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PLANNING FOR A LABOR MARKET IN DISEQUILIBRIUM: THE MARKET FOR REGISTERED NURSES

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Labor market planning that attempts to balance the supply of labor to demand needs is especially difficult in markets for professional labor. The supply side of these markets is characterized by extensive education and preparation time, and relatively few restrictions to geographic mobility. Efficiency dictates the estimated output from the costly investment in facilities and staff must be accurate to meet demand needs, yet the dynamic nature of these markets means they are often characterized by disequilibrium.

The hospital market for Registered Nurses (RNs) is used as an example of the planning process for a market vulnerable to periods of disequilibrium. Data were collected from employers to determine the extent of resource deficiency and ways in which adjustments were being made. The supply side analysis was extensive and made use of the existing supply of active and inactive nurses as the basis for an in-depth analysis of employment behavior. Time series information was used to determine how the composition of supply was distributed between graduates of the state's educational facilities and in-migrants.

Dynamics of the Hospital Market for Nurses

The hospital market for Registered Nurses has been the subject of considerable research in an attempt to add to the understanding of various market disequilibrium positions that have existed over time. The demand for nurses, derived from the demand for hospital services, is sensitive to changes in medical care technology and changes in methods of financing care. The growth in demand for hospital care, initially stimulated by the expansion of health insurance coverage, put related pressure on the demand for hospital RNs through the late 1960s and 70s. During this time there was a national focus on the problem of excess demand for hospital nurses to the point where the situation was being described as critical and dangerous by 1980.

During the period of the early 1980s, as the economic recession worsened, there was an adjustment in the hospital nurse market. Excess demand that had stubbornly persisted began to collapse as market forces responded to the prevailing economic conditions. The downturn affected both sides of the market by encouraging inactive nurses to return to work and reducing the demand for hospital care. Hospital markets had flourished in previous periods in response to expansion of insurance coverage which tended to equalize access to hospital care among people with a wide range of incomes. Now, with

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unemployment at national averages not experienced for decades, the number of people without access to hospital coverage increased and this impact was transmitted to reduced demand for hospital nurses.

As the recession bottomed out and the economic climate began improving, hospital and nurse demand patterns were again altered. However, some other factors have emerged that promise to have a longer-term negative impact on the demand for hospital services. Health care cost containment has again become a popular national issue and is invoking responses from both public and private sector payers. There is growing consideration of alternatives to hospitals as the primary source of care, and a reduction in obligations for coverage. In October, 1983 the federal government began implementing its new mandatory DRG-based prospective payment system for hospital payment of Medicare clients.¹ Corporate America is awakening to the realization that profits are being eroded as health care costs climb and a major focus of the strategies being developed by these private sector payers is on curbing costly hospital use.

An awareness of these changes and close evaluation of the recent past show the necessity for well-directed policy and planning to correct for imbalances in the nurse market. In theory, several possibilities exist for influencing market adjustment, especially supply side possibilities for eliminating excess demand. However, the choices result in different outcomes (especially in the longer term) for the professional nurse market, as well as for the hospital market. The research described in this paper was partially an attempt to evaluate market changes and to provide a useful framework from which supply policies could be analyzed. During the long periods of excess demand in the hospital nurse market, a source of controversy was whether the situation resulted from deficient supply or deficient quantity supplied of these professionals.² The dynamics of the market complicate resolution of this question and make it an interesting theoretical challenge. But, beyond this, there are serious policy and planning implications since correct definition of the problem is the necessary first step to the correct choice of a solution.

The discussion in this paper is confined to the hospital market for RNs in Utah which had been experiencing disequilibrium (excess demand) for several years in the 1970s. The hypothesis was that the solution that had been recommended to Utah educational planners to expand nurse program capacity in order to increase supply, would not compare favorably with other possibilities. The primary focus of the research was to evaluate supply options

¹ Although the program, using diagnostic related groupings, is currently limited to prospective rate setting regarding hospital care for Medicare clients, the concept is likely not to remain confined to this group or this payer.

² Deficient supply indicates not enough nurses are being trained to keep up with demand; deficient quantity supplied indicates enough nurses are being trained, but they are not contributing an adequate number of hours to the nurse market.

to determine which would be most effective, in terms of cost and outcome, in insuring an adequate number of hours of RN supply to hospital employment.

In order to test the hypothesis, three possibilities for reducing excess demand in a market were evaluated. These options, developed within the theoretical apparatus of labor supply models, are graphed in Appendix A. They are:

1. Increasing the quantity supplied of nurses by increasing the activity level of existing supply,
2. Use of wage discrimination by the hospitals as a means of offering a higher effective wage on a selective basis, and
3. Expanding the rate of growth of the existing supply by accelerating nurse program output.

Although each represents a theoretical solution, the results are different, especially over the longer run and in terms of "who" pays the cost. In order to test the hypothesis that increasing supply is not the optimal choice, considerable data about Utah nurse supply were collected.

The Data Base

Empirical analysis of the supply of registered nurses for Utah was based on a data set comprised of individual responses to a survey questionnaire distributed through the state Department of Business Regulation, Division of Registration. The questionnaire was included with licensure renewal notices mailed to all holders of a current Utah license. The net usable responses resulted in 6,442 observations, which was approximately 78% of Utah's current professional nurse supply.

These survey data on current supply were supplemented with similar information that had been collected from Utah nurses over time by the state's Bureau of Health Statistics. A major consideration in determining the additional data needed for comparison of the supply alternatives was accurate wage data for employed nurses, which had not been collected in previous surveys. One of the primary determinants in a decision to pursue a nursing job is the available wage rate for nursing relative to the wage for comparable jobs. In addition to the current wage rate, the survey observations included current hours per week, plus hours and weeks supplied to nursing the previous year.

The ability of a labor market to achieve equilibrium in response to a higher wage offer is dependent upon the elasticities of supply and demand in that market.³ Although a significant amount of research has been done on nurse labor supply, an accurate measure of responsiveness of hours supplied as a result of wage changes has not been well established. The empirical work has resulted in a range of elasticity estimates from .2 by Boganno, et. al. [3] to 2.8

³ Elasticity is a measure of the responsiveness of quantity demanded or supplied to a change in the wage. An elasticity coefficient less than one indicates that a 10% increase in the wage will induce a response of less than 10%.

by Sloan and Richupan [11]. While most of the findings have shown positive, but quite varied coefficients for the wage term, in investigating wage incentives for married nurses, Link and Settle [9] found some evidence of those nurses being near the negatively sloped portion of their labor supply curve, meaning a higher wage would result in fewer hours supplied.⁴ Consequently, part of the research was to estimate supply elasticity for this specific labor market as a method of predicting the expected response that would be forthcoming from a higher wage offer. This is especially critical because of the potential impact a nurse wage increase has on the total hospital wage bill.

Another category of information deemed critical for the comparison of supply options was that on nurses who were currently not employed in the nurse labor market. This group of inactive nurses comprises that segment of the supply curve above the current wage offer; it is their "reservation wage," that wage that would induce them back to work, that represents a large unknown variable. This is especially challenging in the estimation of female labor supply (which is relevant to the nurse market since it is approximately 95% female) because their individual supply decisions are subject to much wider variation than are male decisions. While both market participation and hours supplied for females are generally more sporadic, this is exaggerated in the hospital nurse market since the demand side requirement of twenty-four hours a day coverage is conducive to this supply behavior.

The survey data included observations on over 800 licensed RNs who were currently contributing zero hours to the nurse market. In addition to the same type of information collected on employed members, these inactive nurses were asked to indicate their reservation wage and the hours that would be supplied at that wage.⁵ They were also asked to rank the importance of the wage rate, along with ten other factors, in their decision to be inactive. All nurses were asked to supply information on non-nursing household income, as well as demographic, educational, work related and professional data.

⁴ This finding suggests that wage incentives as a means of inducing a supply response would not be effective for married nurses since they exhibit a high degree of wage inelasticity. Since these results are from the 1970 Census of Population data, it should be noted that some important changes in the pattern of female labor supply have developed since that time, and these might cast doubt on the applicability of the Link and Settle conclusion for the 1980s market.

⁵ While the average wage for nurses employed in the hospital setting was \$9.30 an hour, the overall weighted average (reservation wage) for those not employed in nursing was \$11.87. The weights were assigned according to the degree wage was considered a factor in the decision not to be in hospital nursing.

Empirical Analysis of the Utah RN Market

The labor supply equations used for analysis of the RN survey data had a theoretical and empirically tested background since they had been developed from the theory of female labor supply and a review of other research.⁶ The micro data used had some distinct advantages due to the recency of the information and its comprehensiveness relative to the effective Utah RN population.

The degree of influence on the supply of hours to hospital nursing of the wage rate and other designated variables was estimated with OLS regression. Results are reported in Appendix B. The equation, which uses reported weekly hours of hospital nursing as the dependent variable, exhibits most of the *a priori* results and conforms to other findings on supply behavior for this market. While the nurse's own wage rate exerts a direct influence on hours supplied, the effect of additional household income has a negative influence. The only coefficient not yielding the expected sign was that for marital status, which was entered as a dummy variable segregating married from all non-married nurses. It is assumed that non-market time is valued differently according to marital status. The non-negative coefficient is consistent with more recent findings showing married women now contributing more time to market labor than in earlier years.

The elasticity of supply for employed nurses was estimated from the log form of the regression equation on hours of hospital employment. This coefficient shows an elasticity of .2918, which indicates an increase in the wage rate for hospital nurses will result in a relatively low response rate of additional hours supplied. The elasticity coefficient was also estimated for inactive nurses who provided information on the wage at which they would consider returning to hospital nursing and the hours they would contribute at that wage. The elasticity coefficient for this "hypothetical" supply equation was .2061, which translates into a slightly lower response rate of hours to wages for this group of nurses.

Overall, the findings do not deviate in any significant way from results of other research, which implies the Utah hospital nurse market can be viewed as similar in character to others. The estimated relationship between hours of hospital employment and the wage rate does not lend strong support for a wage increase policy as a means of inducing more hours, unless the wage is raised by a substantial amount.

Although the main emphasis of this project was to compare supply side choices for achieving market equilibrium, it was first necessary to estimate the size of the disequilibrium by incorporating demand side analysis. Since that analysis of the Utah hospital market was quite extensive, it will not be elaborated on in this paper except to note three relevant aspects: demand

⁶ The full model of the market included equations of the log of wages, hours, participation in hospital employment and years with current employer; only results for the hours of hospital employment equation are reported here.

elasticity for hospital nurses, the size of the disequilibrium, and the structure of the Utah hospital market.

The elasticity of demand for hospital nurses is relevant to the option of increasing the wage offer since this would induce a negative demand side response and reduce the desired quantity demanded. As is true about the elasticity of demand for any productive factor, it is primarily dependent upon the elasticity of demand for the final product and on the availability of substitute factors. The unique nature of hospital services and prevalence of insurance coverage would indicate a relatively low elasticity of demand for this product, and therefore, for hospital nurses. This has been verified by several research findings [6, 12] in which the general hospital market demand elasticity for RNs is estimated in the range between $-.3$ and $-.4$. Specific hospital variation is dependent upon the capability to substitute non-RN personnel and the nature of services provided by the hospital. This general range of elasticity estimates indicates a relative insensitivity on the part of hospital employers to increased RN wage rates.

Current information on hospital nurse staffing patterns and needs was collected by this researcher from a survey questionnaire which yielded a response rate of over 80% from Utah's 38 non-federal hospitals. Hospital employers responded that their budgeted RN vacancies (those that would be filled immediately if qualified applicants were available) were 165 FTEs (Full Time Equivalents). Although these results reported actual RN vacancies, it was recognized that inconsistencies about the appropriate level of hospital demand can exist. Perceptions may differ among hospital administrators who have fiscal responsibility, medical staff who have responsibility for production of hospital services, and employed RNs who provide a substantial amount of labor for this production. An extensive analysis of projected hospital needs for nurse staffing had been made for each state by a WICHE panel of expert consultants in 1982 [5]. Using their criteria for hospital staffing needs and the composition of Utah hospitals, in combination with the actual reported staffing deficits, excess demand for Utah hospital nurses at the current wage was estimated to be 240 FTEs.

Finally, in consideration of demand, the structure of the hospital market has been a common theme in evaluating the persistence of disequilibrium and in providing rationale for why shortages do not lead to sufficient pay increases to bring inactive nurses back onto the market. In evaluating this situation, Link and Landon [8] note that the effects of monopsony power have been empirically demonstrated to exist in the nurse labor market where specialized skills are required and few alternatives to hospital employment are available.⁷ For

⁷ Implications of theoretical monopsony and oligopsony models are important in understanding wage and employment patterns and the potential for distorted signals to be sent out by hospital employers. Technically, the distortion emerges because of the relationship of the marginal factor cost (MFC) curve to the upward sloping supply curve, meaning a gap always exists between quantity demanded and quantity supplied at the existing wage.

market analysis it is important to recognize that exertion of market power by hospital employers can result in distorted signals about nurse availability, which seem to "verify" that the persistent disequilibrium is due to deficient supply. If the pressure created by monopsonistic employers reporting vacant RN positions is successful in generating increased output from nurse preparation programs, this is ideal for the hospitals since more nurses will be available for hire at the existing wage rate. Although the exertion of hiring side market power is difficult to verify, the corporate structure of hospital ownership is extensive in Utah, and this setting is highly conducive to collusive-type agreements regarding wages and other employment conditions. This situation is more fully described by Booton and Lane [4].

This review of hospital market demand and the results of the supply analysis were incorporated into the comparison of supply possibilities considered for achieving equilibrium in the hospital market for nurses in Utah.

Analysis of Supply Options

The total number of Utah licensed nurses has grown consistently in recent years and was approximately 12,000 in 1981. Since many of these nurses do not reside in Utah they cannot be considered as part of the existing pool from which the supply curve evolves.⁸ From those eligible nurses actually living in Utah, it was estimated that 6,400 were active in nursing employment in 1981, with hospital jobs accounting for over 70 percent of the employment. The evaluation of 1981 market conditions resulted in an estimate of disequilibrium (excess demand) in the range of 210-270 FTEs.⁹

The first possibility considered was the effect on the market of increasing the quantity of hours supplied by raising the current wage offer. Analysis from the survey data on over 4,000 hospital employed RNs showed a direct relationship between the wage rate and hours supplied to the market, while controlling for other influences on the wage, such as educational level and years of experience. Over 1600 nurses were contributing part time hours to hospital employment at an average wage of \$8.84 per hour; it is from this

⁸ Since holding a license to practice in more than one state is a low cost option, it is not uncommon for nurses to be licensed in multiple states simultaneously. In 1979 over 5,000 Utah licensed RNs also held licenses from other states, and nearly half of these held more than one additional license. This behavior has an implication for geographic mobility that complicates planning and policy analysis.

⁹ The nurse survey data revealed an extremely wide variation in hours per week of hospital employment; consequently, these hours have to be translated into FTEs to make appropriate comparisons. The hours for hospital employed nurses translated to approximately 3200 FTEs; subtracting this supply from the state's need of 3461.2 hospital FTEs yielded the measure of excess demand.

group that an increased wage is most likely to induce additional hours. The elasticity coefficients for demand and supply were used as an indication of how much response would result from a higher wage. The supply information revealed that there existed adequate capabilities to produce equilibrium in this market at an excess demand of 240 FTEs.

The major drawback to this alternative is that a percentage increase in wages to induce additional hours from part time nurses cannot be limited to only those, but has to be extended to all nurses. At the average wage of \$9.29 an hour for all employed hospital RNs, the 11 percent wage increase that would be necessary to achieve equilibrium has a substantial impact on the total nursing wage bill. Table 1 shows the cost estimation of this alternative.

TABLE 1
Cost Estimation of Supply Option I

Current estimated total wage bill:

800 FTEs @ \$8.84 per hour (current part time RNs)
 2400 FTEs @ \$9.29 per hour (current full time RNs)
 (1 FTE = 2080 hours per year)
 2080 x \$8.84 x 800 = \$14,709,760
 2080 x \$9.29 x 2400 = \$46,375,680

Yearly wage bill . . . \$61, 085,440

New estimated total wage bill with 11% increase in wage rate and market equilibrium at an additional 106 FTEs.

906 FTEs @ \$9.81 per hour
 2400 FTEs @ \$10.31 per hour
 2080 x \$9.81 x 906 = \$18,486,748
 2080 x \$10.31 x 2400 = \$51,467,520

Yearly wage bill . . . \$69,954,268

Estimated additional cost per FTE gain:

<u>change in total wage bill</u>	=	<u>\$8,868,828</u>	=	\$83,668 per FTE
change in FTEs		106		

There are some considerations that are not included in these estimates due to the difficulty of incorporating them with any degree of accuracy, but the exclusion of which contributes to an overstatement of the additional cost per FTE gain. The higher hospital wage would be an inducement to RNs in other fields and to those considering in-migration to the state, as well as to nurses now contributing zero hours to the market. The assumption of an "across the

board" 11 percent increase in wage rates may be an exaggeration of the amount necessary to realize the supply increase. Since those nurses now contributing full time hours are not likely to be a source of significant additional response, they are also not as likely to reduce their hours substantially if they did not receive a full 11 percent pay raise. Under this condition, with an assumed wage increase of 6 percent for those nurses now employed full time, the estimated cost is the following:

$$2080 \times \$9.81 \times 906 = \$18,486,748$$

$$2080 \times \$9.85 \times 2400 = \$49,171,200$$

$$\text{Yearly wage bill: } \$67,657,948$$

Estimated additional cost per FTE gain:

$$\text{Change in total wage bill per change in FTEs} = \$6,572,508/106 = 62,004 \text{ per FTE}$$

The second option to be evaluated is for achieving equilibrium through a type of wage discrimination whereby the effective wage rate is increased for nurses willing to work less desirable, hard to fill hours. The ideal form of this plan allows the hospital employer to capitalize on nurses' different time preferences for market and non-market work. The major advantage is the requirement for a much lower percentage increase in the wage rate to gain hours of supply since it does not result in a general wage increase. Also, equilibrium can be achieved with less reduction in quantity demanded. A combination of economic theory and empirical evidence was used to support consideration of this option. In essence the offer of non-wage benefits, such as more flexibility in scheduling, can be considered as an attempt to affect the supply elasticity so more hours will be forthcoming for any given pay raise. The actual value of fringe benefits, as a substitute for increased monetary wages is assumed to be higher for married nurses with supplemental incomes; these nurses are also assumed to value non-market time differently. Economic theory of female labor force participation suggests that the decision between household and market work depends, in part, on the market wage relative to the implicit wage of household production. The value placed on non-market time for married women is often higher because of their additional requirements of home productivity, so the inducement to work has to overcome a higher reservation wage. While this aspect of female labor force participation and supply has been widely researched, much less consideration has been given to the possibility of differing price schemes for the value of home time according to times of the week. If a married woman can work during weekend hours when other family members are home to carry out productive activities (such as supervision of younger children), then still be home during the week, the relative cost of home productivity vs. market productivity may change.

Results from the survey of Utah nurses seemed to corroborate those from several other studies on nurse job satisfaction that indicate nurses place a high value on flexible scheduling options. Therefore, it appears the scheduling process promises the greatest non-wage potential for increas-

ing the supply response from these workers. The nature of hospital nursing presents both positive and negative aspects for improved scheduling. The necessity for night and weekend coverage cannot be eliminated, but this also provides the opportunity for better meeting the needs of those who value hours of the day and days of the week differently. For Utah inactive nurses, flexible hours, higher wages, and the need to be home with children were the top ranked reasons for not returning to nursing employment. Development of a policy that would respond to as many of the highest ranked influences as possible would maximize the potential gain in hours supplied.

An innovative scheduling plan that responds to the need for flexible scheduling and time at home with young children, and results in a higher effective wage rate is one that allows nurses to work two twelve-hour weekend shifts at full-week compensation and have the remainder of the week off.¹⁰ The plan will not be detailed here, but its basic component is paying for more hours than are actually worked, so a higher effective wage is received by those nurses taking part in the plan. Weekend night shifts of twenty-four hours of work are paid the equivalent in wages and benefits of forty hours, and weekend day shifts of twenty-four hours are paid the equivalent of thirty-six hours. Additional savings accrue to the hospital in the form of lower administrative costs once the plan is implemented, and reduced recruitment and retention expenditures since turnover should be slowed with more satisfied workers. An additional consideration is the higher level of satisfaction for the remaining nurses who receive a direct non-wage benefit in terms of improved scheduling and the advantage of consistent and predictable hours of non-weekend work.

At the time of this research, one of the large urban Utah hospitals had been effectively using this two-day alternative plan for over a year and had estimated cost reductions and higher satisfaction from nurses. Generalizing from the experience of this hospital and those in other areas offering similar options, the potential for achieving equilibrium under this alternative can be assessed. This plan, which has both theoretical soundness and empirical validity, has an advantage in that the total wage bill is not affected nor is demand reduced to the degree it would be for a general wage increase.

Table 2 shows an estimate of the additional cost of a strict wage discrimination plan to attract 240 FTEs. Discrimination emerges under the option since it allows an RN to receive compensation equivalent to 36-40 hours for only 24 hours of work, when those hours are contributed solely on two consecutive week-end shifts. Since the coverage actually needed is for 240 nurses at 40 hours a week (to equate to 240 FTEs), to realize these

¹⁰ This scheduling concept is often called the "two day alternative" or the "Baylor plan" since it was the administration at Baylor University Hospital that first implemented such a plan in an attempt to reduce critical staffing shortages.

hours 400 nurses would be required. It is assumed that some nurses would work 24 hours to receive pay equivalent to 32 hours of work at their regular pay, and some would require the equivalent of 40 hours at regular pay for 24 hours of work. The survey wage data were used to compute an average effective wage of \$12.25 per hour.

TABLE 2
Cost Estimate of Option II:
Wage Discrimination With a Weekend Option Plan

The additional 240 FTEs are represented by 400 RNs contributing 24 hours a week at a wage of \$12.25 per hour:

Addition to the wage bill:

24 hours per week x 52 weeks = 1,248 hours per year

1,248 hours per year @ \$12.25 per hour = \$15,288 per RN

400 RNs at \$15,288 per year = \$6,115,200

Estimated additional cost per gain:

<u>Change in total wage bill</u>	=	<u>\$6,115,200</u>	=	\$25,480 per FTE
Change in FTEs		240		

If the plan could be implemented in full by nurses willing to receive the equivalent of 32 hours of regular pay for 24 hours of work, the cost would be reduced to the following:

Addition to the wage bill:

1,248 hours per year @ \$10.77 per hour = \$13,440 per RN

400 RNs at \$13,440 per year = \$5,376,000

Estimated additional cost per gain:

<u>Change in total wage bill</u>	=	<u>\$5,376,000</u>	=	\$22,400 per FTE
Change in FTEs		240		

The third theoretical possibility for achieving equilibrium results from a shift outward of the existing supply curve to the point where excess demand is eliminated. Due to the dynamic nature of both demand and supply, realization of this equilibrium had remained elusive over time. Within the hospital setting the degree of substitutability among various health care personnel contributes to ambiguity in measuring demand for nurses. Economic theory regarding the use of inputs indicates that an increasing supply of nurses and a relatively low wage rate would cause them to be substituted for other health care personnel whenever possible since they are qualified to perform a wide range of tasks. Yet, if RNs become relatively more expensive, some of their services can be performed by others. The theoretical structure predicts that a supply increase would tend to keep the wage from rising significantly, thereby encouraging

the continual utilization of nurses for a variety of services.¹¹ This pattern of utilization would continue to put pressure on market supply and would tend to inhibit the migrational inflow that adds to the state's stock of nurses. The degree to which the existing rate of supply has to be altered to meet demand over time is clouded by this substitution pattern.

The most accurate forecast for predicting the impact of Utah nursing programs on the state's RN supply can be gotten from the figures pertaining to recent graduates. While there is an error factor in using the receipt of a Utah license by new graduates as a proxy for Utah nursing employment, it is a good first approximation. During the period 1977 to 1981 about 75 percent of Utah nursing program graduates initially became additions to Utah supply.¹² The figures indicate that to go beyond maintenance of supply to an increasing rate of supply in a predictable manner would require expansion of the rate of Utah program graduates. This expansion would require a substantial time and dollar cost; achieving a long run significant per year increase in graduates may require enlargement of physical facilities and additional human resources.

Since a supply increase is estimated in terms of the number of nursing program graduates, while demand is in terms of hospital FTEs, these have to be put into like dimensions. The calculation (which is eliminated here) includes non-hospital nursing demand and average hours worked by new graduates, and yields an estimate of 426 Utah graduates to close off excess demand of 240 FTEs. If capacity could be expanded enough to accommodate graduating 38 additional Associate Degree and 50 additional Baccalaureate Degree nurses per year, the process would require six years to achieve equilibrium in this manner.¹³

¹¹ Nurses seem to have the "worst of both worlds" with respect to substitution; as long as the differential between their wage and the wage of lesser trained personnel is low, nurses take up the slack in jobs that could be performed by others. Yet, if the wage for nurses rises, their role is subjected to encroachment by other health care professionals. In writing about this situation, Aiken and Blendon report: "Raising nurses' incomes would tend to halt the large-scale substitution of nurses for less highly trained health workers by hospitals in favorable locations." [1, p. 953]

¹² It is also true that this supply has received a substantial contribution from in-migrants who become licensed by endorsement; the percentage of contribution to Utah stock from in-migrant ranged from 46 to 58 percent over this period.

¹³ It would take a minimum of two years to realize the first gain; this is true of the four-year program as well since there currently exists a major pool of pre-nursing students who have completed their first two years and would only require two additional years of academic work.

Evaluation of the costs of such a future oriented process is limited by the degree of accuracy with which the relevant costs can be forecast from trends of past expenditures. Because of this problem and the need to put the estimate for this option into terms comparable to the other cost estimates, it is evaluated on the following basis: 1977 is considered as the base year for the expansionary process, which would have produced the required additional 440 graduates by 1982. This method eliminates the need to rely totally on projected cost estimates since actual figures are available for this period. While this makes the comparisons more meaningful, the reality of future costs being inflated must always be considered.

The cost estimates for this option are based on costs of preparing nursing graduates at two Utah institutions and under the assumption of no increase in capital expenditures.¹⁴ The figures in Table 3 represent a minimum estimate for educational expenses resulting from expanding output from existing fixed capacity. They do not include institutional overhead expenses and general support expenditures.

TABLE 3
Cost Estimate of Option III: Increasing Supply

Estimated cost for increasing supply:			
<u>Estimated additional cost</u>	=	<u>\$3,066,970</u>	= \$12,779 per FTE
Change in FTEs		240	
Addition of the capital expenditures estimate:			
<u>Estimated additional cost</u>	=	<u>\$8,279,850</u>	= \$34,499 per FTE
Change in FTEs		240	
The above figures represent costs incurred from the educational process to expand supply; in addition, to achieve market equilibrium through expanded hospital hiring, the hospital wage bill would be increased as a result of the employment.			
Additional cost to the hospital wage bill:			
<u>2080 x \$7.33 x 240 FTEs</u>	=	<u>\$3,659,136</u>	= \$15,246 per FTE gain
Change in FTEs		240	
Total cost per FTE gain with no capital expenditures:			\$28,043 per FTE
Total cost per FTE gain with capital expenditure estimate:			\$49,745 per FTE gain

¹⁴ The cost figures were obtained from the Utah Board of Higher Education and the respective University Budget offices. While they provide a basis for estimating current cost, any predictions would be subject to error, especially regarding additional capital finances.

Discussion

In any resource market, long run planning and coordination between suppliers and demanders are necessary to help insure that an adequate level of supply will be available without generating a surplus of resources. Predictions have to be made about potential changes on either side of the market and strategies developed for incorporating these predictions into accurate planning documents. Achievement of equilibrium can be elusive and efforts can also be hampered by periods of short run adjustment.

The pervasive disequilibrium in the hospital nurse market appeared to be weakened by the economic downturn in the early 1980s. In order to verify that the market was moving away from a position of excess demand, this researcher surveyed Utah hospitals one year after the initial survey. These survey results revealed that both demand and supply responses had taken place, which resulted in a reduction in excess quantity demanded from 043 percent of total budgeted FTEs to 006 percent. Most hospitals noted that they had been offering more flexible scheduling options or increased wages over the previous year. The degree to which a positive supply response can be attributed to hospital efforts to attract more RN hours or to changing economic conditions is not measurable since for any one nurse overcoming the reservation wage may have been a combination of these factors.

Being able to observe this short run adjustment process and analyze it against market behavior that is predicted from the theoretical structure is important to gaining some understanding of the dynamics of this market. It appears that the previous steady growth in demand for hospital care, coupled with hospital upgrading of RN staffing, have begun to slow. If the RN hospital market is at or near equilibrium, then the question becomes one of assessing the stability of this position. If this has been partially a "recession generated" equilibrium, then achievement of economic recovery may tend to cause the old problem of excess demand to resurface.

The evidence of movement toward equilibrium in this market adds an important dimension to the evaluation of options for reducing excess demand. The major contribution of this market behavior evidence is to help answer the critical question of whether "nurse shortage" represents a deficiency of supply or of quantity supplied. The difference is significant since a persistent shortage of supply does not leave room for many choices except to increase the rate of output from nurse programs. The recent market activity seems to confirm the existence of adequate supply at this time under current demand conditions. While this confirmation allows for more flexibility in policy, it implies the need for close scrutiny of supply choices, especially those that have longer term impact.

Although theory and empirical evidence suggest that employers' offers of higher wages will elicit more hours, the low coefficient for elasticity of supply for Utah nurses indicates a relatively low degree of responsiveness. Table 4 compares cost estimates for the three options. While the cost per FTE gain from a higher general wage rate does not appear to be the most

cost effective, this estimate does not include the possibility that a higher wage would also attract nurses now contributing zero hours. Implementation of this policy would represent sizeable expenditures to individual hospitals experiencing shortages of RN hours, and the possibility of collusion in this market reduces the likelihood of adoption.

TABLE 4
Summary of Options for Reducing Market Disequilibrium

Option	Cost per FTE gain	Cost as percent of Option I	Cost as percent of Option II	Cost as percent of Option III
I. Increasing quantity supplied with a higher wage	\$62,004 \$83,688	—	304%	159%
II. Increasing quantity supplied with wage discrimination	\$22,400- \$25,480	33%	—	53%
III. Increasing supply by accelerating nurse graduates	\$34,792- \$56,513	63%	191%	—

Since analysis of the supply data from this research and from other efforts reveals the importance of non-wage influences on the supply decision, the second option presents more potential for achieving equilibrium at a lower cost. The job-related aspect of scheduling appears to be a key area for wage discrimination and manipulation of the elasticity of supply of hospital nurses. The negative aspects of the necessity to schedule nurse coverage on a twenty-four hours a day basis can be offset by using this need as the basis to capitalize on individual differences in time preference. The cost estimate for achieving equilibrium is significantly lower than a strict wage increase policy; additional bonus features are that it appears to be a low cost plan to implement and it does not require a substantial demand side reduction to bring the market into balance.

Increasing the rate at which nurse programs add to the Utah supply of nurses differs on several dimensions from the other two choices. Two major factors in consideration of any proposal to eliminate excess demand are cost-effectiveness and the method of financing the cost. The first two options discussed would add directly to each individual hospital's variable cost bill; expenditures that would have to be absorbed by the hospital and eventually passed on to payers in the form of higher costs per patient day.

In contrast, the financing mechanism for a supply expansion would be the responsibility of the governing body of the state's public education

programs. Minimal nurse program expansion would require added variable costs to the academic program budgets, while any substantial increase in capabilities would necessitate capital expenditures and additional fixed cost. The financial source for this funding would primarily be state revenues; monies designated for nurse programs that would have to be evaluated in terms of their long term commitment, opportunity costs and other state priorities. From the perspective of the hospital employers a decision by public officials to expand nurse program capacity is ideal since it reduces pressure on the wage structure. Other positive results accrue to the hospital, such as reduced recruitment expenditures.

Conclusion

In a thorough comparison of these theoretical options for affecting the supply side of the market, several criteria should be considered:

1. cost effectiveness (cost per FTE gain),
2. the source(s) of funding for the additional costs,
3. effect on the demand side of the market,
4. consistency of one state's policy with the rest of the country,
5. irreversibility of the policy,
6. longer term considerations of the opportunity costs, and
7. the reality of the transition from theory to practice.

The focus on this research has been to develop an appropriate background for this analysis in order to confirm or reject the hypothesis that a policy for increasing supply would not compare favorably with alternative options.

In terms of nearly all the state criteria the choice of increasing quantity supplied through wage discrimination or offering benefits to raise supply elasticity appears to be superior. In addition to being cost effective, the funding is directly related to the benefit in that hospitals and hospital care payers would incur the cost.¹⁵ This option would be much more hospital specific, meaning it tends to attract supply to need and can be initiated and contracted with more ease than a general policy. Given a degree of uncertainty about the exact direction and magnitude of future demand for hospital care the option provides more flexibility for adjusting to demand changes.

Although in theory accelerated supply does not necessitate a demand side reduction, this benefit is offset by the difficulty of reversing the policy, the long term commitment and the potential for generating excess supply. The merit of this option is much more sensitive to policy on a national scope as well; if other states were not increasing supply but were offering a higher wage, the related cost per FTE gain would be further hiked as retention of Utah graduates worsened. The reverse could be possible if options one or

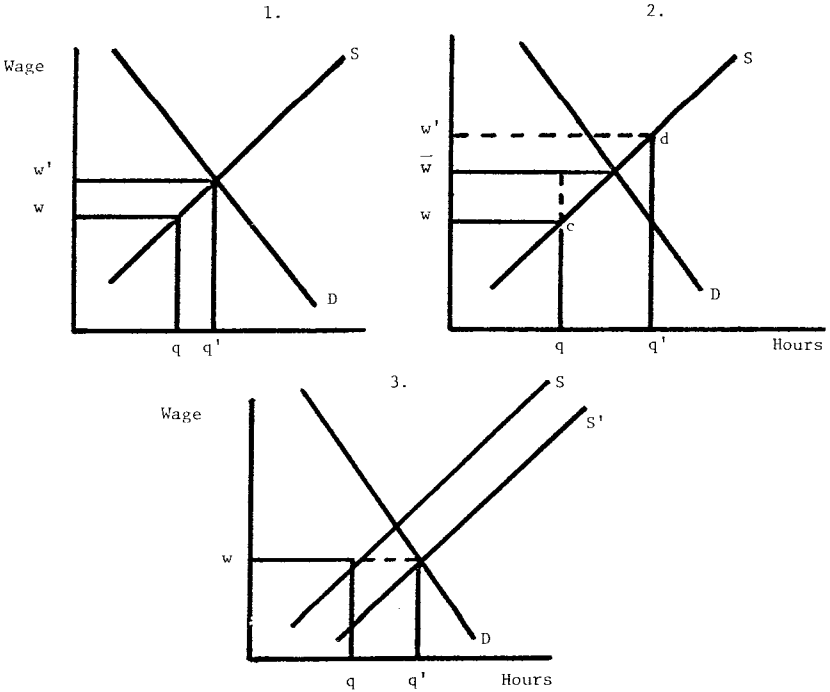
¹⁵ In broad terms when all Utah taxpayers are considered to be consumers of Utah hospital care, funding for increasing supply could be considered somewhat direct as well.

two were implemented and these represented higher wages or more benefits than other areas.

This analysis has centered on one state's specific nurse market disequilibrium to show the effectiveness of applying a theoretical framework in development of planning and policy tools. While the nurse labor market is somewhat unique, the fundamental problem of matching supply output to demand needs in a dynamic market is characteristic of many professional occupations. Accurate forecasts and efficient planning depend upon cooperative efforts from both demanders and suppliers — employers and educators — on an ongoing basis.

APPENDIX A

Options for Achieving Market Equilibrium



APPENDIX B
OLS Regression Results

Weekly Hours of Hospital Nursing as the Dependent Variable

Independent Variable	Coefficient	t Value	A Priori Sign
Wage	.010	10.4***	+
Non-Nursing Income	-.0031	-13.4***	-
Marital status	1.8	3.0**	-
Nursing experience	-.28	-10.9***	+
Hours worked last year	.52	24.3***	+
Position in hospital	9.7	19.5***	+
Presence of young children	-1.7	-3.2**	-

Constant -4.1 Multiple R² .3245 N = 4200

Significance of t values: * = 90%, ** = 95%, *** = 99%

Mean hours of dependent variable = 29.9

Standard deviation of dependent variable = 12.6

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