The Practice Boundaries of Advanced Practice Nurses: An Economic and Legal Analysis

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Abstract

The purpose of this study is to examine the causes and effects of State regulation that determines the extent of professional independence of advanced practice nurses (APNs). We analyze determinants of these regulations in panel data across States.

We find that in States where APNs have acquired a substantial amount of professional independence, the earnings of APNs are substantially lower, and those of physicians' assistants are substantially higher, than in other States. These results are striking since physicians' assistants are in direct competition with APNs; the only real operational difference between these groups is that physicians' assistants are salaried employees who must work under the supervision of a physician. The implication is that physicians have responded to an increase in professional independence of APNs by hiring fewer APNs and more physicians' assistants.

JEL classifications: **C15, C35, K31**

Key words: **regulation, professions, nursing panel data, Markov Chain Monte Carlo.**

The purpose of this study is to examine the causes and effects of State regulation that determines the extent of professional independence of advanced practice nurses. Such nurses include nurse practitioners, certified nurse-midwives, clinical nurse specialists, and nurse anesthetists. Variations in the boundaries of practice for these advanced practice nurses (APNs) are of interest, since there is a considerable overlap between their health care responsibilities and those of physicians. There is a great deal in common, in terms of functions and responsibilities, between nurse practitioners and primary care physicians; between certified nurse-midwives and obstetrician/gynecologists; and between nurse anesthetists and anesthesiologists. We are interested in analyzing differences in the practice boundaries of APNs across States, and changes over time within States. The objectives of this study are to learn (1) the determinants of the extent of the restrictions imposed by a State on the practice of APNs, and (2) the consequences of such restrictions for the earnings of APNs and other health care providers. We do a cross-sectional and time series analysis of the factors that may be important in determining the regulatory outcome. This analysis is motivated by the economic theory of regulation (Stigler 1971; Peltzman 1976; Graddy 1991), which models legislative choice as a response to the competing demands of various interest groups, which offer political support to legislators in exchange for the outcomes they desire.

Professional independence of advanced practice nurses can be summarized by State laws regarding two key issues: (1) the degree of any required

physician supervision of APNs and (2) the extent to which APNs are licensed to write prescriptions. We construct two ordinal categorical variables for these two facets of APN independence and estimate a bivariate ordered probit model for a panel of States. Our model takes into account a particular dependence in the data: Across time, States have almost universally moved towards allowing greater professional independence, rather than lesser independence for APNs.

The plan of the paper is as follows. The next section defines the relevant professions and discusses their regulation, with reference to the literature. The second section describes the data and the third section presents the bivariate ordered probit model. The fourth section applies some of the results from the bivariate ordered probit to study the effects of regulation on earnings. The final section concludes.

I. Definition and Regulation of Advanced Practice Nurses

Nurse Practitioners (NPs) are registered nurses whose formal education and clinical training go well beyond the basic requirements for licensure. Most NPs are trained in master's degree programs.[3] NPs are trained to diagnose and treat common acute illnesses and injuries, manage high blood

[3]As of 1995, 80.9 percent of all students being trained to become NPs were enrolled in M.A. programs. Harper and Johnson (1998).

pressure, diabetes, and other chronic problems; prescribe drugs, devices and treatments; order and interpret X-rays and other laboratory tests; and counsel patients on disease prevention. The number of NPs in the U.S. is not precisely known, since this occupation is not separately licensed but rather certified, and there are several different certifying organizations. Moreover certification, although required in some States, is voluntary in most. As of 1992 estimates of the number of nurse practitioners in the U.S. ranged from 21,900 to 27,200 (Sekscenski, et al., 1994), which amounts to about 1.5 per cent of registered nurses.[4]

Certified Nurse-Midwives (CNMs) are registered nurses with advanced training in midwifery who have been certified through a national examination. They are trained to deliver babies, provide gynecological care, family planning services, and pre- and post-natal care for mothers and infants. They also co-manage with physicians those pregnancies that are considered to be high-risk cases. CNMs are basically substitutes for obstetrician/gynecologists and general practitioner physicians in the management of obstetrical and gynecological care. In 1992, there were between 3500 and 4300 certified nurse-midwives in the U.S. (Sekscenski, et al., 1994).

Within the ranks of APNs, a distinction is often made between nurse practitioners and certified nurse-midwives, on the one hand, and clinical nurse

[4]Morgan (1993) estimated the number of active NPs in 1992 to be 27,226, which was 1.25 percent of the estimated number of active RNs, 2.18 million. There has been remarkable growth in the number of NPs since 1992, however. Industry surveys indicate that there are about 55 thousand NPs in full-time practice (Pearson (2000, Table 3)).

specialists and certified nurse anesthetists, on the other hand, in that the former, but not the latter, are engaged in primary care. Clinical nurse specialists generally practice in tertiary care settings (Safriet 1992, at 423 n.)

Physician assistants (PAs) perform essentially the same tasks as NPs; they provide preventive health services, diagnose illness, conduct physical examinations, order laboratory tests, develop and carry out plans for treatment, consult and collaborate with, and refer cases to, other providers. PAs are not nurses, however; they are mostly graduates of two-year medical training programs. Although the services of PAs and NPs are largely interchangeable, there are subtle differences between their practice characteristics. PAs who work in primary care are typically generalists in the area of family practice. NPs, on the other hand, are more likely to specialize in areas of primary care such as family practice, adults, geriatrics, pediatrics, women's health, neonatal care, or acute care. In addition, NPs are reported to place greater emphasis on prevention and patient education. For the purposes of our study, the most important difference between PAs and NPs is that PAs are salaried employees who by law must work under the supervision of a physician. Also, it is interesting to note that in contrast to NPs and other APNs, a large proportion of PAs are male. The number of PAs in practice in 1992 was estimated to be 22,300 (Sekscenski, et al., 1994).

A. Regulatory Stances across States

There is considerable variation across the States in terms of restrictions on the scope of practice of APNs. Direct limitations on practice generally fall into either of two categories: (1) requirements of formal practice relationships with MDs, in the form of written practice agreements, protocols, and collaboration guidelines; and (2) restrictions of practice to certain sites or facilities, such as family planning clinics, or to certain geographical areas, such as rural areas.

The most recent survey available reports that in sixteen States nurse practitioners must be supervised by, or collaborate with, a physician (Pearson 1998). There is, however, an unmistakable trend toward granting more autonomy to advanced practice nurses. In recent years, twenty-six States have passed laws allowing nurse practitioners to work without a link to a physician. Moreover, in July 1997 the U.S. Department of Veteran Affairs decided to accept nurse practitioners without a practice relationship with physicians.

Another area in which there are major differences among the States in the extent of professional independence concerns the authority of APNs to prescribe drugs, devices and treatments. There are substantial differences across the States both in the extent of an APN's authority to prescribe and in the range of drugs which they are allowed to prescribe. In fourteen States the involvement or supervision of a physician is required, and APNs may not prescribe controlled substances. Nineteen States require the involvement of

a physician. In eighteen States, however, nurse practitioners are allowed to prescribe without any physician involvement (Pearson 1998).

Another aspect of professional independence concerns compensation for the services of the NP or CNM. Two principal issues are: (1) what will the level of compensation be, relative to the amount paid when the same services are provided by a physician; and (2) will payment be made directly to the APN, or can she bill only through a physician? A rule that the APN may be reimbursed only from a payment made to a physician naturally tends to undermine the professional independence of the APN. For years there has been direct reimbursement of nurse practitioners in certain practice settings. NPs are directly reimbursed by many State Medicaid programs that serve low-income individuals and by Medicare programs for patients in rural areas. There is also a recent trend for managed-care organizations to provide direct compensation to APNs. In January 1998 a new Federal statute allowed Medicare to reimburse directly nurse practitioners working anywhere within a State, not just in rural areas.[5] This law will surely have an impact well beyond Medicare, since private insurers and State insurance regulators tend to adopt provisions patterned after federal Medicare arrangements.

B. The Literature on the Legal Environment for Advanced Practice Nurses

[5]Health-related provisions of P.L. 105-33, the Balanced Budget Act.

Sekscenski et al. (1994) constructed "practice environment scores" designed to measure the extent to which State laws were hospitable to the professional independence of physician assistants, nurse practitioners, and certified nurse-midwives. A separate score was constructed for the practice environment of each of the three groups. It turned out that there was a positive correlation across States between the supply of each group (i.e., the ratio of practitioners to population) and the State's corresponding practice environment score.[6]

Declerq et al. (1998) constructed a "support score" representing each State's regulatory environment of certified nurse-midwives. The ratings were based on five factors: (1) whether CNMs were members of the state board that regulated them; (2) the extent of their prescriptive authority; (3) the availability of reimbursement by Medicaid and private insurance companies; (4) whether CNMs had hospital admitting privileges; and (5) whether CNMs in free standing birth centers could be reimbursed. They found a high positive correlation between a State's support score and the supply of CNMs (CNMs per female population). Support scores were also positively associated with median family income, hospital costs, physicians per capita and nurses per capita.

In this study, we evaluate the relationship between determinants, such as the number of physicians and nurses per capita, and measures of APN pro-

[6]This study confirmed the findings of Weston (1980). Sekscenski et al. also found a positive correlation between the supply of generalist physicians and nurse practitioners.

fessional independence in a structural econometric model. The next sections discuss the data and the model.

II. The Data

For the years 1988-1996 we have constructed two ordinal categorical variables representing different facets of the degree of professional independence of APNs in a State: (1) AUTHORITY, which measures the extent to which an APN must be supervised by, or collaborate with, a physician; and (2) PRESCRIBE, which measures the extent to which an APN has license to prescribe drugs. Each variable has levels 1 through 4, where the number increases with the degree of professional autonomy. For AUTHORITY, 4 indicates complete professional independence. For PRESCRIBE, level 4 indicates that the APN can prescribe any drug, including controlled substances, without any requirement that a physician be involved. Level 1 of PRESCRIBE indicates that the involvement or supervision of a physician is required, and that APNs may not under any circumstances prescribe controlled substances. These variables, which are described in detail in Appendix 3, are based on qualitative information about State laws and rankings reported in annual issues of *Nurse Practitioner*.

One of our variables, the percentage of births with low birthweight, represents the general quality of health care within a State. The idea behind this

variable is to explore whether a perception that health care is poor provides the impetus to enact laws that allow APNs to practice independently. Paul (1984) investigated whether the States that first required the licensure of physicians were those with the lowest quality of health care, the idea being that a State could improve its medical care through licensure of physicians. However he found no such relationship.

III. The Effects of Regulation on APN Earnings

A. The Literature on Earnings

We would like to examine the effect of regulation on the income of APNs, primary care physicians, and physician assistants. Sass and Nichols (1996) analyzed the impact of licensing statutes that limit the control of physicians over physical therapists. Some States have enacted "direct access" laws, which allow physical therapists to evaluate and treat patients without a referral from a physician. Sass and Nichols considered two competing hypotheses about the effect of existing laws that require a physician referral. Under the capture model of regulation, physicians simply seek to limit the access of patients to those, such as physical therapists, who offer an alternative to the services of a physician. Under the public interest theory of regulation, however, the requirement of a physician referral benefits patients, who are ill-informed and would make worse choices of therapists' services if there were

no referral requirements. The study found that wages of physical therapists were lower in the States with direct access laws, a result that was striking in view of the vigorous lobbying efforts on behalf of these laws by the physical therapists' national association. Sass and Nichols suggested that direct access laws might increase the supply or reduce the quality of physical therapy services, by allowing the practice of lower quality therapists who would not otherwise survive, since they would not receive referrals from a physician. The question remains as to why the physical therapists' association would work to enact laws that have the effect of reducing their wages. The authors surmised that either (1) physical therapists mistakenly believed that the removal of referral requirements would increase their incomes; or (2) physical therapists were aware of the consequences of these laws for their wages, but were willing to pay this price to gain professional independence.

Sass and Nichols made another point about physician incentives that is directly relevant to the practice of APNs. It is not clear that under the cartel theory physicians would want to minimize the use of physical therapy services by patients. In many situations physicians may have an ownership interest in, or otherwise derive a financial benefit from, the practice of therapists to whom they refer patients. Given the asymmetry of information between patient and physician, there may be a tendency in these situations for the physician to over-prescribe the use of these services.

In a study of dental hygienists, Goldsmith (1989) considered the effect of

State regulations that (1) specified the extent to which hygienists must be supervised by dentists, and (2) restricted the range of tasks that could be performed by hygienists. He assumed that the productivity of hygienists was reduced by laws that required close supervision of them by dentists, and by laws that restricted the scope of their activities. On the other hand, Goldsmith noted, there might be a "compensating differential" for such laws to the extent they made the occupation of a dental hygienist less attractive. In the event he found that the effect of these laws on productivity was dominant; the wages of hygienists declined the fewer the tasks they were allowed to do, and the closer the supervision that was required by law.

B. The Earnings Data

To learn the effect of regulation on the earnings of APNs and other providers, we use data from nine consecutive March Current Population Surveys (CPS) for the survey years 1989 through 1997. The CPS is a large random sample of the U.S. population, used to update the most recent decennial census. It is one of the best available sources of current information on income, work experience and other conditions of the labor market. The CPS data provide information on earnings in the calendar year preceding the March survey. For each year covered by the CPS, we extracted the statistical records of all persons classified in any of three occupational categories:

registered nurse, physician, and physicians' assistant. It should, however, be understood that this is not designed to be a definitive study of the determinants of earnings of registered nurses and physicians. Other studies have examined these issues more thoroughly, for example by controlling for the specialties of physicians or the practice environment of nurses.[7] Rather, our purpose is to put the results for APNs in context by comparing the effects of the variables of our data set on related health professions.

To analyze advanced practice nurses, we selected the records of all those in the registered nurse occupation who had a master's or "professional school" degree (but not a Ph.D.) or alternatively, at least five years of higher education. In so doing our objective was to obtain as many APNs as possible, without including RNs with advanced degrees who were in educational positions.[8]

Our analysis is restricted to the year-round, full-time workers of each occupation, defined as those working fifty or more weeks per year and thirty-five hours or more in a typical week. Earnings for all years are converted to 1997 dollars by the Consumer Price Index. All observations are weighted by

[7]Indeed, the regression results for physicians are based on the two years of our data where there was no upper limit on reported earnings, 1995 and 1996.

[8]In 1996 there were about 207,459 registered nurses with a master's or doctoral degree. This is about 9.8 per cent of the total number of RNs, estimated at 2,115,815. It is also almost four times the total number of APNs, estimated to be 53,753 in 1996 (Division of Nursing, 1996). The great majority of RNs with these advanced degrees are in educational positions, and therefore fall under CPS occupational categories outside of our data set, such as "health specialties teachers".

the March supplement final weight provided with the CPS data.[9] Experience is measured by age minus years of schooling minus six. There are dummy variables for race, sex, marital status and for nine regions of the country. Other dummies indicate whether the worker is self-employed, employed by a hospital, by the federal government, or by a state or local unit of government. Historically there has been a wage premium for registered nurses who work in hospitals. A number of reasons for this differential are provided in the literature: hospital nurses are of higher quality, their work is more arduous, they have more responsibility, and are more likely than other nurses to have evening or weekend shifts. [10] There also seems to be a wage premium for NPs who work in hospitals.[11] Since a 1997 salary survey reported relatively low salaries for NPs in college health clinics ($43,386 compared to an overall mean of $52,532), we have included a variable indicating whether the industry of the employer is education.

[9]It was appropriate to use this variable (MARSUPWT) rather than the earnings weight (ERNLWT), which is specifically constructed for application to hourly and usual weekly earnings, but not for annual earnings (ERN-VAL). Telephone conversation with Dr. Gregory D. Weyland, Bureau of the Census, September 11, 1998.

[10]See, e.g., Ventura (1997). Schumacher and Hirsch (1997) found that the wage premium for hospital employment was attributable partly to greater ability of hospital RNs and partly to less pleasant working conditions. Lehrer, White and Young (1991) stated that, in comparison with nurses in other practice settings, nurses in hospitals have more responsibility, perform tasks that are more physically demanding, and are more likely to have evening, night, weekend or overtime work. See also Mennemeyer and Gaumer (1983), at 38, and Booton and Lane (1985), at 190.

[11]A 1997 survey reported a mean salary of $52,532 for all NPs, but substantially more for those in two hospital settings: $60,050 for emergency departments and $60,208 for surgical facilities (Leccese 1998). Moreover the mean salary for those in HMOs, most of whom would be in hospitals, was $58,515.

C. Earnings Regression Results

Table 3 shows the means of certain variables, to provide a comparison of some characteristics of the sample distributions of RNs, APNs, physicians' assistants, and physicians. Earnings of RNs are less than those of APNs but greater than those of physicians' assistants. It is striking that 60 per cent of physicians' assistants are male, compared to only 7 per cent of RNs and 9 per cent of APNs.

Results of the regressions on log earnings are set forth in Table 4. In the earnings regressions we have used two alternative measures of PRESCRIBE, which represents the extent of an APN's authority to prescribe drugs. One measure is the continuous latent variable, y_2^*, that was produced as a by-product of the Gibbs sampling for the ordered probit reported in this study. Alternatively, we estimated the earnings regression with three dummy variables based on different levels of PRESCRIBE. In general the results were quite similar, but we note below where the results in Table 4 differed across the two specifications.[12] In Table 4, the results from the continuous latent

[12]We do not include AUTHORITY in the earnings regressions, as it was generally insignificant. Legal independence of an advanced practice nurse does not have much operational significance unless it is accompanied by the power to write prescriptions or to receive direct reimbursement for services. Accordingly, when Sekscenski et al. (1994) constructed "practice environment scores," a State could obtain a maximum of 20 points if practitioners had legal status as professionals, 40 points if they were directly reimbursed for their services, and 40 points if they had the authority to write prescriptions. They noted that "more weight was given to the second and third categories because the simple recognition of professional identity entailed in the conferring of legal status alone was considered less important." Ibid. at 1267.

variable are in column A, and those from the dummy variables are in column B.

With respect to physician earnings, it should be noted that the CPS had an upper limit on reported earnings of $100,000 during the years 1988-94. As noted in Appendix 3, this limitation was not important for advanced practice nurses, registered nurses or physicians' assistants, but was quite important for physicians. Accordingly, for physicians we estimated a Tobit specification in which reported incomes of $100,000 were considered censored.

Table 4 (page 3) shows that being self-employed has a large cost in foregone earnings for RNs, and in one specification for APNs, but has a substantial benefit for physicians. The effect for nurses might be considered a compensating differential for the privilege of professional independence or, alternatively, it might reflect the fact that physicians, hospitals and HMOs who hire nurses tend to choose those of the highest quality from the available pool.

Given the traditional allocation of household work, one would expect the earnings of married males to exceed those of married females, ceteris paribus; in addition, those of single females may exceed those of married females, and those of married males may exceed those of single males. There is, however, evidence that these differentials have eroded in recent years, as the traditional division of household work has been revised. See, e.g., Rosen (1992), Blau, Ferber and Winkler (1998). Here, in the large sample of

RNs we find that married females earn less than single females (the omitted reference category), but this differential is reversed for physicians and APNs. It is possible that a married couple departs substantially from the traditional model when the cost of the woman's time is as high as it is for a physician. If the division of work is approximately equal, the married female may actually be able to benefit from economies of specialization of household tasks not available to a single woman. Note also that there is a premium for being male for APNs, physician's assistants, and physicians.

For the geographic variables, the omitted reference category is New England. One generally expects earnings to be somewhat lower in the South, and that holds true here for APNs, and generally for RNs, except that for RNs earnings seem to be equally low in the North Central, i.e., Midwestern States. Earnings tend to increase with population density.[13] For APNs, RNs and PAs, earnings were much larger in the two highest categories of population density.

Most studies of nurses have found that the effect of experience on earnings is statistically significant but relatively small.[14] Here we find a significant effect for RNs –between 1.6 and 1.8 percent per year– which is much lower than the 9.3 per cent effect found for physicians.

For RNs, there is a premium for hospital work, which may reflect the

[13]Studies finding a positive relationship between wages and population density for RNs include Mennemeyer and Gaumer (1983), at 41, Link (1988), at 377, and Lehrer, White, and Young (1991), at 368.

[14]See, e.g., Link (1988), at 377, and Mennemeyer and Gaumer (1983), at 41.

demands of acute care nursing, but this variable has a negative effect for PAs. Race is not significant for APNs or PAs, but there is a negative differential of at least 10 percent for RNs who are Black.

What then is the effect on earnings of PRESCRIBE, i.e., of laws that grant a higher degree of professional autonomy to APNs? The dummy variable for level 3 of PRESCRIBE, the second highest level of authority to prescribe, has a negative effect on the earnings of APNs, significant at the eight per cent level. Moreover, in the specification that uses the continuous latent variable for prescription privileges, a unit increase in this variable reduces earinings by 19 percent. This effect is significant at a probability level of 0.002.

There is also an indication that an increase in the prescription privileges of APNs increases the earnings of physicians' assistants, who might be viewed as their competitors. Although the effect of the latent variable is small, levels 3 and 4 of PRESCRIBE in the dummy variable specifications have a highly significant positive effect on the earnings of physicians' assistants. Note that there is no effect on the earnings of registered nurses or physicians.

The effect for APNs recalls the finding of Sass and Nichols (1996) that the wages of physical therapists are reduced by laws allowing them to treat patients without a physician referral. We might then consider the possibility that the reduction in wages found here is the result of an increase in supply, from APNs who would not otherwise be in practice, since they would not be hired by a physician. However, this would not explain the increase in earn-

ings of the physicians' assistants. This effect would, however, be explained if physicians substitute away from APNs and toward physicians' assistants, in States that grant APNs a high level of professional independence. Physicians who are employed by a hospital or HMO may be less inclined to hire APNs if they believe that the organization that employs them would consider shifting some of their functions to the APNs, whose time is substantially less expensive. Moreover, physicians may be especially concerned about legal or insurance arrangements whereby APNs receive their compensation directly rather than through a supervising physician. Such arrangements are more likely to arise, and to be anticipated by physicians, in States which have taken a liberal position on the professional independence of APNs.

Goldsmith (1989) found that wages of dental hygienists were lower in States where regulation reduced the range of tasks they could do, and required close supervision of them by dentists. However, dental hygienists are much more like physicians' assistants than advanced practice nurses. Their responsibilities are almost invariably determined by, and under the control of, a dentist. Dentists are usually in independent practice, and the allocation of tasks between them and hygienists is determined entirely by them, not by an organization that employs both groups. Hygienists are generally not in a position to establish an independent practice, or to be reimbursed directly rather than through a dentist, and do not perform any of the core functions of a dentist. Thus regulations that are restrictive toward hygienists will simply reduce their productivity, and will be reflected in a lower wage.

IV. Summary and Conclusion

Estimates from CPS data indicate that earnings of APNs are substantially lower, and those of physicians' assistants are substantially higher, in States where APNs have attained a high level of professional independence. This suggests that when APNs have achieved substantial independence, physicians have responded by hiring fewer APNs and more physicians' assistants. This shift in demand may be derived from a concern on the part of primary care physicians that some of their work responsibilities will be reassigned to APNs, or that they are likely to encounter arrangements whereby APNs receive their compensation directly, rather than through a supervising physician.

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