Factors that May Explain Interstate Differences in Certificate-of-Need Decisions

by Charles E. Begley, Milton Schoeman, and Herbert Traxler

A major difficulty in conducting studies of the impact of certificate-of-need programs is in accounting for interstate differences in program characteristics. This paper addresses this problem by examining the empirical relationship between various characteristics of certificate-of-need programs and program decisions, measured in terms of the approvals of hospital capital projects. Aggregate data on capital expenditure approvals and net bed change approvals for 28 States are correlated with an index of each State's regulatory characteristics that was developed in an earlier study. In addition, a multivariate model of certificate-of-need approvals is estimated in which certain measures associated with the need for hospital capital in a State are introduced, along with the indices of regulatory characteristics, to explain interstate differences in program decisions.

The results of this analysis indicate that although regulatory characteristics are significantly correlated with the relative number of new beds approved, they have little correlation with total capital expenditure approvals. Moreover, variables reflecting the need for new hospital capital in a State, such as past population growth and existing hospital capacity, appear to be more important than regulatory characteristics in explaining the relative amount of capital approvals.

Introduction

In conducting research on the impact of State certificate-of-need (CON) regulations, disagreements persist over which direct or indirect effects are relevant, how they are measured, how long before they appear, and how much they vary among States. Despite these differences, however, most evaluation studies of CON have two things in common: 1) a strong, often exclusive, emphasis on economic measures of impact such as changes in hospital investment rates or operating costs; and 2) the implicit assumption that the legislated characteristics of CON programs and the process by which CON reviews are implemented functionally relate to their impact.

Despite widespread agreements that variation in the process of conducting CON leads to interstate differences in impact, only recently has explicit account of the effects of these differences been taken in a quantitative study of the program (Policy Analysis, Inc. and Urban Systems Research, Inc., 1980, hereafter referred to as the PAI study). In previous studies, the effect of CON was estimated by hospital cost or investment functions in which CON impact was measured by the coefficient on dummy variables reflecting the presence or absence of the program or years of program maturity. (Salkever and Bice, 1976; Hellinger, 1976; Sloan and Steinwald, 1980) Although this approach captures the average effect of the program, nationwide, it tends to bias results against effectiveness by giving equal weight to all State programs, no matter how they have been implemented. By treating all programs as homogeneous, the dummy variable approach does not capture the effect of programs which by virtue of commitment, resources, and proper management, have the potential to contain growth in the industry.

In the PAI Study (conducted under contract to the Bureau of Health Planning, DHHS), the legislative framework and implementation setting of several State programs were extensively analyzed and a classification scheme was developed. States with strong cost-containment programs were classified differently than States with weaker programs on the basis of the political environment of the CON program and the manner in which CON was conducted. In adopting this approach, it was assumed that a specific set of programmatic factors provided the basic constraints upon which program effectiveness depend. A quantified index of these factors was developed and used in regression analysis to test the hypothesis that stronger programs are more successful than weaker programs in achieving cost containment. Although the PAI approach is a marked improvement over previous evaluations, which make no allowances for interstate differences in CON programs, its validity rests upon the assumption that the set of factors employed to classify programs is strongly correlated with effectiveness. At the present time there exists no empirical evidence to support that assumption, but with the development of the PAI classification scheme, we may begin to test hypotheses to determine which factors are associated with different program outcomes.

This paper examines several hypotheses concerning the validity of the measures developed in the PAI Study, by relating those measures to interstate variation in CON approvals. Initially, a rank-order correlation analysis is presented which compares rankings of States on the regulatory measures developed in the PAI Study to rankings based on different measures of CON approvals over the period January 1, 1979 through June 30, 1980. Second, a regression model of CON approvals is discussed which estimates the significance of the regulatory factors and some variables reflecting the need for capital, in explaining interstate variation in CON decisions. Before these results are presented we briefly describe the regulatory classification measures developed in the PAI Study.

Classifying Programs by Regulatory Characteristics

The PAI Study attempted to "develop a quantitative measure of CON that would take into account the substantial interstate variation in the program." Their measure of CON in cost and investment functions included important differences in the programmatic characteristics of CON programs. These characteristics were selected on the basis of extensive on-site observations and expert judgment as to which factors influence program outcomes (Cahodes, 1981). Five characteristics were ultimately selected as key indicators of each State's potential effectiveness: 1) overall program orientation including either constraint oriented, planning/distribution, or due process oriented; 2) locus of decision-making for review, either State level or health systems agency (HSA) level; 3) the availability and scope of project review standards; 4) the number of explicit exemptive provisions (in the enabling legislation); and 5) enactments of legislative amendments to the CON program. The last of these five factors was eventually dropped because it did not reveal a great deal about CON programs following enactment of P.L. 93-641, the National Health Planning Act.

The four remaining program descriptors were quantified by adopting a numerical scale for each descriptor and then distilling these into two independent factor scores or indexes of regulatory characteristics. This reduction of dimensionality was performed via principal component factor analysis and linear discriminant analysis and resulted in two linear scales which were used to distinguish CON programs in various States. The classification of the States along these two indices is presented in Table 1. Factor 1 scores tend to be highest in States which appear to be heavily committed to containing costs and have strict application of objective review standards in the approval process. On the other hand, Factor 2 scores tend to be lower for these States and higher for States which show greater commitment to due process for the industry and allow relatively more project exemptions. Given these factor loadings, Factor 1 has come to be associated with program "toughness" while Factor 2 has been interpreted as a measure of program "weakness." Examination of Table 1 suggests a geographic concentration of States with high Factor 1 scores in the Northeast, which may also account for a mild correlation between Factor 1 scores and the maturity of the CON programs.

The value of the factor scores in a statistical analysis of the effects of CON rests upon the assumption that the regulatory characteristics—via the four program descriptors—are correlated with the relative effectiveness of CON programs over a given period of time, that is, that framework and process determine outcome. Data on the CON decisions of various States that have been collected recently by the Bureau of Health Planning allow a preliminary empirical test of that assumption.

Interstate Differences in CON Decisions

The Bureau of Health Planning (BHP), DHHS, has fairly comprehensive data on States' capital expenditure activities reported on the HRS-258 form and its more recent replacement, the HRA-45. After a CON application has reached final disposition, the State CON agency (usually the State health planning development agency [SHPDA]) submits a completed HRA-45 to BHP and the data is entered into the computer. The following analysis is based on data from BHP's HRA 258-45 files, covering the 18-month period January 1, 1979 through June 30, 1980. Twenty-eight States were selected for study on the basis of availability of data and their inclusion in the referenced PAI Study.

Analysis of both the amounts of capital expenditures and net bed changes approved by each of the States during the study period leads to the following observations (Tables 2, 3, and 4).

1) Both total volume and *per capita* amounts of capital expenditures approved (Table 2) vary substantially among States. The total capital expenditures range was nearly 1:80, from $4.7 million (Rhode Island) to $369.8 million (Michigan) with a mean of $114.3 million, standard deviation $101.1 million, and coefficient of variation 0.88. The *per*

TABLE 1

Factor Scores for the CON States

State*	Factor 1[1], Measure of Toughness Program Activism (high scores = more rigourous)	Factor 2[1], Measure of Weakness Program Limitations (high scores = less rigorous)
California (1969)[2]	−1.053	.686
Maryland	−1.053	.686
Virginia	−1.053	.686
Arizona	− .875	− .379
North Dakota	− .875	− .379
Washington	− .875	− .379
Illinois	− .713	1.685
Tennessee	− .713	1.685
Texas	− .713	1.685
Nevada	− .535	.621
Florida	− .375	− .052
Ohio	− .375	− .052
Oregon	− .375	− .052
Arkansas	− .196	−1.117
Kansas	− .196	−1.117
Kentucky	− .196	−1.117
Minnesota	− .196	−1.117
Montana	− .196	−1.117
New Jersey	− .196	−1.117
Oklahoma	− .196	−1.117
South Carolina	− .196	−1.117
Colorado	− .034	.947
South Dakota	.859	−1.204
California (1975)[2]	.985	1.216
Connecticut	1.164	.151
Michigan	1.878	− .935
New York	2.040	1.128
Rhode Island	2.040	1.128
Massachusetts	2.219	.064

[1]Policy Analysis, Inc., and Urban Systems Research and Engineering, Inc. Evaluation of the Effects of Certificate-of-Need Programs: Final Report, August 1980, page 80.

[2]Two factor scores were derived for California on the basis of progam changes during the study period.

capita expenditures range was 1:12.7, from $5.04 (Rhode Island) to $63.75 (Nevada). Its mean was $22.94, standard deviation $12.37, and coefficient of variation 0.54.

2) Even greater variation is observed in net bed change approvals (Table 3), which on an absolute level ranges from −962 (New York) to +1,158 (Texas). Net bed change per thousand population ranged from −.056 (Connecticut) to .580 (Nevada).

3) The average *per capita* expenditures approved by the five least constraining States (as defined by high approval amounts) was almost five times that for the five most constraining States (Table 4). The average net bed change disparities were even more dramatic, ranging from −.034/1000 population for the most constraining States to .195/1000 population for the least constraining States. Even if Nevada is eliminated from Table 4, the disparity remains large. In terms of capital expenditures *per capita*, the other four least constraining States approved over four times that of the five most constraining States. In terms of net bed change *per capita*, the four least constraining States (excluding Nevada) approved an average of .10 beds/1000 population compared to −.034/1000 for the five most constraining states.

4) There appears to be little correlation between the two measures of CON approvals. Of the 10 least constraining States, based upon capital expenditures approved *per capita*, only four ranked in the top 10 of States with the greatest net bed change per thousand. Likewise, the 10 most constraining States, based upon capital expenditures *per capita*, contained only five of the States with the smallest net bed change approved *per capita*.

TABLE 2

Capital Expenditures Summary January 1, 1979 - June 30, 1980 (ranked by *per capita* expenditures)

State	Capital Expenditures Approved[1] Per Capita ($)	Total (Million $)
Nevada	63.75	42.2
Massachusetts	39.75	234.6
Michigan	39.43	369.8
Washington	39.34	143.9
South Carolina	37.87	111.5
South Dakota	33.09	22.8
Connecticut	28.27	92.0
Illinois	28.81	327.5
Oklahoma	26.12	73.0
Tennessee	24.12	106.0
Ohio	23.80	257.0
Minnesota	21.50	86.1
Kentucky	19.72	69.2
Texas	19.28	249.0
North Dakota	19.20	12.4
Virginia	18.86	97.8
Arkansas	18.43	39.8
Colorado	18.21	49.8
Oregon	16.15	38.8
Kansas	16.02	36.9
Florida	15.42	145.0
Maryland	15.17	65.1
California	12.54	277.9
New Jersey	12.40	92.4
Arizona	12.27	30.3
Montana	11.23	8.5
New York	6.43	115.7
Rhode Island	5.04	4.7
Range	5.04 to 63.75	4.7 to 369.8
Average	22.94	114.3
Standard Deviation	12.37	101.1

[1]Bureau of Health Planning, Health Resources Administration, *Program Information Letter*, December 27, 1979, pp. 6-7; Computer printout entitled "Total Expenditures and Beds Proposed and Approved by State and Type of Facility, 7/1/79-6/30/80" prepared for the Office of Program Development, Bureau of Health Planning; 1979 population estimates by Bureau of Economic Analysis, Department of Commerce.

TABLE 3

Bed Change Summary January 1, 1979 - June 30, 1980

State	Net Bed Changes Approved[1] Per 1000 pop.	Total
Nevada	.580	384
Tennessee	.140	615
Texas	.090	1,158
Arkansas	.086	185
Oklahoma	.078	217
Arizona	.075	186
Florida	.062	583
Washington	.061	224
Kentucky	.056	− 182
Montana	.050	38
North Dakota	.037	24
Colorado	.034	93
Oregon	.032	77
Massachusetts	.030	175
Virginia	.020	104
Maryland	.017	72
Illinois	.014	157
Ohio	.007	77
Rhode Island	.006	6
New Jersey	.003	25
Kansas	.001	2
California	−.002	− 35
South Carolina	−.006	− 17
Michigan	−.012	− 110
South Dakota	−.019	− 13
Minnesota	−.028	− 113
New York	−.053	− 962
Connecticut	−.056	− 182
Range	−.056 to .580	− 962 to 1,158
Average	.046	113.1
Standard Deviation	.110	340.6

[1]Bureau of Health Planning, Health Resources Administration, *Program Information Letter*, December 27, 1979, pp. 6-7; Computer printout entitled "Total Expenditures and Beds Proposed and Approved by State and Type of Facility, 7/1/79-6/30/80" prepared for the Office of Program Development, Bureau of Health Planning; 1979 population estimates by Bureau of Economic Analysis, Department of Commerce.

TABLE 4

Comparison of Least Constraining States to Most Constraining States

Least Constraining	Capital Expenditures Approved Per Capita ($)		Net Bed Changes Approved Per 1,000 Population
Nevada	$63.75	Nevada	.580
Massachusetts	39.75	Tennessee	.140
Michigan	39.43	Texas	.090
Washington	39.34	Arkansas	.086
South Carolina	37.87	Oklahoma	.078
Average	$44.03	Average	.195
Most Constraining			
Rhode Island	$ 5.04	Connecticut	−.056
New York	6.43	New York	−.053
Montana	11.23	Minnesota	−.028
Arizona	12.27	South Dakota	−.019
New Jersey	12.40	Michigan	−.012
Average	$ 9.48	Average	−.034

These data highlight the substantial variation among the States in CON activity, as measured by approval levels. It should be pointed out, however, that these differences do not necessarily reflect variation in program outcome. Salkever and Bice (1979) and others (see Steinwald and Sloan, 1979) have described the weaknesses in using approval data to measure program outcomes. For example, a major problem with these data is that they do not capture the effects of CON on the number of projects and the amount of capital proposed. Because of this weakness, and others, the use of approval data has been limited to descriptive studies which show how different kinds of projects and applicants are treated in the CON process (Bicknell and Walsh, 1975; Lewin and Associates, Inc., 1975). In such analyses the type of projects and amount of capital approved by CON may be viewed as the intermediate staging through which the program achieves its impact. This view is adopted here. As an intermediate indicator of program effects, CON approvals should be correlated with the ultimate impact of the program.

Factors Associated with Interstate Variation in CON Approvals

The connection between regulatory characteristics and regulatory approvals was investigated by performing a simple correlation test relating interstate variation in CON approvals to the regulatory indices used in the PAI Study. States were rank-ordered according to two measures of CON approvals, net bed change approved per 1,000 population and capital expenditures approved *per capita*. Rankings on these two measures were then compared to the factor score rankings by means of Spearman rank-order coefficients. The results, which are presented in Table 5, suggest an ambiguous relationship between the measures of regulatory characteristics and CON approvals.

Factor 1, the measure of regulatory toughness, was significantly negatively related to net bed changes approved, but it had no correlation with capital expenditures. Apparently, the characteristics of CON programs which are heavily weighted in Factor 1, such as an overall orientation toward constraining costs in the industry and the use of objective review standards in conducting project reviews, were fairly good indicators of the relative amount of bed expansion approved in the CON process. These same measures, however, had little correlation with the *per capita* amount of capital expenditures approved. Factor 2, on the other hand, was not correlated with either measure of program outcome and its correlation coefficient with respect to capital expenditures approved *per capita* had the wrong sign, that is it indicated weaker programs had a higher score on Factor 2 (a tendency to approve fewer expenditures over the study period). This analysis suggests that the regulatory characteristics that were heavily weighted in Factor 2, due process orientation and the number of project exemptions, are not as good at predicting differences in CON approvals as the characteristics reflected in Factor 1.

TABLE 5

Capital Expenditures and Net Bed Change: Correlation with Indices

State	Per Capita ($)	Rank on Capital Expenditures/Capita	Per 1000 Pop.	Rank on Net Bed Change/1000 Population	Factor 1	Factor 2
Michigan	39.43	3	−.012	24	1.878	−.935
Illinois	28.81	8	.014	17	−.713	1.685
California	12.54	23	−.002	22	.985	1.216
Ohio	23.80	11	.007	18	−.375	1.128
Texas	19.28	14	.090	3	−.713	1.685
Massachusetts	39.75	2	.030	14	2.219	.064
Florida	15.42	21	.062	7	−.375	−.052
Washington	39.34	4	.061	8	−.875	−.379
New York	6.43	27	−.053	27	2.040	−1.117
South Carolina	37.87	5	−.006	23	−.196	−1.117
Tennessee	24.12	10	.140	2	−.713	1.685
Virginia	18.86	16	.020	15	−1.053	.686
New Jersey	12.40	24	.003	20	−.196	−1.117
Connecticut	28.27	7	−.056	28	1.164	.151
Minnesota	21.50	12	−.028	26	−.196	−1.117
Oklahoma	26.12	9	.078	5	−.196	−1.117
Kentucky	19.72	13	.056	9	−.196	−1.117
Maryland	15.17	22	.017	16	−1.053	.686
Colorado	18.21	18	.034	12	−.034	.947
Nevada	63.75	1	.580	1	−.535	.621
Arkansas	18.43	17	.086	4	−.196	−1.117
Oregon	16.15	19	.032	13	−.375	−.052
Kansas	16.02	20	001	21	−.916	−1.117
Arizona	12.27	25	.075	6	−.875	−.379
South Dakota	33.09	6	−.019	25	.859	1.204
North Dakota	19.20	15	.037	11	−.875	−.052
Montana	11.23	26	.050	10	−.196	−1.117
Rhode Island	5.04	28	.006	19	2.040	1.128

Factor 1 with Capital Expenditures Approved/Capita, Spearman $r_s = -.0175$, $p = .465$
Factor 2 with Capital Expenditures Approved/Capita, Spearman $r_s = -.1173$, $p = .277$
Factor 1 with Net Bed Change/1000 Population, Spearman $r_s = -.5429$, $p = .002$
Factor 2 with Net Bed Change/1000 Population, Spearman $r_s = .1207$, $p = .271$

The results of the correlation analysis suggest two possibilities with respect to the factor scores. One possibility is that the two measures of CON approvals adopted here are not valid indicators of ultimate program impacts, and thus should not be expected to be highly correlated with the factor scores which presumably are associated with program impact. The fact that neither measure is correlated with the other nor with the factor scores may indicate that these measures have little analytical value. Since these measures were based on only a year and a half of CON experience, they are, at best, incomplete indicators of the programs' overall effectiveness. The other possibility is that other variables not captured by the regulatory measures, but which are correlated with them, influence program decisions and ultimately program impact. For example, interstate differences in market forces related to the need for hospital capital in a State might be an important indicator of the potential impact of CON. It may be true that at any given time, market conditions may provide constraints on CON agencies that overshadow the programmatic process characterized by the regulatory index scores. Such variables as the existing stock of capital, occupancy rates, and past population growth might be important along with the regulatory factors in predicting the decisions made by CON agencies. To examine the importance of these variables in explaining CON decisions, while controlling for differences in regulatory characteristics, a multiple regression model of CON approvals was estimated.

Two equations were specified in which the dependent variables were net bed change approved per thousand population and total capital expenditures approved *per capita* by State. Explanatory variables included various factors related to the need for hospital capital expansion in a State as well as the regulatory characteristics of that State's CON program. In the first equation, net bed change approved per thousand population is expressed as a function of existing capital stock (1978 beds/capita and assets/bed), the historical bed growth rate[1] (1975-1978 average bed growth rate), the historical population growth rate (1970-1978 average population growth rate), the current occupancy rate (1978 occupancy rate), and the two measures of regulatory characteristics (Factor 1 and Factor 2). In the second equation, total expenditures approved *per capita* is expressed as a function of the same variables as in the net bed change equation, except that the historical rate of growth in hospital assets (1975-1978 average growth rate of hospital assets) is used as a measure of the investment cycle in place of the historical bed growth rate.

[1]Use of the historical bed growth rate in the net bed change equation and the historical asset growth rate in the capital expenditure equation is based on evidence that investment cycles in the hospital industry are important determinants of the impact of CON (see Howell, 1981).

Table 6 presents the results of estimating the two equations. Equations one and three exclude the regulatory factors while equations two and four include them. In equation one, 66 percent of the variance in net bed change approved per thousand was explained by the market factors related to need. Based on the regression coefficients it appears that States which had experienced more rapid population growth prior to 1979 approved relatively more beds during 1979-80, other things constant. The magnitude of the coefficient on the population growth variable suggests an average increase in net bed change approvals of .67 per thousand population for each percentage increase in a State's past population growth rate. The dollar value of existing assets per bed was also significantly positively related to bed approvals; its coefficient indicated an increase in bed approvals of .006 per thousand for every thousand dollar increase in existing assets per bed. The existing stock of beds, recent growth in that stock, and occupancy were also positively associated with net bed change, but their coefficients were not significant.

TABLE 6

Regression Estimates of Interstate Differences in CON Decisions

	Constant	1978 Bed/Capita	1975-78 Bed Growth	1978 Asset/Bed	1975-78 Asset Growth	1978 Occupancy	1970-78 Pop. Growth	Factor 1	Factor 2
(1) Net Bed Change/1000	−.452	.008	1.490	.006	—	.004	.670	—	—
		(1.330)[1]	(1.34)	(3.75)[2]	—	(1.38)	(4.02)[2]	—	—
(2) Net Bed Change/1000	−.412	.010	1.080	.006	—	.004	.606	−.017	.018
		(1.660)	(.923)	(3.75)[2]	—	(1.33)	(3.55)[2]	(.944)	(1.200)
(3) Expenditures/Capita	20.321	1.584	—	−.400	1.259	−.132	16.295	—	—
		(1.660)	—	(.394)	(.760)	(.277)	(.591)	—	—
(4) Expenditures/Capita	18.969	1.543	—	−.400	1.269	−.113	18.737	.443	−.634
		(1.445)	—	(.400)	(.699)	(.213)	(.618)	(.142)	(.245)

Summary Statistics:
(1) $R^2 = .662, F = 8.626$
(2) $R^2 = .699, F = 6.643, F(\text{Fac } 1, \text{Fac } 2) = \frac{.01291}{.00524} = 2.464$
(3) $R^2 = .231, F = 1.325$
(4) $R^2 = .235, F = .876, F(\text{Fac } 1, \text{Fac } 2) = \frac{13.8498}{163.1276} = .085$

[1](t-values)
[2]Significant at .05 level, one-tailed test

Equation two adds the two factor scores to the net bed change equation. Although the coefficients on these variables had the expected signs, they were not significant. Moreover, their inclusion in the model improves the explanatory power of the equation by an insignificant amount as indicated by the F-test performed on the additional variance explained by the regulatory factors.

With regard to the capital expenditures equations, only about 24 percent of the variation in this measure of CON decisions could be explained by the model. Moreover, none of the coefficients on the explanatory variables were significant. Addition of Factor 1 and Factor 2 to the model in equation four added little to its explanatory power. The R^2 improves by an insignificant amount ($F = .085$) and the signs on the factor coefficients are the opposite of that expected from equation two and from our theory.

In summary, these analyses provide only weak support for the assumption that program outcomes vary in a manner that can be systematically explained by the regulatory index scores used in the PAI Study. Although Factor 1 was significantly correlated with net bed change approvals, it became insignificant when variables related to the need for capital were introduced in a multivariate model of net bed change approvals. With respect to total capital expenditure approvals, neither the need variables nor the regulatory factors could explain a significant amount of interstate variation. This finding raises some doubt whether indicators of the regulatory framework and process, alone, can accurately distinguish effective from ineffective programs, or alternatively, whether existing quantitative analyses which have adopted these measures to capture the impact of effective CON programs are valid.

Conclusion

It is evident from this analysis that interstate variation in CON approvals is substantial which is consistent with the assertion that CON programs are not homogeneous. However, our model of net bed change approvals suggests that interstate differences in market forces related to the need for capital, such as past population growth and existing assets per bed, may be better indicators of the variation in CON outcomes than the characteristics of the regulatory process. Thus, even if we assume the indices used in the PAI Study are valid measures of regulatory characteristics, evaluation of the program should consider the major initial situations and operations of the State's hospital industry. Market conditions may explain more of the cost-containment potential of CON programs than many of the studies to date have dared to admit. It may well be the case, that interstate differences in the manner in which CON is implemented has played only a minor role in influencing the effectiveness of CON. If so, using structural measures of the CON process to identify effective programs may be fruitless.

Attributing interstate variation in CON decisions to differences in market conditions implies that the CON process has not significantly altered the industry's normal investment pattern. This result does not necessarily imply that CON is inherently ineffective or that strong CON programs will not influence investment patterns in the future. It does suggest, however, that at the present time we know little about the characteristics of an effective CON program.

Acknowledgements

The authors wish to thank the Bureau of Health Planning, DHHS, Southern Illinois University School of Medicine, and Georgia Institute of Technology for their support for this project. An earlier version of this paper appeared as a Program Information Note of the Bureau, April 1981.

References

Bicknell, William and Diane Walsh, "Certificate-of-Need: The Massachusetts Experience," *New England Journal of Medicine*, Vol. 292, No. 20, 1975.

Cohodes, Donald R., "Interstate Variation in Certificate of Need Programs: A Review and Prospectus," in *Health Planning in the United States: Selected Policy Issues, Volume Two*, National Academy Press, Washington, D.C., 1981, pp. 54-88.

Hellinger, Fred J., "The Effects of Certificate-of-Need Legislation on Hospital Investment," *Inquiry*, Vol. 13, No. 187, 1976.

Howell, Julianne R., "Regulating Hospital Capital Investment: The Experience in Massachusetts," DHHS Publication No. PHS51-3298, Hyattsville, MD, March 1981.

Lewin and Associates, Inc., *Evaluation of the Efficiency and Effectiveness of the Section 1122 Review Process*, National Technical Information Service, Springfield, VA, 1975.

Policy Analysis, Inc. and Urban Systems Research and Engineering, Inc., "Evaluation of the Effects of Certificate-of-Need Programs," DHHS, Bureau of Health Planning, Hyattsville, MD, 1980.

Salkever, David S. and Thomas W. Bice, "The Impact of Certificate-of-Need Controls on Hospital Investment," *Milbank Memorial Fund Quarterly: Health and Society*, Vol. 54, (Spring, 1976).

Salkever, David S. and Thomas W. Bice, *Hospital Certificate-of-Need Controls: Impact on Investment, Costs, and Use*, American Enterprise Institute, Washington, D.C., 1979, pp. 27-29.

Sloan, Frank A. and Bruce Steinwald, "Effects of Regulation on Hospital Costs and Input Use," *Journal of Law and Economics*, Vol. 23, (Winter, 1980).

Steinwald, Bruce and Frank A. Sloan, "Regulatory Approaches to Hospital Cost Containment: A Synthesis of the Empirical Evidence," unpublished paper, Vanderbilt University, 1979, p. 19.