistent and unbiased, they are not fully efficient. Therefore, once the Heckman coefficients are estimated for the wage equation from the two-stage Heckman procedure, they were then used as initial values in a maximum likelihood estimation technique that yields consistent and efficient estimates of the model parameters [42]. Thus, if possible, MLE estimates are preferred. The predicted wages based on this selectivity-corrected equation were used to construct the wage rate variable included in the participation and hours given participation equations. The resulting selectivity corrected coefficients are consistent and unbiased.

Though identification of the Heckman Two-Stage model is guaranteed by the nonlinear functional form of the estimation technique used, it is preferred to have additional variables in the selection equation, which are excluded from the outcome

equation to reduce multicollinearity in the second stage outcome equation[1]. Based on these coefficients, a selectivity-corrected predicted wage for the whole sample can be estimated.

The basic labor supply model for the current analysis is drawn from consumer demand theory of the consumption-leisure model. With the known history of observed selectivity bias in labor supply modeling and research (Greene, 2003), selectivity was tested for and corrected wherever applicable. The emphasis in the current analysis is on the female labor supply. To that end, the current analysis focuses on factors which have been shown to affect the female labor supply (estimates for males were obtained separately). The factors included are predicted own wage, educational attainment, other family income, age, family composition, potential experience, demographic and geographic characteristics. Earlier research on the labor supply suggests that the other family income should negatively impact hours worked by RNs. In addition, the presence of children in the home (specifically young children - six years or less) should negatively impact hours worked by RNs. Education, potential experience, demographic and geographic factors have ambiguous impacts across studies.

The impact of RN wages on the labor supply of registered nurses is of

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[1]For the labor supply equations, such variables were difficult to find in the NSSRN data. Potential variables for identification were tested for the labor supply equations (RN Union coverage, level of direct patient care, work setting and work position). The outcome will be discussed further in the results section.

particular interest to policy makers. The impact of own wage has two components; an *income* and a *substitution* effect. The first one would cause a decline in hours worked due to an increase in own wages and therefore a negative impact on the labor supply. The second one would cause an increase in hours worked due to the substitution of more hours worked for leisure time and thus a positive impact on the labor supply (Reynolds, et al, 1986). However, in the labor participation model, the income effect should not be observed, because if an RN does not currently work, higher wages should not reduce the probability of working. Hence, only the positive substitution effect should be observed in the participation model. On the other hand, it is unclear whether the income or substitution effect will dominate in the labor supply model. Although, most of the recent research on nurses or women's working behavior suggests that their labor supply is inelastic, but not backward bending.

3.3 Estimation Overview

The Heckman Two-step selectivity estimation as described above, was estimated and corrected for (wherever applicable) for all wage and labor supply equations. The first step in estimating the labor supply of nurses in the current analysis was obtaining consistent, unbiased predictions of wages for all nurses. The wage participation model was derived from the model estimated by Chiha and Link in 2003 for the 2000 NSSRN, with some enhancements. (Please refer to Table 1 in the Appendix for detailed variable definitions.) The wage estimation model is as follows:

Stage (1): Wages Greater than Zero Dummy = β*Participation determinants + ε

Stage (2): Log(Wages) = γ*RN wage determinants + $\sigma\rho$*Inverse Mills Ratio + μ

The method consists of obtaining initial parameter estimates which are then used as initial values in a maximum likelihood procedure that yields consistent and efficient estimates of β, γ, ρ and σ, where σ is the standard error of Stage (1) Equation. The maximum likelihood procedure allows for the possibility that there are unobservable variables affecting the decisions to work and, if hours worked are greater than zero, the actual number of hours worked. If the correlation between the error terms in Equations 1 and 2 is nonzero and significant, predictions of hours worked based only on RNs who work yield biased estimates. In other words, if unobservable characteristics of RNs that affect their probability of labor force participation are correlated with unobservable determinants of their supply of hours of work, the OLS estimates of the hours equations will be biased. The estimation strategy tests for selection bias and if present, corrects for it.

The *Stage (1) wage participation equation* determinants include a constant, other family income (in thousands), educational attainment (Diploma, Baccalaureate, Master/Doctorate and Associate -omitted), indication of foreign training, indication of Licensed Practical/Vocational Nurse (LPN/LVN), indication of marital status, mutually exclusive indication of children in the home (all less than 6, all greater than 6 and less than 18, some less than 6 and some greater than 6), age, race indicator, residence in a Metropolitan Statistical Area (MSA) indicator, Census Region Indicators (Northeast, Midwest, West, South Omitted), potential experience (years since graduation from initial RN training program) and an indicator of union representation.

The *Stage (2) log of wage equation* determinants include a constant, indicators for educational attainment, potential experience, potential experience squared, race indicator, residence in a MSA, Census Region indicators, percent of state where RN resides which has union coverage, physicians per 100,000 in state where RN resides, indicator whether the RN has union representation in their primary nursing position. All Census data regarding physicians, nurses, health insurance coverage and unionization by state were obtained from the statistical abstract of the US for the years 2004 and 2008. Wages provided are based on the RN's estimate of annual salary divided by annual hours worked in their primary nursing position for the years 2004 and 2008.

The current labor supply model was based on the model created by Chiha and Link (2003). Some additional environmental variables were also studied based on the contemporary literature. The appendix provides more detailed descriptions of these variables in Table 1. The basic model is as follows:

Stage (1): Annual Hours Greater than Zero Dummy = β_0 + β_i*Participation determinants + ε

Stage (2): Log(Annual Hours Worked) = γ_0 + γ_i*Hours worked determinants +$\sigma\rho$*Inverse Mills Ratio + μ

The *Stage (1) hours participation* determinants include a constant, predicted wages for RNs, educational attainment, residence in a MSA status, age, Census region indicators, percent of union coverage in the state where the RN resides, physicians per 100,000 in the state where RN resides, indication of children in the home, indication

of LPN/LVN, indication of foreign training, race indicator, and other family income.

The *Stage (2) log of hours equation* determinants include a constant, predicted wages for RNs, educational attainment, residence in a MSA status, age, Census region indicators, percent of unionization in the state where RN resides, physicians per 100,000 in the state where RN resides, indication of children in the home, indication of LPN/LVN, indication of foreign training, race indicator, and other family income. Finally in this study, indicator variables were created to identify missing values (in lieu of deletion) to preserve sample size and to make results comparable across models. (Variables like ED_MISS, RACE_MISS - they have been indicated in the Variable Definition section in the Appendix).

Variable Definitions. In the context of the current study of the RN labor market, the two dependent variables represent whether or not a nurse chooses to work, and if so, how many hours she works per year.

The independent variables used in the analysis are noted below.

The log of RNs' real hourly market wage. Maximum likelihood was used to estimate selection-corrected wage equations for 2004 and 2008 then wages were predicted for all the RNs in the samples. The predicted wage variable was then included in the participation and hours equations. Included in the wage equation are variables indicating: educational attainment, potential labor market experience, race, sex, region of residence, and residence in a metro area. Also included are variables representing key characteristics of the health and labor markets in the location of the

RN's residence. These include the number of physicians per 100,000 population, and the percentage of the state's labor force which is unionized.

Other family income (thousands of dollars). The NSSRN data provide a measure of total family income, and another measure of earnings from working as an RN. Total family income excluding the earnings of the RN has been calculated as total family income minus RN earnings.

Level of education. Nursing is unique in the sense that entrance to the profession is basically from three different degree programs, associate degree, B.S. degree and diploma degree. Dummy variables were created to indicate whether the RN received as the highest academic nursing degree an Associate degree (a two-year program at a community college), a Diploma degree (a three-year program at a nursing school sponsored by a hospital), a B.S. degree (a four-year program at a college or university), or a Graduate degree (this is minor).The NSSRN also provided information about the type of program that *initially* qualified the respondent to be an RN.

Presence of children at home in different age groups. One-zero dummy variables were created to signify the presence of children in different age groups: all children less than or equal to six years old; all children greater than six years old; some greater, some less than six years old - that is children of all ages; and no children in the home.

Foreign RN. This variable assumes the value of 1 if the RN is foreign-trained. This characteristic is included because the government has allowed foreign RNs to

obtain working papers in the U.S. in order to help alleviate shortages, although this has raised ethical concerns.

Previously an LPN. This variable takes the value of 1 if the RN was previously a licensed practical nurse (LPN). It is included because skills of qualified LPNs can be upgraded so that they can become RNs to help alleviate shortages.

Other Controls included in all participation and hours equations. These include age, race, region of residence, potential experience (number of years since graduation) and potential experience squared.

Chapter 4

DETERMINANTS OF PARTICIPATION AND LOGARITHM OF HOURS WORKED

4.1 Wage Estimation Results

Results for the wage regressions to obtain the predicted RN wage for each sample are listed in Tables 18 and 19 of the Appendix for 2004 and 2008 datasets. Table 16 lists the estimated coefficients of the wage participation Probit equation (i.e. if wage > 0, then the dummy variable for working equals 1, else the dummy variable equals 0) for the full sample of 2004 and 2008 datasets. Table 17 lists the estimated coefficients for the log of wages equation for the full sample of 2004 and 2008 datasets. The estimates were obtained via the Two-Stage Heckman procedure for the 2008 dataset, where selectivity bias was detected. In case of no selection (for the 2004 dataset, OLS was used to obtain efficient estimates of wage).[2] Link proposed that the inclusion of potential experience with age may have caused collinearity, which would hinder MLE regression. In addition, the high level of participation of the sample may also be underlying the lack of convergence of the MLE estimates. With such high participation, there may not be enough variation in the data to obtain convergence

[2] Several attempts were made to modify the model to obtain convergent MLE estimates. Various variable combinations (and inclusion/exclusion variations) were attempted. The inclusion of extra variables was also attempted. Union representation was tested as an identifying variable, but without any success. Greene also recommends reviewing the scaling of variables (1995). Several scaling transformations were attempted without MLE convergence. Higher order terms for age and potential experience were also tested without success.

using MLE. In two recent studies by Brewer et al, (2006 and 2008), log wage regressions were also estimated using OLS, which provides some additional support for the validity of using OLS. The MLE estimates for the cases with selectivity did converge by increasing the number of iterations to 500. Finally, since the wage and hours equations are estimated with the dependent variable in logs, the interpretation of the coefficients is straightforward. For example, if a dummy variable (like gender) has a coefficient of 0.205 in the wage equation, then this implies that male RNs earned 20.5 percent more than female RNs (with all other factors held constant and females as omitted class).

Other Income

As anticipated, other income has a significant negative impact on participation (at the 5 percent level). As household income increases (excluding the nurse's own income), with all other factors held constant, the nurse will be less likely to participate in the workforce. This is consistent with previous studies using the NSSRN data (Chiha and Link, 2003 and Brewer et al, 2006). This variable was excluded from the log wage equation and serves as an instrument in the two stage equations.

Educational Attainment

Overall, educational attainment had a modest impact on participation. As would be expected, education was more important in determining wages. Completion of a diploma or associate degree as the highest degree earned did not affect RN's probability of working; although, attaining a Masters or Doctoral degree increased the probability of working for RNs. Completion of a Baccalaureate as the highest degree,

only increased RN wages by about 3.6 percent compared to Associate degree nurses(at the 1 percent level) for both years. This is not surprising, given the trend in recent years for RNs to pursue more advanced degrees according to the key findings reported on the 2004 and 2008 NSSRN from the HRSA. As more nurses pursue higher degrees, employers will face higher salary expectations from RNs. Accordingly, attainment of Masters or Doctoral degrees significantly increased predicted RN wages by 18and 16 percent (at the 1 percent level) for the 2004 and 2008 datasets respectively. This result is consistent with the most recent estimates of Brewer, et al (2008). Brewer et al, also found that attaining a Baccalaureate had a small positive impact on wages for RNs compared to Associate degree nurses). Chiha and Link also found a relatively small return for the Baccalaureate degree investment, suggesting a rather poor rate of return for that degree.

Foreign and LPN

In recent years, attempts have been made to increase the nursing labor force by attracting foreign trained nurses and Licensed Practical Nurses into the registered nurse population. Neither of these variables had a significant influence on participation in the 2008 dataset and neither were included in the wage equation. They did have a small positive effect on participation in the 2004 dataset.

Marital Status and Family Composition

The family dynamic is an important factor for participation. Being married significantly increased the probability of participation in the workforce at the 1 percent level (this variable was excluded from the log wage equation). This result is

surprising, given the higher participation rates of single women. The result could be a reflection of aggregating the data for the regression. As with previous studies, the presence of young children (less than 6 years old) significantly reduces the probability of working (at the 5 percent level).

Age

In light of the aging US population, the demand for RNs is expected to increase. However, RNs are also aging with the mean age of nurses being in the mid-forties. Replenishment of the nursing labor force will be crucial to keep up with anticipated demand. With the dual increase in age and overall participation of nurses from the 2000 NSSRN, it is not surprising that age has a significant, negative impact on the probability of working. This may be driven by dynamics from the personal life of nurses. For example, a nurse in her forties may be more likely to participate than a nurse in her early fifties due to physical demands of the work, need for household income for children in college or preparation for retirement. Age terms were not included in the wage regressions.

Race

White non-Hispanic nurses were more likely to participate in the labor force, although the effect was marginally significant (at the 10 percent level). White nurses also earned 2 percent less than non-white nurses, which was significant at the 5 percent level (the non-white group includes a broad ethnographic composition such as Asian, Native American, African American, Hispanic, etc.). This wage result is consistent with recent estimates by Brewer et al, although Brewer found larger

differences in wages between whites and nonwhites (thus, nonwhites are expected to earn 3 to 10 percent higher wages than whites). The large number of missing values in the 2004 analysis for this variable has been taken care of by introducing a dummy variable for the missing category, in lieu of deletion of the observations.[3]

Residence in an MSA and Census Region

Market characteristics such as residence in a metropolitan statistical area and census region of residence impacted participation and wages of RNs. MSA residence increased the probability of working in the nursing labor force (significant at the 1 percent level). MSA residence also associated with an 11.6 (9.3) percent premium for RNs compared to RNs who lived outside of a metropolitan area for 2004 (2008) datasets. Census regions did not affect participation in the 2004 dataset. For the 2008 dataset, living in the Mid-Western US is associated with an increased probability of working in the nursing force (significant at the 1 percent level) compared to the Southern US, which was the omitted category. The effect was marginally significant for the Northern-Eastern US (at the 5 percent level). RNs in the Northern and Mid-Western US made less than RNs residing in the Southern US for the 2004 dataset, while they made significantly more for the 2008 dataset. Only the Western RNs

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[3] In the current estimation sample, missing values were deleted for race (as they were for other key variables). The reason that race had a large amount of missing values was due to a change in the survey implementation of the 2004 NSSRN by the HSRA. The HSRA indicated that for the 2004 NSSRN, follow up practices were limited for certain variables (including race) in order to focus on other variables considered more critical.

consistently and significantly made more than their Southern counterparts (at the 1 percent level) 5.7 (12.3) percent for 2004 (2008).

Potential Experience

Potential experience, the average years since graduation from initial nursing program, is approaching 19 years for the sample. As expected, potential experience positively impacted RN wages (significant at the 1 percent level). However, the size of the effect is relatively small, at about 1.5 percent.

Union

The extent of union representation in state can be an important factor in nurses' participation decisions, because of its potential to improve earnings and working conditions for RNs. An increased extent of union representation in the RN's state of residence did not have a significant effect on the participation rate.

Gender

Gender was included in the wage and participation equations. Similar to recent studies, male RNs had higher salaries than female RNs. Male RNs earn nearly 8.9 (7.4) percent more than female nurses (significant at the 1 percent level) for the 2004 (2008) dataset. This result is consistent with recent results from the 2006 and 2008 Brewer et al nursing wage estimates.

Potential Experience

Potential experience has a significant positive impact on the wage equation up to a certain point and then it has a significant negative effect as indicated by the negative coefficient of the squared terms.

The significant, negative impact of the potential experience variable on wage may be reflective of general dissatisfaction in the nursing labor force (i.e. burn out, stress, high levels of overtime, etc.). These factors could cause some nurses to choose an alternate career in which the RN training would have some value, but the career is outside the field of nursing (perhaps in a managed care organization or pharmaceutical company). It could also just be picking up general life cycle events that cause earnings to decline in later years in the workforce.

Market Level Variables

Several healthcare market characteristics affected RN wages (that were not included in the participation equation). The number of physicians and nurses per 100,000 in the population in the RN's home state significantly impacted nursing wages (at the 5 percent level). Having more doctors should increase demand for nurses, and as such increases in physicians should increase wages as well. The estimates confirm this with physicians per 100,000 having a significant positive effect on RN wages. In addition, the percent of the RN's home state which is unionized positively impacts RN wages. States with higher levels of unionization will tend to have more support for union practices (compared to states without comparable levels of unionization). Consequently, unions in states with high unionization levels can be more effective at increasing wages in the RN's home state. This effect was observed in both of the samples. A one percent increase in the level of unionization coverage was associated with a 0.56 (0.35) percent increase in RN wages (significant at the 5

percent level) in the 2004 (2008) dataset. These results indicate the continued importance of studying unionization in the RN's state of residence factors at both the environmental (RN's workplace) and market levels. Both the hourly manufacturing wage and the percent of healthcare coverage in the RN's home state had no impact on RN wages.

Selection Bias

For the wage regressions, the coefficient of rho (the Inverse Mills Ratio) was negative and significant for Married Females for both datasets. This result provides evidence of selectivity. Hence, predictions of wages would be understated, without making any adjustment for selectivity. This result implies that nurses included in the current sample, who chose to work, had lower wages than a randomly selected nurse who was not employed in nursing at the time of the survey. The average predicted selectivity corrected wages for RNs were $25/hour for the full sample ($27.32 for men, $26.73 for married women, and $25.89 for single women). With the high observed rates of participation in the sample (roughly 90 percent), selection bias was observed in some samples. Selection corrected models were estimated.

4.2 Labor Supply Estimation Results

Results for the participation and log of annual hours worked are listed in Tables 20, 21, 22, and 23 of the Appendix. Tables20 and 21 list the estimated coefficients of the participation Probit equation (i.e. if hours > 0, then the dummy variable for working equals 1, else the dummy variable equals 0) for 2004 and 2008

respectively. Tables22 and 23 list the estimated coefficients of the log of annual hours equations for 2004 and 2008 respectively. The estimates were obtained via the Two-Stage Heckman procedure, in cases were selectivity was found to be existent, using Maximum Likelihood Estimates.[4] In the cases where selectivity was not present, a Probit was estimated for the participation equation, while OLS was used for the log of hours equation.

Predicted Own Wage

Predicted log of RN wages were obtained from the wage regressions (adjusted for selectivity) shown in Tables 18 and 19 of the Appendix. RNs' own wage did not have a significant impact on participation rate of the entire sample. For married women and men, wages had no significant impact on hours worked (although, for married women, the coefficient was negative and almost significant at the 10 percent level for the 2004 dataset, while positive and not significant for the 2008 dataset). For

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[4]MLE estimates were not possible initially, with the high level of collinearity of variables in the participation equation with variables in the log of hours equation. The union membership of RN's in their primary nursing position was tested as a potential variable for identification—MLE estimates were still unsuccessful with its inclusion in either the participation or log hours equations. In some cases, it was significant in the participation equation; however it had a perverse interaction with predicted RN wages. Inclusion of the Union variable caused the coefficient of RN wages to be negative and significant. When the union variable was removed from the participation equation, RN wages were positive and significant as economic theory predicts. Union was not significant in the log of hours equations. Link suggests that the impact of unions enters the log of hours equations through the predicted wages of RNs (which already incorporates the RN's union coverage). Hence Union was removed from the Labor Supply Equations, with consistent estimates using MLE (all MLE algorithms converged finally, after increasing the maximum number of iterations to 500).

single women, wages had a positive impact on hours worked, although not significant for the 2004 dataset, but highly significant for the 2008 dataset. This represents a situation where the substitution effect dominates the income effect, which means that as RN wages increase, single women will work more. However, the effect is rather small (0.04 and 0.34 elasticity); a one percent increase in wages will be expected to increase hours worked by single women by 0.04 (0.34) percent for the 2004 (2008) dataset. With the 2000 NSSRN sample, Chiha and Link found a small positive effect for single RNs (and no significant wage impacts on hours worked by married women or men). Overall, the results are fairly consistent with the literature, that suggests that wages have little to no impact on hours worked, which indicates an inelastic labor supply.

Other Family Income

Consistent with the wage participation equations, other family income had the expected significantly negative impact on participation. Increased household income (excluding the nurse's own wage) significantly decreased the probability of working for the entire sample (at the 1 percent level). However, the effect was fairly small (it was even smaller than the effects observed by Link and Chiha for other income).

When looking at hours, only married women's hours worked were significantly impacted by changes in other family income (at the 1 percent level) in both datasets. As other family income increases, married women are anticipated to work slightly less. Other family income did not significantly affect hours worked by single female RNs or male RNs in 2004 dataset, although it affects them significantly

(at the 1 percent level) in the 2008 dataset.

Educational Attainment

The effect of highest educational attainment varied significantly by cohort. Education had little impact on participation for the most part. For men, obtaining a baccalaureate degree significantly decreased the probability of working in nursing (compared to an Associate degree) at the 5 percent level (10 percent level for the 2008 dataset). For married women, attaining a graduate degree significantly increased the probability of working in nursing (compared to an Associate degree) at the 1 percent level (10 percent level for the 2008 dataset). For single women, attaining a diploma significantly decreased the probability of working in nursing (compared to an Associate) at the 1 percent level, for the 2004 dataset, while a graduate degree significantly increased the probability of working in nursing (compared to an Associate) at the 1 percent level for the 2008 dataset.

For log of hours worked, men who attained a graduate degree are expected to work significantly more hours than their associate degree counterparts (at the 5percent level) for the 2004 dataset, although this has no significant effect for the 2008 dataset. Married women who attained a graduate degree are expected to work significantly more hours than their associate degree counterparts (at the 5 percent level) for the 2004 dataset (not significant for the 2008 dataset).Single women who attained a diploma degree are expected to work significantly more hours than their associate degree counterparts (at the 1 percent level) for the 2004 dataset (not significant for the 2008 dataset). In general, RNs with a graduate degree are seen to put more hours than

their associate degree counterparts. Because nurse educators would need advanced degrees, this result corresponds well with the current trend of higher overtime hours for educators observed by the HSRA in their NSSRN findings.

Foreign and LPN

While being a foreign trained RN or previously being trained as an LPN had no effect on participation (as was seen with the wage participation equation), these factors do significantly impact hours worked by RNs. Married women who were foreign trained are predicted to work substantially more than non-foreign trained counterparts (significant at the 1and 5 percent level for 2004 and 2008 datasets respectively). This provides support for efforts of policy makers to recruit more foreign nurses into the labor force to increase nursing labor hours supplied, although there are some ethical concerns regarding foreign trained nurses being attracted from less developed nations that also face nursing shortages. Men who are foreign trained have no significant effect on hours worked. The sample of men is rather small, which suggests that these results for men should be viewed with caution. Having ever been an LPN is expected to slightly increase hours worked for all nurse cohorts (at the 5 percent level). Again, this provides support for efforts by policy makers to increase the nursing labor supply by recruiting LPNs to become RNs.

Family Composition

The presence of younger children (typically, six years or less) had the anticipated effects on both participation and hours worked by RNs. For men, having children increased their likelihood of participating in the labor force (at the 10 percent

level). For married women, the presence of any children reduced the probability of working in nursing, while the presences of either older children or older and younger children in the home increased the probability of working for male RNs (at the 1 percent level). The presence of children did not impact the probability of working for single female RNs, which may reflect the greater financial concerns of the single parents who may not be able to afford not to work. For men, the presence of children is does not have a significant effect on the hours worked. The presence of any children in the home also expected to reduce hours worked for married female RNs (at the 1 percent level). Single female nurses with any children do not have any significant effect on the hours worked. The negative impact on participation and hours worked by RNs, particularly for married women, is consistent with recent research on the nursing labor supply.

Age

Consistent with the wage regressions and the proportion of older nurses in the sample, age has a significant, negative impact on the probability of working. The coefficients of age were significant at the 1 percent level for all three groups. Using the derivative of the participation equation, the threshold or maximum level of participation with respect to age was identified. After this threshold is reached, RN participation would be expected to decline as they got older. The threshold age for participation was 40 for male RNs, 41 years old for married female RNs, and 42 for single female RNs.

Age was a significant factor in hours worked (at the 5 percent level) for women, while age did not significantly impact hours worked by men. Both married and single women are expected to work more as they age. Using the derivative of the hours supplied equation, the threshold or maximum hours worked with respect to age was identified. The threshold age for hours worked was 41 years for males, 45 years for married females, and 42 years for single female RNs. With the average age of nurses increasing, this suggests that policies which bring new nurses into the labor force will likely be more effective at increasing the supply of nursing labor (rather than trying to persuade the current nursing labor force to work more hours).

Race

In the population of RNs, race was not a significant factor in the decision to participate in the nursing labor force. Married, white women are expected to work less than married women of other ethnicities. Race did not impact hours worked for single women or men.

Residence in an MSA and Census Region

Living in a metropolitan statistical area only impacted married and single women's decision to participate in nursing. For married women, living in an MSA significantly increased their probability of working in nursing (at the 1 percent level). This effect could be a result of a metropolitan area's multitude of nursing jobs available. Only single female nurses for the 2004 dataset are expected to work more hours as a result of living in an MSA (significant at the 5 percent level).

Living in an MSA did not affect the hours worked by men or married women. Regional differences were more notable in the expected hours worked by nurses than on the probability of working in nursing. Western male nurses were more likely than Southern nurses to work (with the effect being significant for the 2008 dataset). Married female nurses from the Midwest are less likely to participate in the nursing labor force compared to Southern nurses (significant at the 1 percent level for the 2008 dataset). All the cohorts were significantly impacted by their region in terms of hours worked, although the coefficients are relatively small. Thus, regional dynamics affect work behavior for registered nurses.

Selection Bias in the Labor Supply Model

For the labor supply regressions, the coefficient of rho (the Inverse Mills Ratio) was only significant for married women in the 2004 dataset and not significant for single women or men elsewhere. Accordingly, this suggests that selectivity is not a significant problem overall for the labor supply estimation. This result indicates that selectivity bias may be diminishing. Nevertheless, it is still important to test for the potential bias, and if found to take appropriate measures to account for the same.

Chapter 5

SUMMARY & CONCLUSIONS

The nursing shortage is predicted to continue and actually worsen in the next twenty years. Understanding what determinants will expand the supply of nursing labor the most will be vital for policy makers, particularly given the negative impact the shortage has on patient care.

Several key variables had similar impacts across all studies, including the current analysis. The effect of other income was shown to have a negative impact on the hours worked by nurses. In addition, the presence of children reduced both the likelihood of working in nursing and the number of expected hours worked, particularly for married women. Further, foreign trained female nurses are expected to work more than their counterparts, although they comprise of only about 3.5 percent of the entire sample. Having ever been an LPN was also found to increase expected hours worked. This group, like registered nurses is a large portion in the healthcare industry and many have already upgraded their skills to qualify for licenses as RNs.

Data on labor force participation and annual hours worked were presented, which provided insights into why the small impact of the own wage is as expected. A high percentage of RNs participate in the labor force and when they do that, the hours worked are high. Almost 81 (88) percent of married female nurses and about 88 (90) percent of the single female nurses were in the labor force in 2004 (2008), and they

worked an average of more than 1,600 hours per year. The male counterparts have participation rates of about 90 percent and worked more than 1,900 hours per year, irrespective of marital status.

To create a successful policy to address the shortage of RNs in the long term, market forces and government policies must support investments in the education of new nurses. The concern is that the U.S. population, including the RNs, is aging. The average age of nurses in the U.S. was over 45 in 2004 and increased to over 46 in 2008. Moreover it is expected to increase. Our results in the previous section of this paper indicate that RNs tended to work more hours per year up to approximately age 41 to 45 years, after which the number of hours worked declines.

Policies need to be implemented to increase the number of RNs. Federal and state governments may start providing subsidies in the form of loans and scholarships to potential nurses. Loans could be offered so that loans and/or grants to RNs are exempted, or at least reduced, if the potential nurse would commit to work in a particular geographic area for a set period of time. A substantial portion of the RN population is composed of married women, implying that location decisions are likely to be made conditionally on the location of the spouse's job. Hence, they are likely to be geographically immobile. Even so, states may be skeptical about the loss of loan or scholarship recipients to other states. However, Coffman and Spetz [15], in their study noted that 99 percent of RNs educated in the state were still in California. Loans and scholarships are likely to have sizeable payoffs for the states that provide them, to the extent that this is a national phenomenon. Care should be taken while choosing

candidates for loans and scholarships to include not only the traditional groups, white females, but also people in groups that are currently under-represented in the profession such as Hispanics, African-Americans and males. The fact to be noted about males is that they prefer to work full time, as opposed to working part time compared to their female counterparts, as can be noticed by the fact that in 2008, male RNs worked about 1,840 hours per year on average, which is significantly more than the typical female RN, with an average of about 1,600 hours for the same period.

In the Heckman selectivity models, wage was not an effective tool to increase the hours worked by nurses, but not participation. With the high level of participation and annual hours worked by nurses as well as the advancing age of the RN population, the current nursing workforce may be utilized to full or near capacity. The wage results suggest that efforts should be made to increase the growth of new RNs instead of trying to increase the current hours worked by current RNs. More education infrastructure is needed to support the entry of new nurses, as was stated in the introduction to this thesis This may be an area where policy makers can focus to increase the nursing labor supplied.

Selectivity was identified in the estimation of wages in some cases, but was less of a factor for the labor supply estimations. Selectivity was identified in the wage equations, which implies that the estimates for wages would be biased without adjusting for the reservation wage of nonworking nurses. Selectivity was not statistical significant in the labor supply equations. The trend of increasing participation rates may make selection adjustments moot in future research, but the results of the analysis

indicate that researchers should still test for selectivity. One consequence of these higher participation rates may be that MLE methods will be more challenging to estimate, although varying certain estimation parameters may finally provide consistent estimates. If additional questions were included in the NSSRN which would specifically focus on the participation decision, but not on the decision to work a given number of hours, that would certainly improve identification of the model. However, these questions would be rather challenging to determine. As yet, identifying variables have not been included in the NSSRN questionnaire, so the models incorporate the best information available.

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Appendix

VARIABLE DEFINITIONS AND ESTIMATION RESULTS

Table 15: Variable Definitions

GENDER
Indicator variable for gender of the RN. (1=Male and 0=Female). Unknown or refused responses were deleted from the sample.

AGE
Age of RN at the time of the survey (2004 or 2008). RN's aged greater than 64 or less than 19 years of age were removed from sample.

MARRIED
Indicator variable for marital status of RN. (1=RN is married and 0=RN is not married).

OTHINC_1k
This is a measure of the other income brought in by spouses or family members in the household, in thousands of US Dollars. This variable was derived by subtracting RN's total salary, TOTSAL, from other household income, Q71 (Q68 for 2008), in case TOTSAL is positive. If TOTSAL is negative, earnings from principal nursing position, Q34 (Q30 for 2008 dataset) was used instead. The household income variable from the survey was grouped into ranges. Before the derivation of this variable, every observation was assigned a value to the midpoint of its respective range to make this derivation possible. This is therefore an approximate measure.

PWAGES
Predicted wages (in logarithm), as estimated by the Log Wage Equation for the RNs who have positive wage rate, and then calculated for the entire target sample, to be used in the Labor Supply Equations.

POTEXP
This is a measure of potential experience as an RN. The number of years passed since the RN graduated from their initial program and the year of the survey (2004 or 2008). This variable is derived from Q3Year (Q4YEAR for 2008), which is the year graduated from initial nursing program. Unknown or refused responses were deleted from the sample.

LPN
Indicator variable for whether or not the RN was ever licensed as an LPN/LVN. (1= licensed as an LPN and 0=Never licensed as an LPN). Unknown or refused responses were deleted from the sample.

UNION
Indicator variable for whether or not the RN has union representation in their primary nursing position. (1=Union representation and 0=No union representation).

PCT_UN_04/PCT_UN_08
Percentage Unionization in different states (for 2004 and 2008) where nurses work - a state level variable, obtained from the Bureau of Labor Statistics.

PHYS_04/PHYS_08
Number of physicians per 100,000 patients in the state where RN is employed(for 2004 and 2008)- a state level variable, obtained from the Bureau of Labor Statistics.

RESMSA
Indicator variable for whether or not the RN lives in a Metropolitan Statistical Area (MSA). (1=Residence in an MSA and 0=Does not reside in an MSA).

FOREIGN
Indicator variable for foreign training. (1=RN received training outside of U.S. and 0=RN received trained in U.S.) Unknown or refused responses were deleted from the sample.

Educational Attainment
DIPL
Indicator variable for the highest level of education completed by the RN. Unknown or refused responses were deleted from the sample. (1=Diploma and 0=Not Diploma).

ASSOC
Indicator variable for the highest level of education completed by the RN. Unknown or refused responses were deleted from the sample. (1=Associates and 0=Not Associates).

BACC
Indicator variable for the highest level of education completed by the RN. Unknown or refused responses were deleted from the sample. (1=Baccalaureate and 0=Not Baccalaureate).

PHD_MS
Indicator variable for the highest level of education completed by the RN. Unknown or refused responses were deleted from the sample. (1=Masters or Doctorate and 0=Not Masters or Doctorate).

ED_MISS
Indicator variable for the highest level of education completed by the RN. (1= RN has not reported highest level of education completed and 0= RN has reported highest level of education completed).

Employment Region
NE
Indicator variable for RN's region of employment. (1=Employed in Northern region and 0=Is not employed in Northern region). The Northern region is composed of ME, VT, NH, MA, CT, RI, NY, PA, and NJ.

SOUTH
Indicator variable for RN's region of employment. (1=Employed in Southern region and 0=Is not employed in Southern region). The Southern region is composed of MD, DE, DC, WV, VA, NC, SC, GA, FL, KY, TN, MS, AL, OK, AR, TX, LA.

MIDWST
Indicator variable for RN's region of employment. (1=Employed in Midwestern region and 0=Is not employed in Midwestern region). The Midwest region is composed of MI, OH, IN, IL, WI, MN, IA, MO, ND, SD, NE, KS.
WEST
Indicator variable for RN's region of employment. (1=Employed in Western region and 0=Is not employed in Western region). The West region is composed of MT, WY, CO, NM, ID, UT, AZ, NV, WA, OR, CA.

Ethnicity
WHITE
Indicator variable for RN race. (1=RN is Asian and 0=RN is not White). For the purposes of this study White includes White only/Non-Hispanic.

HISP
Indicator variable for RN race. (1=RN is Hispanic and 0=RN is not Hispanic). For purposes of this study the Hispanic group is composed of the following categories:

White alone/Hispanic, Black alone/Hispanic, Two or more races/Hispanic, and Hispanic.

OTHRACE
Indicator variable for RN race. (1=RN's race is categorized as Other and 0=RN's race is not categorized as Other). For the purposes of this study the Other group is composed of the following categories: American India/Alaskan Native only, Native Hawaiian/other Pacific Islander only, and Multiple races – Non Hispanic.

AFRAMER
Indicator variable for RN race. (1=RN is African American and 0=RN is not African American). For the purposes of this study African American includes only African American only/Non-Hispanic.

ASIAN
Indicator variable for RN race. (1=RN is Asian and 0=RN is not Asian). For the purposes of this study Asian includes Asian only/Non-Hispanic.

RACE_MISS
Indicator variable for RN race. (1= RN has not reported race and 0= RN has reported race).

Family Composition
CH_LE6
Indicator variable for number of children in the home. (1=RN has only children less than or equal to six years of age and 0=No children).

CH_GE6
Indicator variable for number of children in the home. (1=RN has only children greater than six years of age and 0=No children).

CH_ALL
Indicator variable for number of children in the home. (1=RN has children of all ages, that is some less than 6 years, some more than 6 years; and 0=No children).

CH_NO
Indicator variable for number of children in the home. (1=RN has no children in home and 0=Some children in home).

CHLDUNKW
Indicator variable for number of children in the home. (1=Unknown if RN has children in the home and 0= Number of children is known).

Work and Wages

HRS_YR

Number of hours worked annually in principal nursing position.

WAGE_RT

Hourly wage rate of RN. This is derived by dividing the annual earnings from the principal nursing position by the annual hours worked, only if greater than zero.

WAGED

Indicator variable whether the RN is employed or not. (1=RN is employed in nursing profession and 0=RN is not employed in nursing profession).

LNWAGE_RT

Natural log of wage rate of RN, in case WAGE_RT is positive.

LNHRS_YR

Natural log of Number of hours worked annually in principal nursing position, in case that is positive.

WORK_FT

Indicator variable whether the RN is working full time or not. (1=RN is employed full time in nursing profession and 0=RN is not employed full time in nursing profession).

WORK_PT

Indicator variable whether the RN is part full time or not. (1=RN is employed part time in nursing profession and 0=RN is not employed part time in nursing profession).

TABLE 16: WAGE PARTICIPATION – Probit Participation Equation for Full Sample

Variable	2004 NSSRN	2008 NSSRN
Constant	3.352234*	2.663807*
	(29.25)	(28.14)
OTHINC_1k	-0.016572*	-0.00832*
	(-52.12)	(-52.12)
DIPL	-0.153635*	-0.076367**
	(-3.88)	(-3.88)
BACC	-0.048911	-0.026161
	(-1.5)	(-0.99)
PhD_MS	0.318942*	0.115685*
	(8.96)	(3.18)
ED_MISS	-0.281546	-
	(-1.33)	-
FOREIGN	0.342953*	0.081434
	(3.2)	(1.19)
LPN	0.096444	0.051629***
	(2.63)	(1.74)
MARRIED	0.459048*	0.351139*
	(13.92)	(12.4)
CH_LE6	-0.696114*	-0.334453*
	(-12.18)	(-7.07)
CH_GE6	0.103698*	0.07756*
	(-1.2)	(2.72)
CH_ALL	-0.596236	-0.321785*
	(-10.24)	(-6.41)
AGE	-0.043769*	-0.028664*
	(-24.99)	(-20.99)
HISP	-0.057869	0.082256
	(-0.52)	(1.1)
OTHRACE	-0.11454	0.023997
	(-1.27)	(0.33)
AFRAMER	0.188782	0.10067***
	(2.32)	(1.72)
ASIAN	0.296536	-0.141121**
	(2.7)	(-2.07)

TABLE 16: WAGE PARTICIPATION – Probit Participation Equation for Full Sample (contd.)

RACE_MISS	0.095314	-
	(1.47)	-
RESMSA	0.221931*	0.101279*
	(7.04)	(4.07)
NE	0.054373	0.067695***
	(1.1)	(1.9)
MIDWST	0.060472	-0.093697*
	(1.45)	(-2.73)
WEST	0.026942	0.01268
	(0.66)	(0.41)
PCT_UN_04/08	-0.005916	0.00061
	(-1.86)	(0.25)
PHYS_04/08	0.000532	0.000222
	(1.97)	(1.04)
RHO	-0.059497	-0.071382**
	(-1.27)	(-2.23)
SAMPLE SIZE (N)	18645	26598
PROPORTION OF RN'S WHO WORK	83.47%	88.21%

Note 1: *t*-statistics in parentheses. *Significant at the 1% level **Significant at the 5% level ***Significant at the 10% level

Note 2: MLE estimates were successfully used, with efficient estimates and converged algorithm wherever RHO is significant.

TABLE 17: WAGE RATE – Log of Wages Equation for Full Sample

Variable	2004 NSSRN	2008 NSSRN
Constant	2.73937*	2.862139*
	(193.2)	(240.29)
DIPL	0.01584***	0.011477
	(1.84)	(1.57)
BACC	0.03736*	0.036465*
	(6.39)	(7.78)
PhD_MS	0.18116*	0.163446*
	(21.85)	(23.56)
ED_MISS	0.00878	-
	(0.18)	-
HISP	0.03517***	0.029852*
	(1.74)	(2.47)
OTHRACE	-0.01297	0.016223
	(-0.76)	(1.24)
AFRAMER	0.07068*	0.06052*
	(5.73)	(6.38)
ASIAN	0.06767*	0.104579*
	(4.57)	(10.14)
RACE_MISS	0.02807*	-
	(2.53)	-
RESMSA	0.11609*	0.093412*
	(19.04)	(19.96)
NE	-0.01748***	0.021187*
	(-1.88)	(3.27)
MIDWST	-0.0759*	0.024697*
	(-9.82)	(3.78)
WEST	0.05722*	0.123322*
	(7.4)	(21.43)
PCT_UN_04/08	0.00567*	0.003568*
	(9.39)	(7.88)
PHYS_04/08	0.00047593*	0.000619*
	(9.26)	(16.29)
POTEXP	0.01644	0.014724*

TABLE 17: WAGE RATE – Log of Wages Equation for Full Sample(contd.)

	(19.88)	(22.96)
POTEXP2	-0.0003143	-0.000274*
	(-15.52)	(-18)
RHO	-0.059497	-0.071382**
	(-1.27)	(-2.23)
SAMPLE SIZE (N)	15563	23462

Note1: *t*-statistics in parentheses. **Significant at the 5% level ***Significant at the 10% level *Significant at the 1% level

Note 2: MLE estimates were successfully used, with efficient estimates and converged algorithm wherever RHO is significant.

TABLE 18: WAGE RATE – Log of Wages Equation for Males, Married Females, Single Females - 2004

Variable	MALES	MARRIED FEMALES	SINGLE FEMALES
Constant	2.88496*	2.769738*	2.73365*
	(63.86)	(136.97)	(126.36)
DIPL	0.02988	0.023809**	0.03174**
	(0.92)	(2.05)	(1.57)
BACC	0.0356**	0.04388*	0.03538*
	(1.97)	(5.34)	(3.86)
PhD_MS	0.12858*	0.190922*	0.1457*
	(4.68)	(16.56)	(11.19)
ED_MISS	-0.09268	0.051164	0.06886
	(-0.96)	(0.69)	(0.88)
HISP	0.01161	0.050885***	-0.01499
	(0.2)	(1.8)	(-0.45)
OTHRACE	-0.01541	-0.022908	-0.01034
	(-0.35)	(-0.87)	(-0.43)
AFRAMER	0.00476	0.052132*	0.05816*
	(0.1)	(2.75)	(3.53)
ASIAN	0.06767*	0.042286**	0.04254
	(4.57)	(2.13)	(1.5)
RACE_MISS	0.01632	0.033211**	-0.00968
	(0.52)	(2.04)	(-0.59)
RESMSA	0.07833	0.113361*	0.10556*
	(3.69)	(13.89)	(10.04)
NE	-0.03639	-0.030127**	-0.01616
	(-1.19)	(-2.3)	(-1.12)
MIDWST	-0.02514	-0.087915*	-0.08381*
	(-0.94)	(-8.36)	(-6.56)
WEST	0.08829*	0.052233*	0.05729*
	(3.59)	(4.82)	(4.73)
PCT_UN_04	0.00488*	0.006134*	0.00633*
	(2.53)	(7.28)	(6.62)
PHYS_04	0.00049929*	0.000515*	0.00046654*
	(3.31)	(6.75)	(6.32)
POTEXP	0.01583	0.015619*	0.02155*
	(4.51)	(13.77)	(17.91)

TABLE 18: WAGE RATE – Log of Wages Equations - 2004(contd.)

POTEXP2	-0.00036047	-0.000254*	-0.00042908*
	(-3.43)	(-9.32)	(-14.62)
RHO	-0.029497	-0.071382**	0.050933
	(-2.17)	(-2.23)	(1.03)
SAMPLE SIZE (N)	998	10012	4553

Note1: *t*-statistics in parentheses. **Significant at the 5% level ***Significant at the 10% level
*Significant at the 1% level

Note 2: MLE estimates were successfully used, with efficient estimates and converged algorithm wherever RHO is significant.

TABLE 19: WAGE RATE – Log of Wages Equation for Males, Married Females, Single Females - 2008

Variable	MALES	MARRIED FEMALES	SINGLE FEMALES
Constant	3.02333*	2.856676*	2.84914*
	(70.07)	(190.39)	(128.54)
DIPL	0.02854	0.005347	0.02939**
	(0.88)	(0.61)	(2.05)
BACC	0.05204*	0.034303	0.04079*
	(3.06)	(5.94)	(4.5)
PhD_MS	0.15758*	0.170986*	0.14542*
	(5.8)	(20.14)	(10.91)
HISP	-0.01884	0.021387	0.07854*
	(-0.54)	(1.4)	(3.33)
OTHRACE	0.0207	-0.022908	0.0053
	(0.53)	(1.15)	(0.21)
AFRAMER	0.08151**	0.055656*	0.06943*
	(2.16)	(2.75)	(4.74)
ASIAN	0.0943*	0.100251*	0.12287*
	(2.88)	(7.92)	(5.83)
RESMSA	0.05774*	0.100081*	0.08135*
	(3.18)	(17.76)	(8.55)
NE	0.01448	0.01826**	0.0256**
	(0.57)	(2.29)	(2.05)
MIDWST	0.00978	0.025408*	0.02591**
	(0.41)	(3.17)	(2.03)
WEST	0.08841*	0.128107*	0.12202*
	(4.2)	(17.96)	(11.15)
PCT_UN_08	0.00488*	0.003037*	0.00508*
	(2.53)	(5.44)	(5.84)
PHYS_08	0.00269***	0.000682	0.00053135*
	(3.9)	(13.75)	(7.97)
POTEXP	0.01655*	0.013745*	0.01705*
	(5.95)	(16.93)	(14.74)
POTEXP2	-0.00035057*	-0.000254*	-0.00032167*

TABLE 19: WAGE RATE – Log of Wages Equations - 2008 (contd.)

	(-4.42)	(-13.35)	(-11.6)
RHO	0.090439	-0.073155*	-0.080036
	(0.63)	(-2.02)	(-1.26)
SAMPLE SIZE (N)	1510	16386	5566

Note1: *t*-statistics in parentheses. **Significant at the 5% level ***Significant at the 10% level
*Significant at the 1% level
Note 2: MLE estimates were successfully used, with efficient estimates and converged algorithm wherever RHO is significant.

TABLE 20: WAGE PARTICIPATION – Probit Participation Equation for Males, Married Females, Single Females - 2004

Variable	MALES	MARRIED FEMALES	SINGLE FEMALES
Constant	5.880974	4.794998*	3.551471*
	(1.18)	(-1.09)	(2.7)
PWAGES	-0.796075	-0.394793	0.156849
	(-0.47)	(-1.09)	(0.35)
OTHINC_1k	-0.02085*	-0.01527*	-0.024406*
	(-12.6)	(-44)	(-27.29)
DIPL	-0.190629	-0.083246***	-0.243004*
	(-0.8)	(-1.67)	(-3.88)
BACC	-0.377003	0.951089	-0.139098***
	(-2.34)	(0.78)	(-1.86)
PhD_MS	0.122277	0.51534*	0.072461
	(0.36)	(5.4)	(0.62)
ED_MISS	-0.630418	-0.100157	-0.48699
	(-1.17)	(-0.34)	(-1.22)
FOREIGN	1.10875	0.32245*	0.298257
	(1.10443607)	(2.64)	(1.24)
LPN	-0.283518***	0.167625*	-0.040588
	(-1.75)	(3.76)	(-0.54)
MARRIED	0.520317*	-	-
	(3.46)	-	-
CH_LE6	-0.422215***	-0.812861*	-0.15829
	(-1.73)	(-12.07)	(-0.88)
CH_GE6	0.275905***	0.088241**	0.007613
	(1.73)	(-1.2)	(0.1)
CH_ALL	0.172197	-0.730285*	0.141164
	(0.58)	(-10.24)	(0.64)
AGE	-0.043016*	-0.04334*	-0.050917*
	(-5.16)	(-16.88)	(-14.85)
HISP	-0.491676	-0.019139	0.037656
	(-1.37)	(-0.14)	(0.15)
OTHRACE	0.372749	-0.123096	-0.264451***
	(0.76)	(-1.05)	(-1.7)
AFRAMER	0.188782	0.137092	0.26005***
	(2.32)	(1.32)	(1.74)

TABLE 20: WAGE PARTICIPATION – Probit Participation Equation- 2004 (contd.)

ASIAN	1.158897	0.342503	-0.013437
	(1.11)	(2.75)	(-0.05)
RACE_MISS	0.213846	0.149564***	0.03007
	(0.81)	(1.8)	(0.25)
RESMSA	0.19429	0.221931*	0.208191*
	(0.92)	(7.04)	(2.45)
NE	0.238429	0.023148	0.06091
	(0.93)	(0.38)	(0.6)
MIDWST	-0.151328	0.045591	0.022318
	(-0.75)	(0.78)	(0.23)
WEST	0.156332	0.022444	0.110636
	(0.67)	(0.43)	(1.24)
PCT_UN_04	0.002728	-0.005005	-0.000033328
	(0.16)	(-1.12)	(0.001)
PHYS_04	0.001563	0.00097*	-0.000011902
	(1.09)	(2.5)	(-0.02)
RHO	-0.343534	0.011537	-0.243469
	(-1.41)	(0.17)	(-1.39)
SAMPLE SIZE (N)	1140	12324	5181
PROPORTION OF RN'S WHO WORK	87.54%	81.24%	87.88%

Note1: *t*-statistics in parentheses. **Significant at the 5% level ***Significant at the 10% level
*Significant at the 1% level
Note 2: MLE estimates were successfully used, with efficient estimates and converged algorithm wherever RHO is significant.

TABLE 21: WAGE PARTICIPATION – Probit Participation Equation for Males, Married Females, Single Females - 2008

Variable	MALES	MARRIED FEMALES	SINGLE FEMALES
Constant	5.507393***	3.55871*	4.162193*
	(1.74)	(3.44)	(2.9)
PWAGES	-1.114753	-0.110703	-0.544237
	(-1.07)	(-0.31)	(-1.1)
OTHINC_1k	-0.00689*	-0.007679*	-0.01696*
	(-6.81)	(-34.89)	(-22.15)
DIPL	-0.298576***	-0.072136***	0.03428
	(-1.75)	(-1.75)	(0.44)
BACC	-0.215481***	-0.010172	0.043015
	(-1.78)	(-0.29)	(0.68)
PhD_MS	0.273629	0.137358***	0.269904**
	(1.09)	(1.75)	(2.42)
FOREIGN	0.167669	0.100489	-0.003343
	(0.65)	(1.24)	(-0.02)
LPN	0.022535	0.026858	0.180499*
	(0.19)	(0.76)	(2.8)
MARRIED	0.381283*	-	-
	(3.26)	-	-
CH_LE6	-0.212281	-0.459242*	0.077935
	(-1.23)	(-8.1)	(0.48)
CH_GE6	0.101712	0.021046	0.159235**
	(0.85)	(0.61)	(2.29)
CH_ALL	-0.145574	-0.730285*	-0.097986
	(-0.75)	(-7.3)	(-0.58)
AGE	-0.011249**	-0.033094*	-0.025995*
	(-1.92)	(-16.83)	(-9.29)
HISP	0.372579	0.060028	0.125993
	(1.38)	(0.67)	(0.74)
OTHRACE	0.508372***	0.060499	-0.244961***
	(1.74)	(0.66)	(-1.74)
AFRAMER	0.300003	0.096857	0.17949***
	(1.13)	(1.22)	(1.7)
ASIAN	0.158117	-0.145385***	0.000126
	(0.62)	(-1.67)	(0.001)
RESMSA	0.07301	0.118264*	0.13979**
	(0.59)	(2.54)	(2.01)

TABLE 21: WAGE PARTICIPATION – Probit Participation Equation- 2008 (contd.)

NE	0.235175	0.088533**	0.011698
	(1.48)	(2.08)	(0.15)
MIDWST	-0.312**	-0.117557*	0.104716
	(-2.4)	(-2.85)	(1.29)
WEST	0.398687*	-0.042593	0.264021*
	(2.5)	(-0.74)	(2.93)
PCT_UN_08	-0.019013***	0.004155	-0.002561
	(-1.83)	(1.36)	(-0.44)
PHYS_08	0.001157	0.000135	0.001026**
	(1.29)	(0.38)	(1.96)
RHO	-0.00737	-0.045432	-0.011384
	(-0.04)	(-1.28)	(-0.26)
SAMPLE SIZE (N)	1671	18718	6209
PROPORTION OF RN'S WHO WORK	90.37%	87.54%	89.64%

Note1: *t*-statistics in parentheses. **Significant at the 5% level ***Significant at the 10% level *Significant at the 1% level

Note 2: MLE estimates were successfully used, with efficient estimates and converged algorithm wherever RHO is significant.

TABLE 22: HOURS PARTICIPATION – Log of Hours Worked Equation for Males, Married Females, Single Females - 2004

Variable	MALES	MARRIED FEMALES	SINGLE FEMALES
Constant	7.96267*	7.79384*	7.49788*
	(23.67)	(88.55)	(83.23)
PWAGES	-0.1208	-0.05478***	0.04265
	(-1.03)	(-1.7)	(1.3)
OTHINC_1k	-0.00021867	-0.00034035*	-0.00003104
	(-1.47)	(-8.1)	(-0.3)
DIPL	-0.00396	-0.00187	-0.01193*
	(-0.22)	(-0.36)	(-1.73)
BACC	0.01374	0.00527	0.00523
	(1.23)	(1.26)	(1.0)
PhD_MS	0.0526**	0.04039*	0.01941**
	(2.31)	(4.59)	(2.31)
ED_MISS	-0.02082	0.02397	-0.08083
	(-0.41)	(0.73)	(-1.99)
FOREIGN	0.002958	-0.00013471	-0.01413
	(0.12)	(-0.01)	(-0.99)
LPN	0.00048396	0.0079**	0.01424*
	(0.04)	(2.03)	(2.64)
MARRIED	0.03701*	-	-
	(3.45)	-	-
CH_LE6	0.00503	-0.04016*	0.01207
	(0.33)	(-6.8)	(1.06)
CH_GE6	-0.00991	-0.01276*	0.00179
	(-0.94)	(-3.7)	(0.37)
CH_ALL	0.02166	-0.02185*	-0.01283
	(1.31)	(-10.24)	(-1.02)
AGE	0.00093388	0.00043234***	0.00025789
	(1.55)	(1.8)	(1.05)
HISP	-0.0219	0.02407*	-0.01798
	(-0.73)	(1.97)	(-1.05)
OTHRACE	-0.02583	-0.00032504	0.02181***
	(-1.13)	(-0.03)	(1.77)
AFRAMER	0.01289	0.00343	-0.00901
	(0.55)	(0.41)	(0.19)
ASIAN	-0.057718	0.01002	0.00314
	(-2.22)	(1.01)	(0.19)

TABLE 22: HOURS PARTICIPATION – Log of Hours Worked Equation - 2004 (contd.)

RACE_MISS	-0.02042	0.00413	-0.00396
	(-1.25)	(0.59)	(2.7)
RESMSA	0.01483	0.00246	0.221931*
	(1.02)	(0.48)	(-0.46)
NE	-0.0365**	-0.02539*	-0.01918*
	(-2.23)	(-4.43)	(-2.56)
MIDWST	-0.02879**	-0.01612*	-0.013***
	(-2.04)	(-3.03)	(1.45)
WEST	-0.03409**	-0.01991*	-0.02895*
	(-2.1)	(-4.0)	(-4.48)
PCT_UN_04	0.00114	0.00044992	-0.0003634
	(0.97)	(1.08)	(-0.67)
PHYS_04	-0.00003255	-0.0000984*	-0.00007206***
	(-0.34)	(-2.66)	(-1.76)
RHO	-0.343534	0.011537	-0.243469
	(-1.41)	(0.17)	(-1.39)
SAMPLE SIZE (N)	998	10012	4553

Note: *t*-statistics in parentheses. **Significant at the 5% level ***Significant at the 10% level
*Significant at the 1% level

TABLE 23: HOURS PARTICIPATION – Log of Hours Worked Equation for Males, Married Females, Single Females - 2008

Variable	MALES	MARRIED FEMALES	SINGLE FEMALES
Constant	6.74807*	7.76091*	6.77122*
	(11.85)	(27.32)	(24.41)
PWAGES	0.28858	0.05646	0.34392*
	(1.52)	(0.57)	(3.51)
OTHINC_1k	-0.00121*	-0.00272*	-0.00286*
	(2.52)	(-33.88)	(-12.51)
DIPL	-0.00664	-0.06299*	-0.03238***
	(-0.18)	(-1.67)	(-1.86)
BACC	-0.02208	-0.05124*	-0.02657**
	(-0.97)	(-4.99)	(-2.09)
PhD_MS	0.0018	0.02342	-0.0246
	(0.04)	(1.02)	(-1.06)
FOREIGN	-0.01434	0.04643**	0.03665
	(-0.3)	(1.97)	(1.21)
LPN	0.02873	0.03208*	0.00504
	(1.34)	(3.22)	(0.4)
MARRIED	0.05652*	-	-
	(2.52)	-	-
CH_LE6	0.00798	-0.23908*	-0.01731
	(0.25)	(-15.91)	(-0.63)
CH_GE6	0.0297	-0.06594*	0.00279
	(1.4)	(-7.08)	(0.22)
CH_ALL	-0.00833	-0.21832*	-0.05442***
	(-0.24)	(-13.58)	(-1.65)
AGE	-0.00156	-0.00657*	-0.00521*
	(-1.4)	(-11.72)	(-8.94)
HISP	-0.01784	0.06531*	-0.0376
	(-0.46)	(2.82)	(-1.25)
OTHRACE	0.0607	0.037	-0.02349
	(1.4)	(1.46)	(-0.77)
AFRAMER	-0.03539	0.05906*	-0.04399**
	(-0.79)	(2.89)	(-2.3)

TABLE 23: HOURS PARTICIPATION – Log of Hours Worked Equation - 2008 (contd.)

ASIAN	-0.02135	0.08746*	-0.07642**
	(-0.45)	(3.38)	(-2.4)
RESMSA	0.0252	0.01114	-0.00018373
	(1.11)	(0.84)	(-0.01)
NE	0.03382	-0.00698	-0.00098023
	(1.2)	(-0.57)	(-0.06)
MIDWST	0.02189	0.01917	0.023
	(0.83)	(1.55)	(1.44)
WEST	-0.06108**	-0.053*	-0.04426**
	(-2.14)	(-3.21)	(-2.5)
PCT_UN_08	-0.00174	-0.00049362	-0.00024909*
	(-0.91)	(-0.54)	(-1.77)
PHYS_08	-0.00030416	-0.0000691	-0.00024909*
	(-1.86)	(-0.69)	(-2.56)
RHO	-0.00737	-0.045432	-0.011384
	(-0.04)	(-1.28)	(-0.26)
SAMPLE SIZE (N)	1671	18718	6209

Note: *t*-statistics in parentheses. *Significant at the 1% level **Significant at the 5% level ***Significant at the 10% level