

1997

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Schumacher, E.J. (1997). Relative Wages and the Returns to Education in the Labor Market for Registered Nurses. *Research in Labor Economics*, 16, 149-176.

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RELATIVE WAGES AND THE RETURNS TO EDUCATION IN THE LABOR MARKET FOR REGISTERED NURSES

Edward J. Schumacher

I. INTRODUCTION

Over the past two decades there have been substantial changes in the health care sector in general and hospitals in particular. These changes in turn have had an impact on the labor market for nurses. Nursing comprises the third largest occupation among women (behind secretaries and teachers) and is the largest occupation in hospitals, accounting for about a quarter of total hospital employment in 1992 (Wootton & Ross, 1995). It is well documented that there were substantial “shortages” of qualified RNs during the 1980s, reaching a peak in the late 1980s (Aiken & Mullinex, 1987; Buerhaus, 1993; Hassanein, 1991; McKibbin, 1990). Recently, however, new RNs are having a more difficult time finding employment after graduation and shortages are no longer perceived to pose a problem in the nursing labor market (Bridger, 1996; Buerhaus, 1995). As the health care industry continues to evolve, an understanding of the labor market for registered nurses is essential to

Research in Labor Economics, Volume 16, pages 149–176.

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ISBN: 0-7623-0312-3

understanding how this market will respond to change. While there has been substantial research on the labor market for RNs, these studies focus primarily on monopsony power (Hirsch & Schumacher, 1995; Sullivan, 1989), labor supply (Phillips, 1996; Link 1992), unionism (Hirsch & Schumacher, in press; Adamache & Sloan, 1982; Feldman & Scheffler, 1982; Cain et al., 1981), or schooling (Lehrer et al., 1991; Link, 1988; Booton & Lane, 1985). There has been little research, however, providing wage analysis of RNs over time or relative to wage opportunities outside of nursing.¹

This chapter examines the response of the RN labor market to the structural changes occurring in hospitals in the 1980s and to the subsequent slowdown in the market in the early 1990s. Utilizing data from the Current Population Survey (CPS) for the years 1973 through 1994, the earnings of RNs are compared to those of a group of college educated females in non-health related occupations, providing a measure of the returns to the RN occupation relative to alternative investment paths and over a long time period. The results show that after controlling for job skills and personal characteristics, RNs made significant real and relative wage gains throughout the 1980s, peaking in the early 1990s and showing a decline in 1994.

The training of RNs requires considerable investment in specific human capital that is not easily transferred across occupations or industries. A nurse can attain training through three educational routes: a two year associate degree (AD) generally awarded through a community college or technical school, a three year hospital-based diploma program, or a four year baccalaureate degree (BS). By utilizing the Sample Survey of Registered Nurses (SSRN) for 1984, 1988, and 1992 the chapter next provides updated evidence on the returns to RN education (conditional on the decision to train as an RN). There is little difference in the earnings of AD versus diploma nurses. RNs with a BS in nursing earn 5 to 6 percent more than those with lesser degrees. Previous research on the returns to RN education (eg., Link, 1988) finds similar evidence, but includes only RN degree attainment and not non-nursing education. By controlling for previous degree attainment, a potentially cleaner estimate of the return to the BS in nursing than those from previous studies is provided. Results indicate that non-nursing education has value in the nursing labor market, but its impact is small and its omission does not appear to bias estimates of the return to specific nursing degrees.

The chapter is organized as follows. The next section provides a historical background for the institutional changes occurring in the health care industry and in the labor market for RNs. Section III outlines the estimation technique and the data utilized in the chapter. The relative earnings of registered nurses between 1973 and 1994 are examined in Section IV. In Section V, the returns to RN schooling are estimated, while in Section VI the role of non-nursing education is examined. Conclusions follow in Section VII.

II. INSTITUTIONAL BACKGROUND

Changes in the health care sector have resulted from rapid developments in medical technology, changes in regulatory structure, changes in insurance coverage, and the growth of market competition. Due to the heavy reliance on nursing personnel to provide care, nursing labor markets have also undergone rapid change. As a consequence, the training and duties of an RN in the 1970s are very different from that of an RN in the 1990s (Curtin, 1994).

The first major change over the period was an internal reorganization of nursing services in hospitals. In the mid-1960s team nursing, wherein RNs, LPNs, and aides work together to provide care, was the norm (Krall & Prus, 1995). RNs oversaw the work of the team, and allocated a high proportion of their time as managers and less as caregivers. Beginning in the late 1960s, primary care nursing became more frequent in hospitals. Under this system, each RN is assigned responsibility for the total care of five to eight patients, giving RNs more autonomy and responsibility for patient care. Over time, primary care nursing became the standard organization of care in hospitals. In 1983, 40 percent of patients received care through primary care, while in 1988, 61 percent of patients were treated through primary care nursing (Krall & Prus, 1995).

Krall and Prus (1995) argue that primary care nursing is more efficient than team nursing due to a high degree of job dissatisfaction and turnover among RNs working within teams. In addition, team nursing led to additional inefficiencies since much of the RN's time is devoted to managing team members and moved the most highly skilled nursing personnel out of direct patient care. The movement to primary care nursing led to lower turnover and a higher degree of job satisfaction (Prescott, 1986). Gardner (1991) finds evidence that primary nursing leads to higher quality nursing than team nursing, and that primary nursing is associated with lower stress levels and higher retention levels than team nursing. This restructuring, therefore, put a greater emphasis on the use of RNs relative to LPNs and aides in providing patient care.

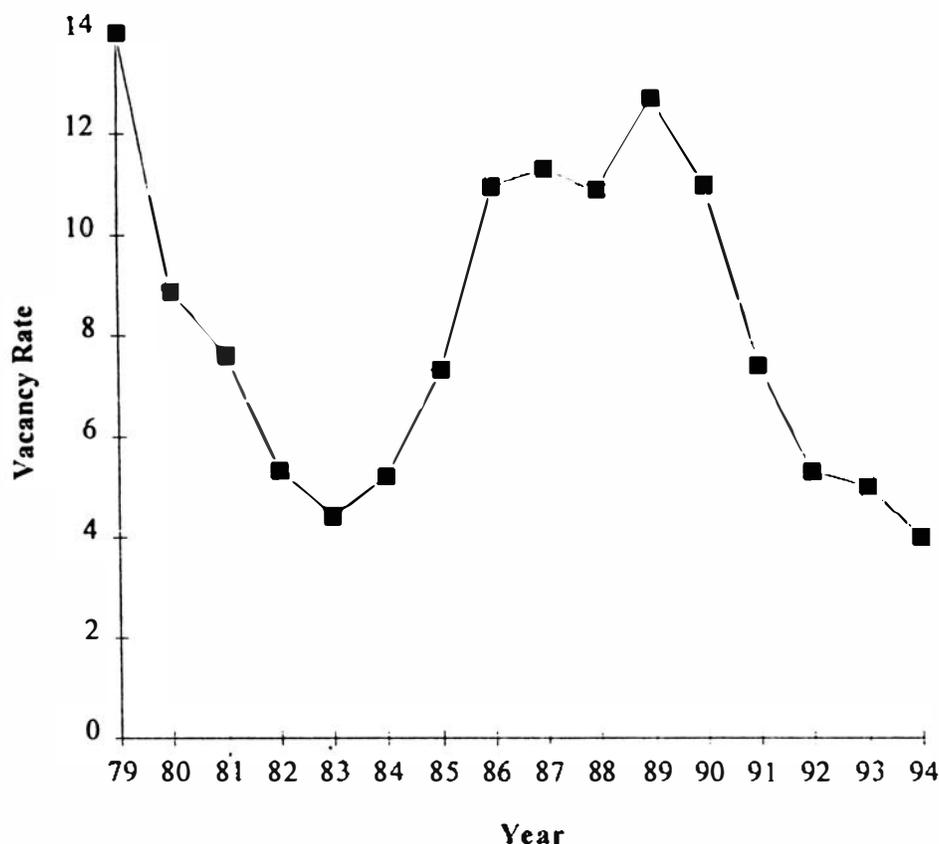
Beginning in the early to mid-1980s there was substantial regulatory pressure placed on hospitals for cost containment. The Social Security Amendments, adopted in 1983, included a prospective payment system (PPS) reimbursement plan by Medicare. This plan set up a patient classification scheme establishing 495 illness categories or diagnostic related groups (Folland, Goodman, & Stano, 1997). Medicare reimbursed hospitals a fixed price for each illness type, regardless of variations in inputs. This change in reimbursement policy gave incentives for hospital enrollment to include fewer, but more severely ill inpatients, with shorter length-of-stay, and increased outpatient activity (Pope & Menke, 1990). Length-of-stay decreased as more intensive daily care was provided. Average length-of-stay decreased 9 percent in the first year of PPS and a total of 14.6 percent between 1982 and 1985 (Feinglass & Holloway, 1991). Thus, nurses were treating more acute patients in a shorter time period, and hospitals moved toward all RN nursing staffs

since RNs were more skilled and versatile than other nurses (Buerhaus, 1993). Almost 70,000 LPNs were moved out of hospital employment between 1980 and 1988 and replaced by RNs (Aiken, 1990). The result of this change led to an increase in the number of hospital employed RNs per 100 beds from 74 in 1983 to 81 in 1985 (Aiken, 1987). Thus, the change in reimbursement policy resulted in an increased ratio of nurses to patients due to the change in patient mix resulting from substantially altered admission patterns, shorter length of stay, and increased use of nurse intensive technologies (Aiken, 1990).

A major shift in health policy occurred in the late 1980s and early 1990s. This was the “adoption of traditional market forces as a legitimate strategy to achieve greater efficiency in the production of health care services” (Buerhaus, 1992, p. 21). As the threat of major reform in the health care industry loomed in the early 1990s, hospitals, private insurers, and other health care providers became more cost conscious. In addition, the rise of managed care over traditional fee-for-service third-party payer insurance led to greater price competition and has led some hospitals to turn to hospital layoffs (Rosenthal, 1996). Since 1992, the rate of increase in the annual change in hospital cost per adjusted admission has fallen. From 1991 to 1992 the rate of real increase was 5 percent, but between 1992 and 1993 real costs increased only 1.7 percent, and from January to April 1994 real costs declined by 0.3 percent (Prospective Payment Assessment Commission, 1994). As a result “hospital employed RNs have felt the effects of cost reduction and have increasingly perceived that their own job security is at risk” (Buerhaus, 1995).

Figure 1 displays national average hospital RN vacancy rates from 1979 to 1994 (Buerhaus, 1993, 1995). The vacancy rate is defined as the percentage of full-time equivalent RN positions that hospitals are actively trying to fill. In 1979 the vacancy rate was at 14 percent and an acute shortage of RNs was reported (Buerhaus, 1993). Over the early 1980s this shortage was alleviated as vacancy rates fell to as low as 4.4 percent in 1983. In the years that followed, however, vacancy rates increased dramatically, reaching a peak of 12.7 percent in 1989. This increase in vacancy rates is consistent with the restructuring of the nursing labor market described above. As hospitals moved to a more skilled nursing staff, they found it harder and harder to fill vacant positions. After 1988, the vacancy rate began to fall until it reached a historical low of 4.0 percent in 1994, again consistent with the rise of price competition and cost consciousness.

Observation of the historical trends in the nursing labor market over the past 20 years suggests that the increasing use of RNs should have resulted in wage increases for RNs and, consequently, reported nursing shortages should have been alleviated. Researchers have argued, however, that the long upward trend in vacancy rates refutes the classical explanation of the labor market and have turned to monopsonistic explanations of the RN labor market (Aiken & Millinex, 1987; Booton & Lane,



Note: The vacancy rate is defined as the average number of full-time equivalent RN positions that hospitals are actively trying to fill. These data are taken from Beurhaus (1993, 1995).

Figure 1. RN vacancy rate: 1979–1994.

1985). Hirsch & Schumacher (1995) find no support for monopsony power in nursing labor markets. Krall (1995) also argues that the monopsony explanation is not convincing based on the empirical evidence, and the labor market mobility of women. She argues that institutional factors in the hospital led to relatively rigid wages among nursing personnel despite rising vacancies and, thus, shortages persisted. Buerhaus (1993) argues that demand for RNs increased rapidly during the 1980s while supply lagged, thus wages were slow to catch up, as prolonged shortages persisted.

The purpose of this research is to examine the response in RN wages to these changing economic conditions. RN earnings are examined over the years 1973 to 1994, after controlling for measurable worker and labor market characteristics. In addition, to control for economy-wide changes, we calculate the earnings of RNs relative to a non-nursing comparison group. This paper provides a more detailed analysis of RN wages than previous studies, and allows a measure of how responsive were wages to the restructuring of the hospital labor market.

III. METHODOLOGY

A. Measurement

In order to examine the real wage growth of RNs over the period, differences in worker and labor market characteristics must be accounted for. This is done by constructing an adjusted earnings index. For each group of workers, the following equation is estimated:

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

where $\ln W_{in}$ is the log real wage for worker i in occupational group n , X contains observed personal and job-related characteristics that affect the wage, β their coefficients, and ε is a well behaved error term. Assuming a common structure of earnings over time, the coefficients on year dummies (τ) provide an estimate of log earnings differences by year after controlling for worker and other characteristics. This equation is estimated for RNs, LPNs, and a comparison group of workers in non-health occupations. The year coefficients are converted to a percentage index by the formula $\exp(\tau_y) * 100$, where τ_y is the coefficient for year y .

RN *relative* earnings are examined by estimating the following equation by year:

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

where $\ln W_{iy}$, X , β , and ε are defined as in equation 1, and y indexes the year. RN is a dummy variable equal to 1 if the worker is employed as an RN. This equation pools RNs with the respective comparison group and estimates separate log wage regressions by year. The coefficient δ_y provides an estimate of the relative earnings differential between RNs and the comparison group for year y . This approach allows the earnings structure to vary over time, but restricts the structure to be the same for RNs and the comparison group.

B. Data

There are two primary sources of data utilized in this study. The first is drawn from the May CPS surveys from 1973 through 1978 and the monthly CPS Outgoing Rotation Group (ORG) earnings files for the years 1979 through 1994. Between 1973 and 1979 the earnings supplement was only conducted once a year (in May), but all persons in the sample were administered the questions. Beginning in 1979, quarter samples were asked the earnings supplement questions each month. Thus, the sample sizes for years prior to 1979 are about a third of those for later years. We include all employed wage and salary registered nurses age 18 or over whose

major activity was not schooling.² The CPS sample includes 48,667 RNs. The CPS is also used to construct a large comparison group non-nursing sample, discussed subsequently.

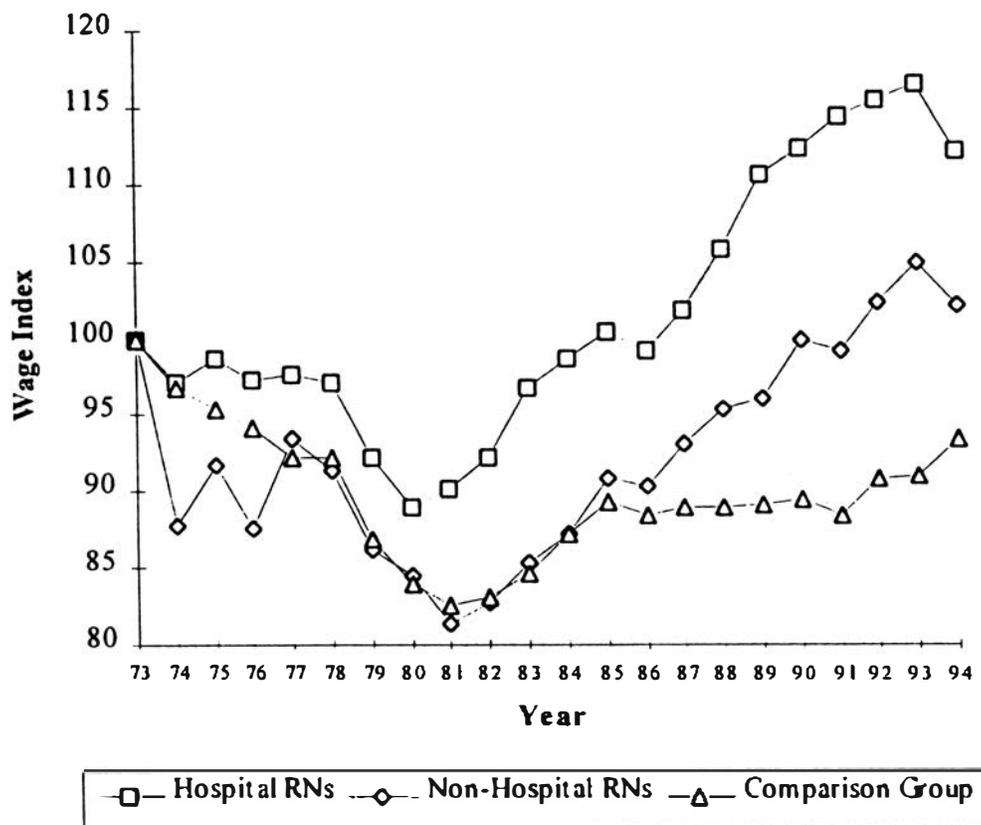
The second source of data (used below in Sections V and VI) is taken from the Sample Survey of Registered Nurses (SSRN) for 1984, 1988, and 1992. This survey is conducted by the U.S. Department of Health and Human Services, Public Health Services, Health Resource and Services Administration. The data, obtained from a mail survey of a sample of licensed registered nurses, contain roughly 30,000 observations per year, yielding large samples of RNs (including those employed in or out of nursing, unemployed, or out of the labor force) with detailed information on these individuals. This chapter examines the roughly 25,000 per year currently employed as RNs. The advantage of the SSRN is that it contains detailed occupation and industry classifications, and detailed educational information. The CPS (beginning in 1992) contains only information on degree attainment, whereas the SSRN asked specifically about nursing education and about education received prior to nursing education. The SSRN, however, is conducted only about every 4 years, may be subject to response bias, and contains information only on registered nurses, not allowing comparisons to alternative groups of workers.

IV. THE RELATIVE WAGES OF REGISTERED NURSES: 1973–1994

A. The Adjusted Earnings Index

We compare RNs to a group of workers consisting of college educated (years of schooling completed greater than or equal to 16) women in the following broad occupational categories (excluding detailed health-related occupations): executive, administrative and managerial; professional specialty occupations; technicians and related support; sales, administrative support and clerical; and service occupations (except protective and household services).³ Figure 2 displays the adjusted real wage index (1973 = 100) for hospital RNs, non-hospital RNs, and the comparison group.⁴ The index fell throughout the seventies for all groups. Beginning in the early eighties, however, real wages began to rise, and the increase was substantially steeper for RNs than for the comparison group. Hospital RNs in 1993 earned about 16.4 percent higher wages than an RN with similar characteristics in 1973, however, a comparison group worker in 1993 earned 9.6 percent *less* than a similar worker in 1973. The wage growth for RNs appears to have peaked in the early 1990s. While there is an increase in real earnings for the comparison group in 1994, RN real wages decreased.

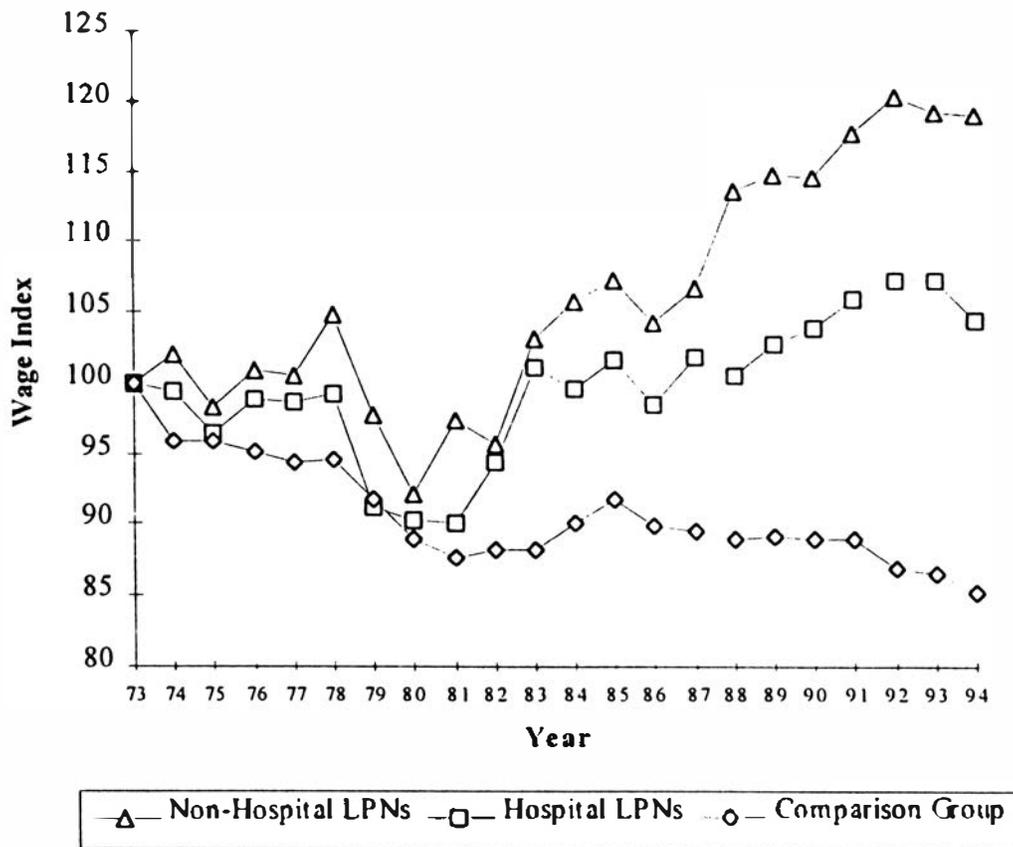
Figure 3 displays similar indices for licensed practical nurses. The LPN comparison group is defined similarly as the RN group except that those with some college education (years of schooling less than 16 but greater than 12) are selected. The figure shows that while the real and relative wages of LPNs increased throughout



Note: Data for 1973 through 1978 are from the May CPSs and for 1979 through 1994 are from the monthly CPS ORG files. The indices are derived from a separate log wage equation for each group including controls for years of schooling, potential experience (years since finishing school) and its square, and dummies for race (2), gender (in the nursing regressions), part-time status, marital status (2), region (8), large metropolitan area, and year (21). The coefficients on the year dummies are converted to a percentage index by: $\exp(\beta) * 100$, where β is the coefficient.

Figure 2. Adjusted wage indices for RNs and the comparison group.

the 1980s, non-hospital LPN wage growth was more rapid than among (the small sample of) hospital LPNs—the opposite of what occurred for RNs. Table 1 displays employment by occupation and industry for the 1977 to 1994 period. RNs observed significant employment gains over the period (in both sectors), while LPN employment growth was less rapid and limited to the non-hospital sector. In the late 1970s hospitals employed about 2.5 to 3 RNs to each LPN, but by the early 1990s there were about six RNs for every LPN. Hospital employment for LPNs began declining in the early to mid-1980s, consistent with Aiken's (1990) finding that hospitals were using fewer LPNs and replacing them with RNs. Although LPN wages and employment rose, the increases were smaller than for RNs and were concentrated outside of hospitals, while RN wage and employment growth was strongest in hospitals.



Notes: Data for 1973 through 1978 are from the May CPSs and for 1979 through 1994 are from the monthly CPS ORG files. The indices are derived from a separate log wage equation for each group including controls for years of schooling, potential experience (years since finishing school) and its square, and dummies for race (2), gender (in the nursing regressions), part-time status, marital status (2), region (8), large metropolitan area, and year (21). The coefficients on the year dummies are converted to a percentage index by: $\exp(\beta) * 100$, where β is the coefficient. The LPN control group consists of females in non-health occupations with more than 12 years of schooling but less than 16.

Figure 3. Adjusted wage indices for LPNs.

B. Nursing Relative Wages

Table 2 displays the RN log wage differential by year. In 1973 an RN earned 14.9 percent higher wages than a comparison group worker with similar characteristics. This differential rose substantially over the period, with particularly rapid growth in the late 1980s, and peaking in the early 1990s. Separate analyses of hospital RNs and RNs with at least 16 years of schooling indicate similar temporal patterns.⁵ The higher differential for hospital RNs reflects the sizeable wage premium realized by hospital relative to non-hospital RNs. It is worth noting that college educated

Table 1. Nursing Employment 1977–1994 (in Thousands)

| | <i>Hospital RN</i> | <i>NonHosp RN</i> | <i>Hospital LPN</i> | <i>NonHosp LPN</i> |
|------|--------------------|-------------------|---------------------|--------------------|
| 1977 | 761 | 302 | 234 | 137 |
| 1978 | 774 | 338 | 256 | 146 |
| 1979 | 851 | 372 | 237 | 139 |
| 1980 | 905 | 397 | 232 | 143 |
| 1981 | 922 | 391 | 244 | 150 |
| 1982 | 1005 | 410 | 250 | 150 |
| 1983 | 986 | 386 | 273 | 170 |
| 1984 | 1014 | 388 | 248 | 168 |
| 1985 | 1045 | 402 | 231 | 171 |
| 1986 | 1071 | 417 | 235 | 182 |
| 1987 | 1139 | 449 | 221 | 185 |
| 1988 | 1101 | 458 | 217 | 206 |
| 1989 | 1182 | 507 | 205 | 209 |
| 1990 | 1173 | 500 | 214 | 226 |
| 1991 | 1216 | 496 | 206 | 239 |
| 1992 | 1282 | 523 | 203 | 251 |
| 1993 | 1298 | 561 | 181 | 244 |
| 1994 | 1348 | 608 | 167 | 230 |

Source: *Employment and Earnings*, January issues 1978–1995. Employment is reported only by detailed occupation, not occupation by industry. The breakdown between hospital and non-hospital employment was derived by multiplying the total employment reported in *Employment and Earnings* by the percent of the CPS sample employed in the hospital using three year moving averages.

females made large wage gains throughout the 1980s relative to males and to females with lower levels of education (Levy & Murnane, 1992). The rising RN relative wage occurred, therefore, despite widening skill and narrowing gender wage gaps over the period. Compared to all male and female workers, relative wage gains are substantially larger.

There was a large drop in the differential in 1994, indicating an end to the rapid wage gains realized by RNs throughout the 1980s and early 1990s. In 1993 an RN earned about 42.5 percent higher wages than a similar worker in the comparison group. In 1994 the differential fell to 34.0 percent, suggesting a significant change in the nursing labor market. Results from *Employment and Earnings* suggest this trend continued in 1995. Median full-time weekly earnings among RNs in 1996 were \$697 (January 1997, Table 39, p. 206), as compared to figures for 1995, 1994, and 1993 of \$716, \$722, and \$746, respectively, in constant 1996 dollars. Thus real earnings for RNs appear to have continued to fall in 1995.⁶

Table 2. RN Log Wage Differentials By Year

| | <i>All RNs</i> | <i>Hospital RNs</i> | <i>School \geq 16 RNs</i> |
|------|----------------|---------------------|--|
| 1973 | 0.139 | 0.193 | 0.150 |
| 1974 | 0.076 | 0.205 | 0.071 |
| 1975 | 0.103 | 0.218 | 0.081 |
| 1976 | 0.080 | 0.219 | 0.051 |
| 1977 | 0.173 | 0.260 | 0.126 |
| 1978 | 0.151 | 0.258 | 0.139 |
| 1979 | 0.156 | 0.247 | 0.124 |
| 1980 | 0.180 | 0.267 | 0.154 |
| 1981 | 0.179 | 0.302 | 0.172 |
| 1982 | 0.192 | 0.330 | 0.173 |
| 1983 | 0.200 | 0.358 | 0.170 |
| 1984 | 0.209 | 0.370 | 0.172 |
| 1985 | 0.220 | 0.356 | 0.182 |
| 1986 | 0.216 | 0.334 | 0.191 |
| 1987 | 0.250 | 0.366 | 0.229 |
| 1988 | 0.257 | 0.387 | 0.216 |
| 1989 | 0.263 | 0.433 | 0.210 |
| 1990 | 0.285 | 0.438 | 0.247 |
| 1991 | 0.294 | 0.458 | 0.257 |
| 1992 | 0.322 | 0.472 | 0.279 |
| 1993 | 0.354 | 0.492 | 0.300 |
| 1994 | 0.293 | 0.423 | 0.246 |

Notes: Data for 1973 through 1978 are from the May CPS and for 1979 through 1994 are from the monthly CPS ORG files. Coefficients are from an RN dummy variable in a regression pooling RNs with the comparison group run separately for each year. Other variables included in the regression were years of schooling, potential experience and its square, dummies for race (2) female, large metropolitan area, industry (11), marital status (2), part-time status, and region (9).

C. Alternative Explanations for the Wage Differential

Differences in Job Characteristics

The rising relative wages realized by RNs throughout the 1980s and early 1990s are consistent with the institutional literature described above indicating an increased demand for RNs. These differentials, however, could be due to differences in job characteristics or skill requirements between RN and comparison group jobs. If RN jobs require greater skills or have less attractive working conditions, then the RN differential estimated above should be interpreted as a compensating differen-

tial and not a true rent. To account for job-specific characteristics we first examine information from the *Dictionary of Occupational Titles* (DOT), which contains a large variety of skill and working condition variables defined at the occupational level.⁷

Table 3 displays a description of selected DOT variables with their corresponding means for RNs, the comparison group, and for workers in all occupations. There is a higher general educational score for RNs and a higher intelligence rating (1 represents the highest rating), but these differences are rather small. RN occupations require substantially more strength and greater physical demands than the comparison group (and for the average of all occupations), implying at least part of the

Table 3. A Description of Selected DOT Variables

| Variable | Description | Mean | | |
|---------------------------|--|-------|------------|-----------|
| | | RNs | Comparison | All Occs. |
| GED | (1–6 point scale) General educational development includes formal and informal education required for occupation in areas of reasoning, math, and language (the highest of the three). | 4.91 | 4.52 | 3.81 |
| TRAIN | (in months) Training time required for occupational proficiency. It measures the amount of time required to learn the techniques, acquire the information, and develop the facility needed for average performance in a specific job-worker situation. | 35.02 | 34.27 | 29.92 |
| INTELLIGENCE | (1–4 scale) index of intelligence required for the job based on the job's relationship to data, people and things (with 1 requiring the most intelligence and 4 the least). | 2.06 | 2.15 | 2.68 |
| PHYSICAL DEMANDS | (0–4 scale) Number of physical demands (climbing; stooping; reaching; seeing; etc.) required on the job. | 1.99 | 0.87 | 1.85 |
| STRENGTH | (1–5 scale) Index of required strength. 1 is the least, 5 is the most. | 2.88 | 1.72 | 2.37 |
| ENVIRONMENT | (0–6 scale) Number of environmental conditions (extreme cold; extreme heat; wet or humid; noise; etc.) existing on the job. | 0.052 | 0.10 | 0.62 |
| OUTDOORS | Percent of workers whose job is performed entirely outdoors. | 0.01 | 1.23 | 7.46 |
| BOTH INDOORS and OUTDOORS | Percent of workers whose job is performed indoors and outdoors. | 0.146 | 8.86 | 19.85 |

Source: Data are from the *Dictionary of Occupational Titles* and England and Kilbourne (1988).

estimated differentials in Table 2 reflect compensation for less pleasant working conditions.

We do not have measures of working conditions over time and it is possible that the relative conditions in RN occupations deteriorated severely enough over the period to increase relative wages. Faucher (1996), however, examines the compensating differential to nurses associated with the risk of contracting AIDS, relating the wages of nurses to the AIDS rate in their city of residence. His results indicate that there is a significant wage premium associated with the threat of contracting AIDS, but this differential *decreased* slightly between 1987 and 1993. Schumacher and Hirsch (1997) examine the wage differential between hospital and non-hospital RNs. They conclude that part of the large wage premium associated with hospital employment is due to higher ability RNs in hospitals and part is due to less pleasant working conditions in hospitals. They show that this differential was relatively stable over the 1979 to 1994 period, with a slight decline occurring in the 1990s. If working conditions were deteriorating in hospitals over this time the wage differential to hospital employment should have increased. Thus, while we do not have direct evidence on worker conditions over time, these studies suggest that deteriorating working conditions are not driving the rising wage differential to RNs.

Differences in Shift Work

Many RNs work second or third shift jobs, whereas few college educated females outside of nursing work these shifts. Therefore, the differential could be driven in part by differences in shift pay. The May 1985 and 1991 supplements to the CPS contain data on usual shift worked. Of the 4,910 individuals in the comparison group, 4,404 (or 89.7 percent) indicated their typical shift worked as the daytime shift. Among the 1,006 RNs in the sample, however, only about half (545) indicated they usually worked the daytime shift. While about 10 percent of the sample of comparison group workers are engaged in shift work, 46 percent of RNs work either the evening (14 percent), night (13 percent), split or rotating (11 percent), or other (8 percent) shift. Comparing the 1985 and 1991 samples reveals very similar means indicating that there was not a major change in the incidence of shift work over the period.

Regressions pooling RNs and the comparison group with and without shift dummies will not provide a reliable estimate for how much of the RN differential is due to shift difference since choice of shift is not random. Hamermesh (1995) finds that shift work is done disproportionately by workers with relatively little (measured and unmeasured) human capital. Simple OLS estimates indicate that there is a *penalty* for shift work among the comparison group of females, since this variable is capturing otherwise unmeasured human capital differences. RNs are a more homogeneous group than the comparison group and there is less likely to be selection bias among them. Estimating the shift differential for RNs (without any

sample selection correction) reveals a premium of about 6.1 percent for shift work. Kostiuk (1990) estimates a differential of 8.2 percent for shift work in *manufacturing* after accounting for selection effects. If the 8.2 percent differential is assumed to be the true differential for both our comparison group and the sample of RNs, then differences in shift work result in about a 2.9 percent RN differential (45.8 percent of RNs are in shift work while 10.3 percent of the comparison group are, a difference of 35.5 percent times the 8.2 percent differential). Using the differential from the RN sample indicates that shift work results in a 2.2 percent differential for RNs. Thus, a small portion of the RN wage differential is due to differences in shift work. Since the means did not change between 1985 and 1991, however, it is implausible that changes in the wage differential are driven by changes in shift work over time.

Differences in Work Experience

The adjusted earnings index is constructed by restricting the coefficients on the right-hand-side variables to be constant over time, and the relative wage differentials are estimated assuming the “quality of potential experience” is the same for RNs and the comparison group. Since the CPS ORG data do not contain direct measures of work experience, we proxy experience as the minimum of age-school-six and age-16. As women’s experience has become more continuous, this variable has become a better proxy for actual labor market experience (O’Neill & Polachek, 1993). If the quality of RN potential experience increased more rapidly than the quality of potential experience for the comparison group, this would lead to an upward bias on the estimate of the *relative* wage growth. On the other hand, if the quality of potential experience for college educated females increased more rapidly than for RNs, we are understating the size of the relative wage growth.

Examining data from the Survey of Income and Program Participation (SIPP) for 1984 and 1990 provides insight into the direction of this potential bias. The SIPP contains direct measures of labor market experience, and by comparing actual experience to potential experience for the two SIPP sample years a measure of the change in the relative quality of experience is obtained.⁸ The following table displays the mean level of actual experience and potential experience for RNs and college educated females:

| <i>Registered Nurses</i> | <i>1984</i> | <i>1990</i> |
|--------------------------|-------------|-------------|
| Actual Experience | 14.62 | 16.62 |
| Potential Experience | 16.95 | 19.07 |
| Actual/Potential | 0.863 | 0.872 |
| Comparison Group | | |
| Actual Experience | 11.21 | 12.80 |
| Potential Experience | 13.40 | 14.73 |
| Actual/Potential | 0.837 | 0.869 |

The proportion of years worked since leaving school for RNs goes from .863 in 1984 to .872 in 1990, while the ratio for college educated females goes from .837 to .869. This suggests that while the quality of potential experience as a proxy for actual experience improved for both groups, there is somewhat greater improvement for the college educated females.⁹ Thus, if anything, we are understating the actual growth in the relative wage for RNs.¹⁰

Having ruled out several alternative explanations, the evidence points clearly to there being large demand induced relative wage increases to RNs throughout the 1980s. Most important was the increase in the utilization of RNs over LPNs in hospitals due to changes in the internal organization of nursing services, cost containment pressures and advances in medical technologies (Krall & Prus, 1995). This structural change was associated with large wage gains for RNs over LPNs and to otherwise similar workers in the economy.

Other than changes on the demand side of the market, there were also supply-side factors which could have impacted RN wages and employment. Over this period there was an expansion in occupational choices available to women. Due to changing roles in the family, lower discriminatory barriers, and reduced wage opportunities for males, females increased their labor supply substantially over this period (Smith & Ward, 1985; Coleman & Pencavel, 1993).¹¹ The broadening of job options for women can be expected to alter the types of people who choose a career in nursing, and if a significant portion of these attributes are not quantified in the data, there may be selectivity bias in our results. Link (1988) estimates a first stage probit labor force participation for RNs and finds there was negative selection after 1977—conditional on obtaining training, RNs who worked had unmeasured characteristics causing them to earn *lower* wages than would have been earned by those RNs out of the labor force if those nonworkers had worked. The type of selection in this case, however, is more complicated. One would like to run a first stage probit on the decision to become an RN. Since virtually all of the sample would choose not to be an RN (only about 4 percent of employed females and 0.2 percent of employed males are RNs), however, the model would have no explanatory power. If the increasing occupational choice available for women over this period was attracting the most able workers out of nursing, this would tend to *understate* the wage growth of RNs over the period. After adjusting for this type of selection, wage growth would be even larger.

The decline in RN earnings in recent years is consistent with a downward adjustment process as described by Beurhaus (1995). As the supply of RNs increased to meet the rapid increase in demand in the mid-to-late 1980s, and as health care expenditure growth slowed in recent years, the differential also declined. This is also consistent with reports of easing RN “shortages” experienced in the 1980s.¹² In the long-run, the only earnings difference between RNs and alternative occupations should be due to differences in skill level (measured or unmeasured by the researcher) or working conditions. Whether the steady state wage rate for RNs will be close to the current level remains to be seen.

V. THE RETURNS TO NURSING EDUCATION

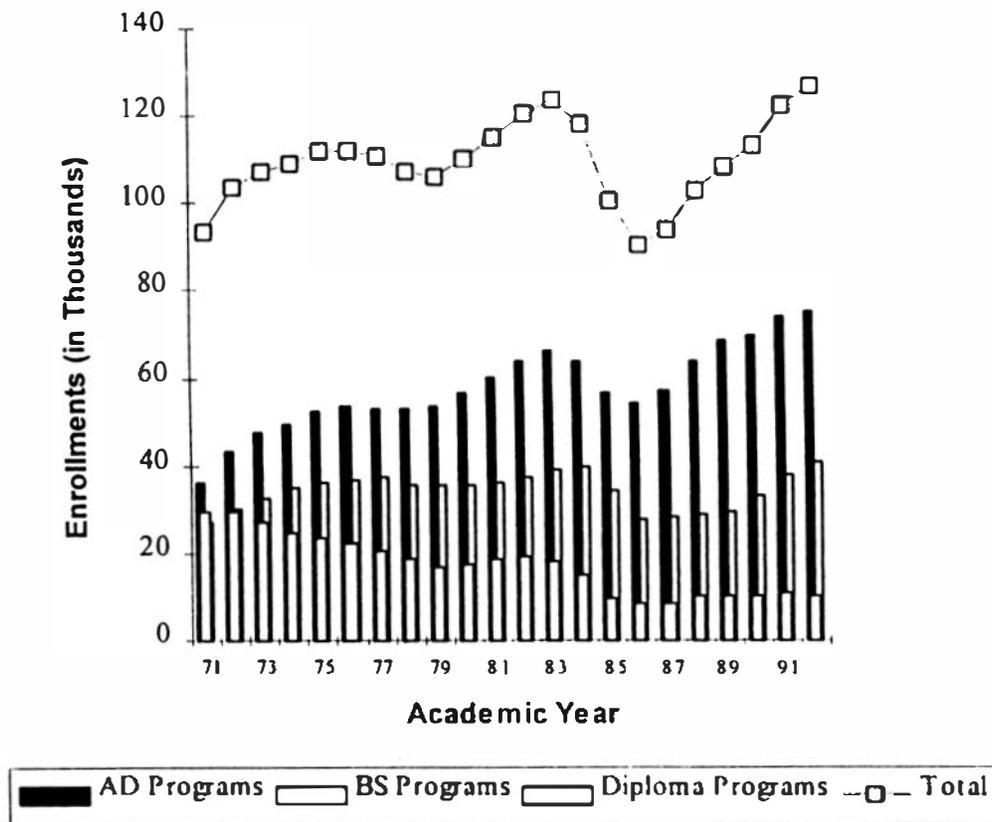
We now turn our focus to estimating the returns to the BS degree in nursing, utilizing data from both the SSRN and the CPS. Figure 4 shows schooling enrollments by degree type for the academic years 1971–1972 through 1992–1993. Enrollments peaked in the 1983–1984 academic year at almost 124,000, then declined to about 94,000 in 1987–1988 and rose to 127,000 in 1992–1993.¹³ The increased enrollments over the period were exclusively through associate and baccalaureate degree programs, while there was a steady decline in diploma program enrollments.

Beginning in 1992, the CPS changed its education questions from years of schooling completed to degree attainment, potentially allowing a more accurate measure of the returns to the three nursing degree types.¹⁴ There is not explicit information in the CPS about nursing degree, just degree and current occupation, and the survey does not provide a clear distinction between the associate and diploma degree.¹⁵ The remaining analysis using the CPS, therefore, pools RNs reporting some college, and the associate degrees.

Table 4 displays mean characteristics from each data set. The SSRN data contain 25,700 RNs whose highest educational attainment is a diploma, 20,893 with an associate degree, 21,657 with a bachelor's degree and 4,866 graduate RNs. Hourly earnings are calculated by dividing the reported gross annual salary by the product of hours usually worked per week and the number of weeks worked in the year. Average real wages (in December 1994 dollars) are \$16.95, \$17.10, \$18.27, and \$22.14 for the four groups. Sample sizes of RNs from the CPS data are 4,455 with associate/diploma degrees, 3,715 with bachelor's degrees, and 731 with graduate degrees. Average real hourly wages are \$17.35, \$19.19 and \$20.55 for the three groups. The CPS data contain a higher proportion of individuals with a bachelor's degree than the SSRN, suggesting there may be many RNs with associate or diploma degrees, but non-nursing bachelor's degree. Such individuals are included as bachelors degree RNs in the CPS, but not in the SSRN.

Other than the differences in schooling, the CPS and SSRN are generally quite consistent. Real wage, age, part-time status, and marital status are similar. An exception is that there are twice as many African-American RNs in the CPS than in the SSRN, suggesting response bias in the SSRN. Correcting both data sets for the over-sampling of smaller states gives a weighted mean of 9.4 percent black RNs in the CPS and 4.2 percent in the SSRN. Thus, black RNs appear to be seriously under-represented in the SSRN.

Table 5 displays regression results estimating the returns to schooling using the two data sets. The results presented in the first column are from the 1992–1994 CPS, those in the second are from the 1984, 1988, and 1992 SSRN, and those in the third include only the 1992 SSRN providing a closer comparison to the CPS.¹⁶ The CPS results indicate that BS RNs earn about 10.7 percent higher wages than RNs with less education. Graduate RNs earn roughly 3.1 percent more than BS RNs. According to the SSRN (for all three sample years), however, BS RNs earn



Source: *Nursing Data Review*, Division of Public Policy and Research, National League for Nursing, 1993 and 1995, Table 11. BS programs are four year university Bachelor of Science programs, AD programs are two year associate degree programs given through a community or technical school, Diploma programs are three year programs given, typically, through a hospital. The academic year indicates the first calendar year of the academic year.

Figure 4. RN admissions by degree type and year.

5.1 percent more than associate degree RNs, while graduate RNs earn about 19.0 percent more than BS RNs.

There is little difference in earnings between AD and diploma RNs, consistent with previous studies. This lack of a differential may provide a partial explanation for the decline of enrollments in diploma programs, since they require one more year of training than the associate degree. Note, however, that the declining enrollments in diploma programs can be explained by supply factors as well as demand factors. The education of RNs has been a heavily debated topic as nursing leaders have moved to gain control of nursing education and limit hospitals' control of education. The American Nurses Association and the National League for Nursing have lobbied to make the baccalaureate a minimum requirement for the RN license (Nichols, 1993). This and the rise of the two year associate degree programs put pressure on the diploma schools. Thus, "diploma schools started

Table 4. Mean RN Characteristics from the Current Population Survey and the Sample Survey of Registered Nurses

| | <i>CPS</i> | <i>SSRN</i> |
|-----------------------------------|------------|-------------|
| Diploma | — | 0.351 |
| Associate | — | 0.286 |
| Bachelors | 0.417 | 0.296 |
| Graduate | 0.082 | 0.067 |
| Real Hourly Wage | 18.383 | 17.738 |
| Age | 40.286 | 40.285 |
| Hospital | 0.703 | 0.675 |
| Female | 0.946 | 0.961 |
| Black | 0.069 | 0.034 |
| Large MSA | 0.453 | — |
| MSA | — | 0.753 |
| Part-Time Status | 0.282 | 0.327 |
| Married, Spouse Present | 0.668 | 0.708 |
| Separated, Divorced or Widowed | 0.173 | 0.157 |
| Union Coverage | 0.195 | — |
| Sample Size | 8,910 | 73,116 |

Notes: Data from the Current Population Survey are for the years 1992–1994, and data from the SSRN are from 1984, 1988, and 1992. The SSRN data contain a variable indicating that the worker resides in an MSA but does not contain information about the size of the MSA. The SSRN does not contain union information.

closing, one after another as their potential students were recruited into associate degree programs” (Curtin, 1994, p. 16).

The results for the 1992 SSRN yield similar results to the pooled sample, and the results are also consistent with those reported by Link (1988). He utilizes Census of Population data from 1970 and the SSRN for 1977, 1980, and 1984, and finds no significant difference in earnings between associate and diploma nurses, while BS nurses earn a significant premium of about 7 percent.¹⁷

Other than the difference in the estimated returns to schooling, there are two substantial differences in the estimates of the two data sets. The 1992–1994 CPS sample suggests there is little difference between male and female earnings, whereas the SSRN suggests there is a large male premium. Similar to the CPS results presented in Table 5, results from the full CPS sample (1973–1994) indicate that there is not a significant difference in earnings between male and female RNs. Table 4 indicates that the CPS contains a larger proportion of males than the SSRN, implying that males may be under-represented in the SSRN and that higher wage males are most likely to respond to the survey.

Table 5. Returns To Registered Nursing Education

| | (1) 92-94 CPS | (2) 84, 88, 92 SSRN | (3) 92 SSRN |
|-----------------------|-------------------|------------------------|-------------------|
| Diploma | — | -0.012 (0.003) | -0.012 (0.005) |
| Bachelor's | 0.102 (0.008) | 0.050 (0.003) | 0.052 (0.005) |
| Graduate | 0.133 (0.013) | 0.224 (0.005) | 0.203 (0.008) |
| Hosp | 0.146 (0.008) | 0.163 (0.003) | 0.168 (0.005) |
| Experience | 0.015 (0.001) | 0.017 (0.000) | 0.016 (0.001) |
| Exp ² /100 | -0.031 (0.003) | -0.032 (0.001) | -0.030 (0.001) |
| Female | 0.010 (0.016) | -0.129 (0.006) | -0.098 (0.009) |
| Black | -0.133 (0.014) | 0.063 (0.006) | 0.085 (0.009) |
| Large MSA | 0.095 (0.008) | — | — |
| MSA | — | 0.111 (0.003) | 0.126 (0.005) |
| Part Time | 0.029 (0.008) | 0.014 (0.003) | 0.018 (0.004) |
| Union Coverage | 0.037 (0.008) | — | — |
| n | 8,910 | 73,116 | 24,877 |

Notes: Column 1 is a log real wage regression from the CPS data for 1992 to 1994, the results in Column 2 use the SSRN for 1984, 1988, and 1992, and Column 3 uses only the 1992 SSRN. Other variables included the equations were dummies for marital status (2), region (8), other race, and year dummies. Standard errors in parenthesis. Experience is proxied as age minus school minus five (except for the 1984 SSRN where it is the actual number of years of experience as an RN). The SSRN does not contain union information. Excluding union coverage from the CPS regression results in virtually identical schooling coefficients.

There is also a large discrepancy on the coefficient on black RNs. The SSRN suggests that black RNs earn a *premium* over similar white RNs of 6.5 percent. The CPS data, however, suggest black RNs earn 12.5 percent *lower* wages than similar white RNs.¹⁸ This result, along with the finding in Table 4 of an under-representation of blacks in the SSRN suggests that there is significant response bias. It appears that a disproportionate share of high-wage black RNs respond to the survey, while low-wage black nurses are under-represented.

VI. THE RETURN TO NON-NURSING EDUCATION

The estimated return to the BS from the CPS is substantially higher than that from the SSRN. A possible explanation for this difference is that RNs receive a return from non-nursing education. The SSRN regression includes type of RN degree but not other education. Some AD and diploma degree RNs in the SSRN also have a bachelor's degree, but not in nursing. To the extent this additional training is valuable in nursing as well as non-nursing markets, these RNs will push up the average wage for associate and diploma degree RNs, lowering the estimated return to the nursing BS. In contrast, the CPS does not have specific RN degree information, so diploma RNs with a non-nursing bachelor's degree will be grouped with those holding a BS in nursing. If non-nursing training has no value in nursing, then CPS estimates should be *lower*, since the CPS will include some associate and diploma RNs with the BS RNs.

To illustrate, consider the following earnings equation:

$$\ln W_i = \sum_{j=1}^J \beta_j X_{ij} + \alpha_1 AD_Y_i + \alpha_2 Dip_N_i + \alpha_3 Dip_Y_i + \alpha_4 BS_N_i + \alpha_5 BS_Y_i + \alpha_6 Grad_N_i + \alpha_7 Grad_Y_i + \varepsilon_i \quad (3)$$

where $\ln W_i$ is the log real wage for worker i , X contains observed personal and job related characteristics that affect the wage, β their coefficients, and ε is a well behaved error term. The remaining variables control for educational attainment. AD , Dip , BS , and $Grad$ are the associate, diploma, bachelor's, and graduate degrees in nursing. The symbol Y indicates that the individual earned a bachelors in a non-health related field prior to their nursing education, and N indicates that the individual has no non-nursing education. The omitted group are those with an associate degree only. This specification allows tests of the following hypotheses:

- (1) $\alpha_1 = 0$: The return to a non-nursing bachelor's degree is zero for AD RNs.
- (2) $\alpha_3 = \alpha_2$: The return to a non-nursing bachelor's degree is zero for diploma RNs.
- (3) $\alpha_5 = \alpha_4$: The return to a non-nursing bachelor's degree is zero for BS RNs.
- (4) $\alpha_7 = \alpha_6$: The return to a non-nursing bachelor's degree is zero for graduate RNs.
- (5) $\alpha_4 = \alpha_5 - \alpha_1$: The return to the BS in nursing relative to the AD is the same for those with and without non-nursing education.
- (6) $\alpha_4 - \alpha_2 = \alpha_5 - \alpha_3$: The return to the BS in nursing relative to the diploma is the same for those with and without non-nursing education.
- (7) $\alpha_6 - \alpha_4 = \alpha_7 - \alpha_5$: The return to a graduate degree in nursing relative to the BS is the same for those with and without non-nursing education.

The SSRN contains information about educational achievement prior to completing nursing education, allowing explicit tests of these hypotheses and providing a measure of the extent and direction of the bias in previous studies of nursing education. There are 2,250 individuals in the sample with a bachelor's in a non-health related field, 938 AD RNs, 253 Diploma RNs, 813 BS RNs, and 246 graduate RNs.

Table 6 displays the effects of including nursing and outside education in log wage regressions for registered nurses, and the results of testing the above hypothe-

Table 6. The Effects of Nursing and Outside Education

| Variable | Regression Results | |
|---|----------------------|----------------|
| | Coefficient Estimate | Standard Error |
| AD_Y | -0.007 | 0.010 |
| Dip_N | -0.013 | 0.003 |
| Dip_Y | 0.040 | 0.019 |
| BS_N | 0.050 | 0.003 |
| BS_Y | 0.050 | 0.011 |
| Grad_N | 0.224 | 0.005 |
| Grad_Y | 0.218 | 0.020 |
| Hypothesis Tests | | |
| Hypothesis | p-Value | |
| (1) $\alpha_1 = 0$: The return to a non-nursing bachelor's degree is zero for AD RNs. | 0.465 | |
| (2) $\alpha_3 = \alpha_2$: The return to a non-nursing bachelor's degree is zero for diploma RNs. | 0.006 | |
| (3) $\alpha_5 = \alpha_4$: The return to a non-nursing bachelor's degree is zero for BS RNs. | 0.956 | |
| (4) $\alpha_5 = \alpha_4$: The return to a non-nursing bachelor's degree is zero for graduate RNs. | 0.738 | |
| (5) $\alpha_4 = \alpha_5 - \alpha_1$: The return to the BS in nursing relative to the AD is the same for those with and without non-nursing education. | 0.588 | |
| (6) $\alpha_4 - \alpha_2 = \alpha_5 - \alpha_3$: The return to the BS in nursing relative to the diploma is the same for those with and without non-nursing education. | 0.017 | |
| (7) $\alpha_6 - \alpha_4 = \alpha_7 - \alpha_5$: The return to the MS in nursing relative to the BS is the same for those with and without non-nursing education. | 0.749 | |

Notes: Data are from the 1984, 1988, and 1992 SSRN. AD, Dip, BS, and Grad represent the associate, diploma, bachelor's, and graduate RN degrees. Y indicates the presence of a bachelor's degree in a non-nursing related field, and N indicates no non-nursing education. Other variables included in the regressions were potential experience and its square, and dummies for gender, race (2), marital status (2), metropolitan statistical area, part-time status, hospital employment, region (8), and year (2).

ses. We reject null hypothesis 2: the earnings of diploma RNs are significantly higher if they attained a bachelor's degree prior to entering their nursing education. Diploma RNs with an outside degree earn about 5.7 percent more than similar diploma RNs without non-nursing education. Hypotheses 1, 3, and 4 cannot be rejected, however, implying that there is not a significant return to a non-nursing bachelor's for AD, BS or graduate RNs. These results suggest that non-nursing academic courses have value in nursing, but their marginal value is low, consistent with a large premium for outside study for diploma RNs but not AD RNs.¹⁹

We reject hypothesis 6, suggesting that while there is not a significant difference in earnings between diploma RNs with an outside bachelor's and BS RNs, diploma RNs without an outside bachelor's earn 6.5 percent less than BS RNs without an outside bachelor's degree. The bias in the estimate of the BS premium that results from not controlling for non-nursing education, however, is minimal. The results in Table 5 suggested that BS RNs earned 6.4 percent higher wages than diploma RNs, while the estimate in Table 6 is only slightly higher. The differential between BS RNs and AD RNs and the differential between BS and graduate RNs is not affected by non-nursing education (i.e., we cannot reject hypotheses 6 and 7).²⁰

The results in Table 6 indicate that there is a small value placed on non-nursing education in the labor market for registered nurses. While the results of previous studies such as Link (1988) omitted a potentially important component of earnings, their estimates of the BS premium do not appear to be seriously biased. This suggests that nursing is a highly specialized field requiring specific training, and the marginal value of non-nursing human capital is small. Schumacher (1997) analyzes the decision of RNs to exit the labor market or to enter an alternative occupation. His findings show that RNs are not sensitive to outside wage opportunities (as measured by the ratio of their current wage as an RN to their predicted wage outside of nursing). RNs who do change occupations receive large wage losses. Alternatively, secretaries are substantially more sensitive to outside wages, suggesting that secretarial training is much less specific and is more easily transferred to alternative occupations. Nursing training, however, appears to be highly specific and is not easily transferred to non-nursing occupations.

The lack of a significant return to non-nursing education raises an interesting question: what is the source of the difference between an AD RN degree and a BS RN degree? Traditional explanations for the source of the difference is a higher level of general training to the BS degree (Lehrer, White, & Young, 1991). This explanation is inconsistent with the findings here, however, since we show that there is not a significant return for a non-nursing BS degree for AD RNs. An explanation that would reconcile this result with human capital theory is that there is selectivity bias owing to unmeasured skill differences between the two groups. Individuals who first obtain a BS in a non-nursing field and then return to school to receive an AD in nursing may have performed poorly or participated discontinuously in the non-RN labor market and subsequently returned to school. This hypothesis cannot

be tested directly, however, since we do not have data on these individuals' labor market histories.

In addition, because non-nursing education appears to play only a small role in the earnings of nurses, left unexplained is why the CPS estimate of the BS premium is substantially higher than the SSRN estimate. We do not know the answer, but can make a couple of conjectures. First, the CPS measure of occupation is self reported (individuals describe their job duties and Census coders place them in one of about 500 occupational categories), whereas the SSRN is mailed only to licensed RNs. The CPS is likely to contain a broader range of individuals whose occupation is coded as an RN. If some lower skilled health care workers are coded by the CPS as RNs, then the coefficient on the BS degree is likely to be biased upward since it will also capture inter-occupational wage differentials. Second, the SSRN is self-selected. As discussed previously, it appears that low-wage RNs are under-represented. If low-wage AD and diploma RNs are particularly likely to be under-represented, the SSRN will understate the size of the BS premium. Consistent with these explanations, the average real wage from the 1992 CPS is \$18.24 for all RNs, as compared to \$19.75 from the 1992 SSRN.

VII. CONCLUSIONS

Registered nurses made significant wage gains during the 1980s and early 1990s, as compared to both licensed practical nurses and to females with college degrees in non-health related occupations. Although differences in job characteristics and shift work account for some of the RN wage advantage, there is a large unexplained differential that increased substantially over the period. This wage growth is consistent with an increased utilization of hospital RNs over the period. Researchers observing abnormally high vacancy rates over extended periods of the 1980s were led to conclude that the competitive labor market model did not apply to the RN market since wages were not adjusting to correct the shortage (Aiken & Mullinex, 1987). Our results suggest this was not the case. Real and relative wages adjusted rapidly over the 1980s so that an RN in 1993 earned a wage 19.8 percent higher than a similar RN in 1983. The results are also consistent with studies of RN labor supply, which typically find relatively low elasticities of supply (Link, 1992). Our finding of a long period of sustained relative wage growth reinforces the prediction in this literature that RNs are relatively unresponsive in the short-run to changes in wages.

Evidence on the returns to RN education, using more recent data than in previous studies, indicates that nurses with a bachelor's degree earn about 5 percent higher wages than RNs with diploma or associate degrees. Previous studies have not controlled for non-nursing education, which may have biased estimates of the returns to nursing education. When incorporating this information into our earnings equations, we find that non-nursing academic training has a positive impact on

earnings, but the marginal value is low. Diploma RNs with an outside bachelor's degree earn a significant premium over similar diploma RNs without non-nursing post-secondary education. We do not observe a differential for the presence of outside education for other degree types. These findings indicate that while previous studies of nursing education have omitted a potentially important variable in wage determination, its omission does not lead to significant bias in estimates of the return to schooling.

The findings of this study are of interest to both economists and health care policymakers alike. Because nursing is the third largest occupation among women, this research provides a richer understanding of a labor market that is of interest to economists studying the role of women in the economy. It is also an important market for health care policy analysts to understand since RNs are the largest occupation in hospitals, accounting for a quarter of total employment. Finally, by examining data over a long time period, it provides some insight into the dynamics of a highly specialized labor market. Traditional family roles required women to be tied to their spouse's employment decision. While RN skills are easily transferred across nursing jobs (a traditional explanation for why the nursing profession is 95 percent female) they are not easily transferred across occupations. As family roles have changed and women have increased their attachment to the labor market, women have been attracted to and faced fewer barriers from alternative high skill occupations. At the same time, demand for highly skilled nurses increased and, as a result, there were expanding wage advantages enjoyed by RNs. These wage differentials appear to be dissipating, however, in response to slowing demand growth and a relatively large flow of young RNs following enrollment increases in the late 1980s.

ACKNOWLEDGMENTS

The author appreciates helpful comments and assistance from Marjorie Baldwin, Barry Hirsch, David Macpherson, and two anonymous referees.

NOTES

1. Exceptions include Buerhaus (1993, 1995) who examines real RN wages between 1979 and 1994, and Krall and Prus (1995) who examine RN to LPN and RN to nursing aide wage ratios between 1956 and 1989.

2. Weekly earnings are top-coded at \$999 per week in the surveys through 1988, and at \$1,923 beginning in January 1989. A maximum of 1.2 percent of RNs are at the earnings cap in any year (1988); 0.4 percent are at the cap in 1994. The comparison group (described below) includes 3.9 percent at the cap in 1988 and 0.5 percent in 1994. For workers at the cap, we assign the estimated mean earnings above the cap based on the assumption that the upper tail is characterized by a Pareto distribution (see Hirsch & Macpherson, 1996, p. 6). We omit individuals with an implied real hourly wage (i.e., usual weekly earnings divided by usual hours worked per week) less than \$1.00 or greater than \$99.99. These groups likely represent those with mismeasured earnings or hours of work.

3. Results are not sensitive to the composition of the comparison group. For example, if we exclude primary and secondary school teachers, we find slightly lower relative wages for RNs but a similar trend over time. Alternatively, if we include all females in the comparison group, relative wages are larger but a similar time trend is observed.

4. The variables included in the regressions are years of schooling, potential experience (the minimum of age-school-six and age-16) and its square, and dummies for race (2), gender (in the nursing regressions), part-time status, marital status (2), region (8), large metropolitan area, and year (21).

5. Table 2 also reveals a temporal path of relative wages highly similar to that shown in Figure 2, the latter based on wage indices whose coefficients are constant across years but allowed to vary across occupational groups.

6. A report in the *American Journal of Nursing* indicates that enrollments in nursing school declined for the first time in six years, while new graduates found a more difficult time finding employment (Brider, 1996).

7. The DOT is a reference manual and data source providing a broad range of information on the content and characteristics of detailed occupations. The DOT contains information at highly disaggregated levels (12,099 occupational categories), while the Census occupational classification is more aggregated (about 500 occupations). England and Kilbourne (1988) provide a weighted mapping of variables from the 1977 fourth edition of the DOT into the 1980 Census of Population (and CPS) occupational categories. This chapter utilizes the England-Kilbourne DOT measures, mapped to the time consistent 1980 and 1990 Census occupational categories. Attempts to estimate the log earnings differential with and without DOT controls for job characteristics did not yield reliable estimates of the compensating differential for these characteristics due to the high degree of collinearity between the DOT variables.

8. The SIPP extract was kindly provided by Marjorie Baldwin. There are 275 RNs and 1,753 comparison group workers in the SIPP sample in 1984. In the 1990 data set there are 357 RNs and 2,288 comparison group workers. The analysis is restricted to employed wage and salary earners. Actual experience is defined as the number of years the individual worked at least six months since the year they first worked six straight months or longer at a job or business.

9. The standard deviations for these numbers are quite large, however, so these differences are not statistically significant.

10. In work not shown, CPS supplements containing information on tenure with the current employer were also utilized (May 1979, 1983, 1988, and January 1983, 1987, and 1991). For all age groups the comparison group has a slightly higher mean years of tenure on the job (6.9 years vs. 6.3 years). Young RNs (age less than 35) tend to have a higher level of tenure than young comparison group workers, while the opposite is true for older (age greater than 50) workers, which could be the result of both age and cohort effects. When including tenure and its square in an earnings equation, the RN log wage differential falls only slightly, from 0.353 to 0.341, suggesting that the RN wage differential is not driven by stronger attachment to the labor market among RNs. Similarly, separate regressions by year reveal the same time pattern in the nursing wage differential with and without comparisons for tenure, suggesting that the use of potential experience is not driving our results.

11. At the same time, however, hospitals were expanding their menu of flexibility in scheduling for RNs during this time, which would make nursing more attractive to women who were trying to coordinate home time and market time.

12. In addition, see Brider (1993, 1996), or Anders (1995).

13. Brider (1996) reports that enrollments leveled off in the 1994–1995 academic year. BS programs showed the only gain (1.8 percent) while AD and diploma schools declined slightly.

14. Jaeger (1993) and Kominski and Siegel (1993) find that there is a great deal of consistency between the two measures, although Jaeger finds that, economy-wide, the new variables explain more of the variation in wages than the old measure.

15. The CPS defines two associate degree categories: "Associate's degree in college—occupational/vocation program," and "Associate's degree in college—academic program." While it appears

that the first classification refers to the diploma and the latter to the associate degree, sample sizes suggest there is significant measurement error. The CPS contains 2,263 RNs with the occupational/vocation program, 1,363 with college-academic programs, and 829 reporting some college but no degree. While the SSRN data indicate about 29 percent of the sample are associate degree RNs and 35 percent are diploma RNs, the CPS classifications suggest about 15 percent associate degree and 25 percent diploma and 9.3 percent with "some college." The reported CPS ratios of diploma to associate RNs were also calculated by five year age groups. If this ratio increased with age it would imply that there is some useful information in the two degrees. There was no clear pattern, however, suggesting that the two degree types should be pooled.

16. The regressions in Table 5 contain dummy variables for hospital employment. Previous research (Lehrer et al., 1991) found that returns to schooling were quite sensitive to whether controls for sector or employment were included. Our results, however, are not sensitive to the inclusion of sector controls.

17. Link controls for demand side variables not included in the regressions in Table 4 (such as the physician to population ratio, crime rate, and dummy variables for states with strict cost containment programs). He also controls for the potential correlation between the decision to work and the wage by estimating a selection model.

18. Using weighted least squares with the population weights to correct for oversampling of smaller states yields virtually identical coefficient estimates for both the CPS and SSRN samples.

19. In results not shown, we also included dummies for the presence of an outside associate degree as well as an outside bachelor's. These results show a small premium for diploma RNs who previously attained an associate degree as compared to diploma RNs who had no outside training, consistent with our argument that non-nursing academic courses have a small positive impact on earnings. We also included a variable indicating whether the individual was licensed as a practical nurse prior to becoming an RN in a log wage regression. The coefficient estimate on this variable was insignificant and very close to zero indicating that working as an LPN does not provide marginally valuable training for the RN occupation.

20. We also classified the outside bachelor's degree between science (physical or social sciences) and non-science majors. The results indicate that choice of major makes little difference, but there is a clear pattern indicating a slightly larger return to science majors.

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