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ABSTRACT

This study examines the potential effects of structural characteristics of teacher labor markets on attempts to provide equal educational opportunity by revising state educational finance systems. After presenting some crude data on teachers' salaries and current per-pupil spending, the authors present a four-step analysis. First, they specify a model of the labor market for teachers and then derive a formulation for the reduced form wage equation. Second, they estimate the wage equations for teachers from data for the 83 largest U.S. cities and the 48 contiguous states. Third, they use these wage equations to predict the wage differentials for different cities and states that would exist if teacher demand variables were held at their average values for the entire sample, while teacher supply variables were left free to vary. Finally, they explore the policy implications of their findings and conclude that no ideal way of providing equal educational opportunity exists. (Author/JG)

FINAL REPORT

Project No. 2-0681
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FACTOR COST DIFFERENCES, EDUCATIONAL EQUALITY, AND FUNDING DECISIONS IN PUBLIC EDUCATION

March 1975

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

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ABSTRACT

This study examines the potential effects of structural characteristics of teachers' labor markets on attempts to provide equal educational opportunity by revising state educational funding regimes. Its point of departure is the existence of teachers' salary differences among educational areas (largely ignored in court and legislative deliberations), so that equal dollar expenditures per pupil -- a possible outcome of some court decisions and legislative enactments -- may not achieve equal real resource availability per pupil. If salary differences could be attributed preponderantly to demand factors in teachers' labor markets then changes in funding mechanisms could provide approximately equal real resources. But predominance of demand forces is not found. Rather, supply-side factors are important in establishing inter-area salary differences. And since funding regime revisions are largely aimed at smoothing out inter-area demand differentials, salary differences are likely to persist. So too are real educational resource differences if only funding mechanisms are altered. To achieve equal educational opportunity, statewide regulatory bodies, whose decisions can accommodate both demand-side and supply-side inter-area differences, seem needed. This solution, however, is fraught with serious educational and political problems. Thus, no ideal way of providing equal educational opportunity exists.

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Chapter 1

INTRODUCTION

In the last few years, there have been a number of important legal decisions pertaining to the constitutional obligations of various governmental bodies to bring about equality of educational opportunity. As a result of the Rodriguez decision of the U.S. Supreme Court, the legal situation now is one in which states are not bound to bring about equality of educational opportunity for the students enrolled in their public school systems. However, states are free to institute equal educational opportunity programs if they wish to do so or if they are required to do so by their own constitutions.[1] And a number of states have at this date passed laws that are designed to further the goal of equal educational opportunity.[2]

The conventional legal standard for measuring the educational output of a school system is the number of dollars expended (usually for current operating activities) per student enrolled or in attendance. But everyone recognizes that this is, at best, a crude approximation. Given the lack of fully reliable information on how to define and to measure the output of the education system and on how precisely the output of the system is produced, the courts would seem to have no real recourse but to adopt the working assumption that educational output is directly related to dollars worth of input.[3] Still, despite this lack of information, it would seem that dollars worth of input is still not the best measure of educational output that is available to the courts. So long as considerable differences in factor prices remain, equal dollar expenditures may mean that there are substantial differences in real resources utilized in each educational area.[4] The implication is that efforts to equalize educational opportunity by equalizing dollar expenditures per student, as many states may undertake to do, may fall short of the mark. Moreover, even if spending formulae (e.g., for all school districts in a state) were designed to bring about equal real resource usage per student--by allowing for current factor price differences in computing the permissible expenditure level for each area--there is a real danger that this approach may build the effects of wealth differences among communities into these prescribed expenditure levels. The reason is that for some factors, such as teachers' services, the observed cost differentials among areas may at least in part reflect the effects--via demand--of the wealth differences among communities--effects that an equal educational opportunity program is supposed to eliminate. To avoid this kind of problem, what is needed is some estimate of the resource cost differences among areas that are due only to forces on the supply side of the resource market.

The purpose of this study is to provide an estimate of the relative importance of elements on the supply side of the market for the most important of the purchased resources used to produce education--the teacher--in determining the cost of this factor of production. If our findings indicate that forces on the supply side are relatively unimportant, then programs that prescribe identical levels of spending per student among areas could be implemented with little fear that teacher salary differentials will be a source of inequality of educational opportunity. If, on the other hand, it is found that forces on the supply side of the teachers' labor market constitute an important reason for teachers' salary differentials, then this finding ought to be taken into consideration in designing equal educational opportunity programs.

After presenting some crude data on teachers' salaries and current outlays per student, our analysis involves four basic steps. First, in Chapter 3 we specify a model of the labor market for teachers and derive from it a formulation for the reduced form wage equation. Second, the wage equation is estimated from data for eighty-three of the largest central cities in the United States and for the forty-eight contiguous states. The results of these estimates are given in Chapter 4. Third, we use the estimated wage equations to predict the wage differentials for the cities and states that would exist under conditions where demand side variables are held at their average values for the sample as a whole while the supply side variables are left free to vary. Again, these estimated wage differentials are reported in Chapter 4. Finally, in a brief Chapter 5 we explore the policy implications of our findings with respect to equal educational opportunity programs.

FOOTNOTES FOR CHAPTER 1

[1]Rodriguez v. San Antonio Independent School District, 337 F. Supp. 280 (D.C., Texas 1971), U.S. Supreme Court, March, 1973. It should be noted that as we use the term equal educational opportunity, it does not include the need for compensatory education. Essentially what we mean by equal educational opportunity is the availability for each student of an identical amount of real educational resources. The thrust of our analysis would not be fundamentally different, however, if equal opportunity were construed to include compensatory education.

[2]California, Minnesota, Ohio, and Pennslyvania are among the states that have passed laws that have the aim of making district revenues more equal to bring about increased equality of educational opportunity. Others, like Connecticut, Maine, New York, Rhode Island, Tennessee, Texas, and Vermont have created commissions to study the financing of education. (NEA, High Spots in State School Legislation, 1969, 1970, 1971, and 1972 editions). North Carolina's Constitution, approved in 1970, specifically states that "The general assembly shall provide . . . for a general and uniform system of free public schools . . . wherein equal opportunity shall be provided for all students," (Article X, Section 2).

[3]For example, see Serrano v. Priest, 487 P. 2d 1241 (Supr. Ct., California, 1969), especially pp. 599-601. A notable exception is provided by Jensen et al. vs. State Board of Tax Commissioners (Cir. Ct. Johnson Co., Ind., 1973). In that decision the court held that there is no basis for finding that disparities that do exist in expenditures per pupil are unreasonable or unrelated to variance in costs.

[4]Nationally, there appears to be substantial variation among areas in the levels of teachers' salaries. For the 1969-1970 school year, the ratio of average teachers' salary in the highest paying of the 48 contiguous states (New York) to that in the lowest (Mississippi) is about 1.8 to 1. The coefficient of variation in average teachers' salaries is about 0.13. The simple correlation between average teachers' salary and average current spending per student enrolled for the states is 0.78. For the 83 central city areas used in our later analysis, the ratio of average salary in 1968-1969 in the highest paying city school district (San Bernadino, Ca.) to that in the lowest paying district (San Antonio, Texas) is 1.66 to 1. The coefficient of variation of salaries is 0.12. Teachers' salaries and current expenditures per student are correlated 0.67.

It is important to note that per student spending differences among areas are much greater than are the teachers' salary differences. For the years cited above, the ratio of spending per student in the highest to the lowest spending state is 2.43 to 1.0. The ratio for the city school districts is 3.19 to 1.0. Thus it is apparent that plans which are designed to equalize educational opportunity by equalizing spending per student, while not allowing for factor price differences, are likely to bring about increased equality of opportunity. However, because of the factor cost differences, there is a reasonable possibility that these plans will fall well short of the goal of full equality of opportunity.

Chapter 2

TEACHERS' SALARIES AND SPENDING PER STUDENT

It has become a common occurrence for educators, legislators, and courts to treat the amount of spending on education per student enrolled as a direct measure of the quality of education received by students. As we have indicated above, in our view much of the variation in spending per student among localities may reflect the effects of differences in the cost of factors of production used in the education process. The most important of these factor costs is, of course, the cost of teachers' services.

The question of what causes salary differentials among areas is a complicated one. As Levin and her co-authors have shown, much of the difference in teachers' salaries between the cities, suburbs, and rural areas <u>within</u> a number of states is due in part to differences in experience and education of the teachers who work in these areas.[1] But it also seems likely that at least a part of the differences in salaries among areas is to be explained in terms of the underlying differences in labor market conditions among geographical areas. The obvious questions suggested by the above are what are the factors that are most important in providing an explanation for the differences in teachers' salaries among labor markets; and what are the implications of the salary differences for total spending by localities on teachers' services?

Before we attempt to answer these questions, we turn first to an examination of the raw data on spending per student and teachers' salaries in the public schools for a number of geographical areas for 1969-1970. The areas that we pick are the forty-eight contiguous states and the school districts in 83 central cities out of the 113 central cities of the 85 largest SMSA's. We do not include Alaska and Hawaii in our analysis because of the atypical cost structures that are faced by the residents of these states. The atypical cost structures apparently are the result of geographical isolation. School districts for thirty cities have been excluded from the analysis because at least some of the required data are not available for these districts.[2]

Data on average salaries for all public school teachers by state in the 1969-1970 school year and the corresponding figures on current expenditures per student are given in Table 1 below. It can be seen from that table that the range in average annual salaries across states is considerable, with a ratio from high to low of about 1.8 to 1.0. The coefficient of variation is 0.13. Correspondingly, differences in spending per student for states are comparable to the salary differences. The ratio of spending per student in the state with highest salary to that in the state with lowest salary is about 2.4 to 1.0. The coefficient of variation is 0.20. Teachers' salaries and spending per student for the states are correlated .78. Thus, it can be seen that there is considerable variation in spending per student, and on the face of it, the variation seems to bear some relationship to the variation in teachers' salaries. Of course, it should be remembered that the variation described here is for state averages. The analogous variation in salaries for public school teachers and in spending per public school student among all the school districts of the forty-eight states would be even greater.

The situation with respect to the sample of large cities is similar to that for the states. The mean earnings for classroom teachers in public schools for 1968-1969 range from $10,598 to $6,369; that is, a ratio of 1.66 to 1.0. The coefficient of variation is 0.12. The coefficient of variation for current expenditures per student in 1969-1970 is 0.25. The data on teachers' salaries and on current spending per student are correlated .67 for our sample of cities.

Simple correlations can be highly misleading. We certainly do not intend to imply at this stage of our work that variations in teachers' salaries are the unique--or even the most important--cause of variations in current spending on education per public school student.[3] Rather, our basic purpose in presenting these basic figures on teachers' salaries and current expenditures per pupil is to set the stage for our discussion and econometric analysis of the factors which affect the supply and demand for teachers' services, and to apply the relevant findings to answer questions about the reasons for differences among school districts in the amount of spending on teachers' services per student enrolled.

Table 2-1:

Average Salaries for Public School Teachers and Public School Current Expenditures on Education Per Student Enrolled, by State for 1969-70

State	Average Salary ($)	Current Expenditures Per Enrolled Student ($)
NY	10,390	1,114
CALIF	10,324	748
MICH	9,823	772

Table 2-1: cont.

Average Salaries for Public School Teachers and Public School Current Expenditures on Education Per Student Enrolled, by State for 1969-70

State	Average Salary ($)	Current Expenditures Per Enrolled Student ($)
ILL	9,569	761
MD	9,383	802
CONN	9,271	912
NEV	9,248	698
WASH	9,237	724
NJ	9,150	921
DEL	9,015	832
WISC	9,000	782
PENNA	8,858	819
IND	8,832	650
ORE	8,814	803
RI	8,776	795
MASS	8,770	682
ARIZ	8,715	719
MINN	8,658	767
FLA	8,410	687
IOWA	8,398	824
OHIO	8,300	672
WYO	8,271	828
VA	8,070	648
VT	7,960	949
MO	7,844	602

Table 2-1: cont..

Average Salaries for Public School Teachers and Public School Current Expenditures on Education Per Student Enrolled, by State for 1969-70

State	Average Salary ($)	Current Expenditures Per Enrolled Student ($)
NEW MEX	7,796	637
NH	7,789	644
COLO	7,760	668
W. VA	7,650	592
UTAH	7,643	578
KANSAS	7,620	658
MONTANA	7,606	749
MAINE	7,572	639
NC	7,494	543
NEB	7,354	643
GA	7,278	524
TEX	7,277	474
TENN	7,050	529
LOUISIANA	7,028	627
KY	6,939	563
IDAHO	6,884	548
SC	6,883	550
OKLA	6,882	517
ALA	6,817	433
N DAK	6,696	625
SD	6,403	629

Table 2-1: cont.

Average Salaries for Public School Teachers and Public School Current Expenditures on Education Per Student Enrolled, by State for 1969-70

State	Average Salary ($)	Current Expenditures Per Enrolled Student ($)
ARKANSAS	6,277	493
MISS	5,798	458

SOURCE: National Education Association, Estimates of School Statistics 1970-71 (Contains 1969-70 revised data), Research Report 1970-R15, Table 7 for Salaries and Table II for current expenditures.

Office of Education, Statistics of Public Schools Fall 1969, Table 5 for enrollment.

Table 2-2:

Average Salaries for Public School Teachers, 1968-69 and Current Expenditures for Public Schools Per Student Enrolled, 1969-70; for School Districts of Large Cities

City	Average Teachers' Salaries ($)	Spending per Student ($)
SAN BERNADINO, CAL	10,598	804
SAN FRANCISCO, CAL	10,249	1,291
LOS ANGELES, CAL	10,043	744
SAN JOSE, CAL	10,029	826
DETROIT, MICH	10,009	840
LONG BEACH, CAL	9,994	954
SAN DIEGO, CAL	9,898	796
OAKLAND, CAL	9,835	876
MILWAUKEE, WIS	9,827	7[illegible]
FRESNO, CAL	9,752	724
ROCHESTER, NY	9,710	1,254
CHICAGO, ILL	9,697	867
NEW YORK, NY	9,696	1,184
SACRAMENTO, CAL	9,533	783
ST PAUL, MINN	9,413	809
GARDEN GROVE, CAL	9,300	621
PHILADELPHIA, PA	9,295	947
EVERETT, WASH	9,287	747
BOSTON, MASS	9,250	883
ANAHEIM, CAL	9,187	730
DADE CO, FLA	9,112	758

Table 2-2: cont.

Average Salaries for Public School Teachers, 1968-69 and Current Expenditures for Public Schools Per Student Enrolled, 1969-70; for School Districts of Large Cities

City	Average Teachers' Salaries ($)	Spending per Student ($)
SEATTLE, WASH	9,086	919
SCHENECTADY, NY	9,070	1,291
TACOMA, WASH	9,053	967
SANTA ANA, CAL	9,052	706
PROVIDENCE, RI	9,037	1,074
SYRACUSE, NY	9,021	1,084
WILMINGTON, DEL	9,006	957
WORCESTER, MASS	8,974	896
YOUNGSTOWN, OHIO	8,957	802
BUFFALO, NY	8,956	1,048
HARTFORD, CONN	8,922	1,138
DAYTON, OHIO	8,881	916
MINNEAPOLIS, MINN	8,844	868
BRIDGEPORT, CONN	8,841	709
PHOENIX, ARIZ	8,814	671
BALTIMORE, MD	8,748	754
ALBANY, NY	8,693	1,232
INDIANAPOLIS, IND	8,689	649
ONTARIO, CAL	8,677	706
ST LOUIS, MO	8,654	729
PATTERSON, NJ	8,643	714
SPRINGFIELD, MASS	8,390	799

Table 2-2: cont.

Average Salaries for Public School Teachers, 1968-69 and Current Expenditures for Public Schools Per Student Enrolled, 1969-70; for School Districts of Large Cities

City	Average Teachers' Salaries ($)	Spending per Student ($)
PINELLAS CO, FLA	8,367	684
CANTON, OHIO	8,363	733
BROWARD CO, FLA	8,298	719
CINNCINATTI, OHIO	8,261	804
CLEVELAND, OHIO	8,214	895
DENVER, COL	8,209	768
KANSAS CITY, MO	8,184	677
PORTLAND, ORE	8,146	763
ALLENTOWN, PA	8,126	694
OMAHA, NEB	8,080	577
LOUISVILLE, KY	8,056	669
JERSEY CITY, NJ	7,989	746
WICHITA, KAN	7,968	634
AKRON, OHIO	7,935	753
RICHMOND, VA	7,915	711
TOLEDO, OHIO	7,864	757
NORFOLK, VA	7,820	671
WARREN, OHIO	7,804	727
NASHVILLE, TENN	7,593	596
DUVAL CO, FLA	7,572	568
NEW ORLEANS, LA	7,552	567
ATLANTA, GA	7,485	693

Table 2-2: cont.

Average Salaries for Public School Teachers, 1968-69 and Current Expenditures for Public Schools Per Student Enrolled, 1969-70; for School Districts of Large Cities

City	Average Teachers' Salaries ($)	Spending per Student ($)
MECKLENBURG CO, NC	7,405	624
COLUMBUS, OHIO	7,385	788
SALT LAKE CITY, UTAH	7,380	594
HIGH POINT	7,341	573
DALLAS, TEX	7,282	529
GREENSBORO, NC	7,249	594
HARRISBURG, PA	7,218	820
PORT ARTHUR, TEX	7,203	575
KANSAS CITY, KAN	7,195	546
MEMPHIS, TENN	7,183	564
BEAUMONT, TEX	7,147	589
HOUSTON, TEX	7,134	489
KNOXVILLE, TENN	7,103	549
TULSA, OKLA	7,081	548
OKLAHOMA CITY, OKLA	6,830	477
EL PASO, TEX	6,829	501
FT WORTH, TEX	6,731	404
SAN ANTONIO, TEX	6,369	433

SOURCE: Average Salaries (1968-69) paid classroom teachers in public elementary and secondary schools from National Education Association, <u>24th Biennial Salary Survey of Public-</u>

SOURCE, cont.: School Professional Personnel, 1969, Research Report 1969-R7, Table A, col. 6 (data by school district). Office of Education, E.L.S.E.G.I.S.-XII, Part B - Finances: 1969-70 (TAPE), current expenditures by school district. Office of Education, Statistics of Local Public School Systems Fall 1969: Pupils and Staff, Table 2, enrollment by school district.

FOOTNOTES FOR CHAPTER 2

[1] Betsy Levin, Thomas Muller, and Corazon Sandoval, The High Cost of Education in Cities, The Urban Institute, Washington, D. C., 1973.

[2] One of the thirty cities, Washington, D. C., has been excluded from the analysis because of its unique fiscal structure.

[3] For example, one obvious alternative possibility is that teachers' salaries and school spending both reflect the effects of differences in community income and wealth.

Chapter 3

TEACHERS' LABOR MARKET:

Analytical Framework

The data on teachers' salaries by city and by state, which we set forth above, are characterized by considerable dispersion. The purpose of this chapter is to provide an economic framework for analyzing the source of the dispersion. To accomplish this we adapt basic labor market theory to the labor market for teachers. The starting point for the analysis is the model of a competitive labor market. A number of complications are then introduced to analyze the behavior of supply and demand for teachers under various market structures and economic situations.

Initially, the complications introduced pertain to questions of market-structure and the effects of differences in the number of buyers on the equilibrium wage. From there, we introduce a number of institutional constraints. These include the effects of a fair wage standard in the community on teachers' salaries, some discussion of the effect of teachers' unions, and consideration of the role played by labor quality in the labor market for teachers. The discussion of labor quality is formulated to take into account the recent findings of an apparent lack of impact of teacher quality on student learning and such institutional factors as the single salary schedule.

I

The first case to be analyzed is that of wage determination in a single isolated labor market. The following conditions are assumed to characterize the situation in this market:

1) No person in the labor market has a special talent for any one profession. In a particular profession all persons with the level of training considered adequate are equally productive.

2) All labor force members have similar preferences with respect to each particular profession. That is, the non-pecuniary aspects of the various jobs in the labor market are ranked the same way by each labor force member.

3) All labor market entrants face similar costs of education. They finance that education with equal ease or difficulty.

4) There is a single educational requirement for each particular occupation.

5) Occupational and educational decisions are generally made on a lifetime basis.

6) The teaching profession uses few people relative to the number of people in all other occupations taken together.

For the particular labor market where the above conditions are met, in long-run equilibrium the wage level for teachers is determined on the supply side of the market. The number of teachers employed, given the supply price of labor, is determined on the demand side. More specifically the supply curve under the assumed conditions is perfectly elastic. The reason is that each entrant into teaching requires a total compensation--monetary and non-monetary--which is the same as that in other occupations. Moreover, given the relatively small size of the teaching profession (assumption 6 above), wages outside of teaching do not vary with the number of teachers.

The supply curve for teachers (SS) is pictured in Figure 3-1. The height of the supply curve, OW_1, is the monetary compensation that must be offered to teachers if people are to be just willing to enter the teaching profession. This required monetary compensation is strongly influenced by the long-run prospects in other professions, the relative non-pecuniary benefits in teaching as opposed to other professions, the education requirement for teaching as compared with other occupations, and the costs of obtaining that education.[1]

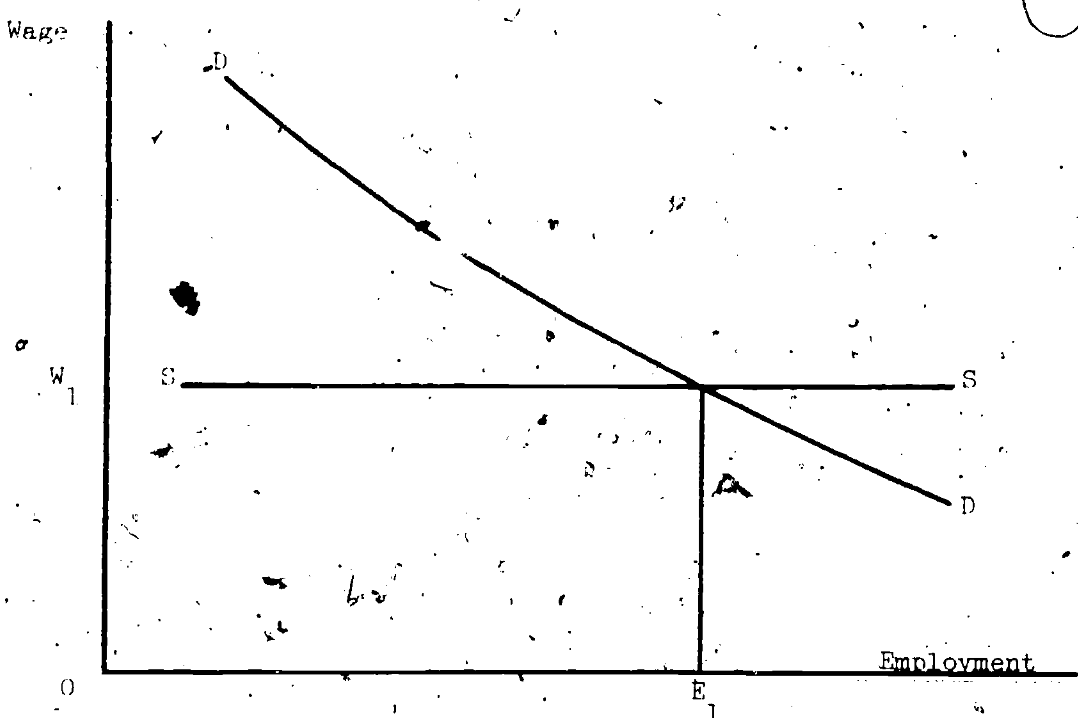


Figure 3-1

The non-monetary aspects of jobs which affect their relative attractiveness to new entrants to a particular occupation include such things as work effort required, and the pleasantness, danger, and satisfaction of work. Non-pecuniary rewards are a substitute for money earnings. Therefore, other things the same, non-pecuniary rewards for an occupation are inversely related to the money wage. That is, as relative non-pecuniary rewards of teaching deteriorate, assuming that the other compensation-determining factors noted above do not change, SS in Figure 3-1 will shift upward. In the case of the teaching profession, the obvious extraordinary non-pecuniary rewards include a summer off and unusual job security once tenure is obtained.

While it has been noted that W_1 reflects the money wage required to encourage people to enter teaching--that is, W_1 is the reservation price for teachers--the relevant time period over which W_1 is measured has not as yet been defined. One obvious possibility is that W_1 represents the expected monetary earnings of teachers over their entire working life. If it is possible to lend and borrow freely on the capital market to finance education, lifetime earnings may conveniently be measured by a yearly equivalent, defined as that constant level of yearly income which would generate the same present value as does the current age earnings profile of teachers when it is discounted at prevailing interest rates.[2] Generally, when discussing long-run occupational choice, the appropriate time frame for measuring earnings is the individual's expected or consuming life.[3]

The empirical analysis presented below is concerned with explaining why wages differ for teachers in different labor markets. If it is assumed that the shape of the time profile of earnings for teachers is similar in the various markets, then a single year's earnings for those with a given level of experience may serve as an index of the lifetime earnings of those who enter the teaching profession in each of the markets.[4] Thus in later chapters, W_1, which is conceptually a measure of lifetime earnings, may be roughly approximated (differences in formal education aside for the moment) by average salary for teachers in a given market adjusted for the average level of experience for those teachers. No matter what salary measure is employed, however, it is important to remember that given the assumed circumstances in this first case, the wage variable will bear some relationship to lifetime earnings and the supply curve itself will be perfectly elastic.

Under these circumstances, the supply relationship may be given by

$$(3\text{-}1)\quad W = S(N, OC),$$

where W is an appropriate measure of the teachers' wage rate as discussed above, N is an index of the relative non-pecuniary advantages of teaching, and OC is the opportunity cost of entering a comparable occupation with training requirements similar to those of teaching. Alternatively, in this single market case with full mobility among occupations, the opportunity cost (OC) can be related to the cost of obtaining the education required of teachers. Therefore, the supply equation may also be written as

$$(3\text{-}2)\ W = S(N, Ed),$$

where Ed measures the years of education required to enter teaching and the relevant alternative occupations in this market (W and N are defined as for equation 1). Of course, given the assumed conditions there is full mobility among all occupations. Therefore, all occupations, not just those which require the same formal education as teaching, are perfect substitutes for teaching as a profession. That is, with identical entry conditions for all those who wish to enter a particular occupation and with similar preferences, total pecuniary and non-pecuniary rewards to each occupation over a lifetime are the same.

It is legitimate to draw the demand curve for teachers on a diagram where the wage variable is defined to bear a relationship to lifetime earnings, as it is in Figure 3-1, only if the lifetime wage concept has some meaning to those who hire teachers. This will be so if school boards behave as if they expect those who are newly hired to remain for a considerable time in their jobs, or if they believe that job candidates base their employment decisions on long-run earnings prospects rather than just on starting salaries. Such behavior on the part of school boards seems to be more reasonable than one obvious alternative: a situation where school boards set their respective salary structures to retain only those within a given age or experience bracket. While such a policy might have some meaning for the retention rate of new hires, it would make little sense with respect to the turnover rates for those with more than a few years of experience. For example, if wages for those with ten to twenty years of experience were made artificially low, the result might be a labor force with little long-run commitment in an occupation where attitude toward the job is crucial to effective performance.

Consequently, it is reasonable to believe that market pressures eventually lead school boards to set wage profiles that are rationally structured so as to discourage any major inflows into or outflows from teaching positions for those in particular age brackets. Accordingly, we proceed as if it is appropriate to draw the demand curve for teachers on a diagram where the wage variable refers to some measure of earnings expected over a long-run working period.

The slope and position of a demand curve for a factor of production such as teachers is traditionally explained in terms of the theory of derived demand. The theory suggests that the demand curve for a factor of production exhibits a negative slope for two reasons. First, as the quantity of a factor of production is increased, the amount of other factors employed remaining the same, diminishing returns to the variable factor eventually set in. In the case of education, where learning takes place by combining teacher time, student time, and equipment, a fixed size student body in a school district eventually leads to diminishing returns to the teacher input.[5] That is, increases in the teacher-student ratio which result from expanded hiring levels in a given district at a given time eventually will yield smaller and smaller increments to student learning. The declining marginal returns to additional teachers hired thus, in part, account for the negative slope of the demand curve for teachers. The second factor which underlies the negative slope of the demand curve for teachers is the negative slope of the demand curve for education itself. As with any economic good, to finance an increase in the amount of education produced, the public must forego consumption of other public or private goods. It seems plausible that the marginal utility of education, as well as of most other private and public goods, is inversely related to the quantity consumed. Consequently, as expenditures are switched from other goods to education, the marginal utility of education declines while that of the other goods increases. The effect is to impart a negative relationship between the "price" of education and the quantum of education desired. The declining marginal value of education, in turn, partially accounts for the declining marginal value of additional teachers hired, and thus for the negative slope of the demand curve for teachers.

It is useful to make our analysis of the demand curve for teachers more rigorous. We begin with a simple model where it is assumed that the board of education behaves, not uncharacteristically, as if education is produced with teacher services and student time. Thus,

$$(3\text{-}3)\quad Q = Q(St, Tch, SES, Pop),$$

where Q is the amount of education produced per student enrolled in the public schools.[6] All other inputs have been deflated by population. Thus St is the size of the student body per capita (adjusted for standard hours of attendance), and Tch represents teacher hours of input per capita. SES is a measure of the socio-economic background of students. The size of population, Pop, is a scaling factor. $\frac{\partial Q}{\partial Tch}$ and $\frac{\partial Q}{\partial SES}$ are assumed to be positive and $\frac{\partial Q}{\partial Pop}$ may take on either sign.[7]

The total output of the school system per person in the population is given by:

$$(3\text{-}4)\quad TP = St \cdot Q.$$

From equations (4-3) and (4-4), assuming again that student body size, St, is exogenous, the marginal product of teachers is given by:

$$(3\text{-}5)\quad \partial TP/\partial Tch = \frac{\partial}{\partial Tch}[Q(St, Tch, SES, Pop)]\ St.$$

We now introduce the demand curve for education into the model. The equation for the demand price for education is:

$$(3\text{-}\ \ ) \quad = P(TP, St, INC, Y, Z).^{8}$$

Equivalently, we have:

$$(3\text{-}6a)\quad P = P^{*}(Q, St, INC, Y, Z).$$

Thus, in addition to St, the demand price (P) is a function of educational output per student (Q), income in the community (INC), a vector (Y) which represents other sources of funds for the public sector, such as non-residential property assessments and state and federal aid, and other factors (Z) such as demographically and geographically determined needs for non-educational services and tastes. Here again, all arguments of the demand curve are specified to be on a per capita basis. The expectation is that $\partial P/\partial Q$ is negative, and, unless having a large number of parents in the voting population is extremely important in determining educational expenditures, $\partial P/\partial St$ is also probably negative. $\frac{\partial P}{\partial INC}$ and $\partial P/\partial Y$ are expected to be positive and $\partial P/\partial Z$ may take on either sign. In this model, consumer surplus is maximized when the demand price for teachers, in this case the value of the marginal product of teachers, is set equal to the supply price of teachers.[9] That is, it is maximized where

$$(3\text{-}7)\quad \frac{\partial TP}{\partial Tch} \cdot P = W.$$

If we substitute for P from equation (3-6a) and for TP and TP/ Tch from equations (3-3) and (3-5), we have a school board's demand curve for labor:

$$(3\text{-}8)\quad W = \frac{\partial}{\partial Tch}[Q(St, Tch, SES, Pop)] \cdot St \cdot P(Q[St, Tch, SES, Pop], St, INC, Y, Z).$$

The aggregate demand curve for teachers in each market could be derived if two further pieces of information were available. First, there are the specific functional forms for the educational production function and for the demand curve which have been used to derive the demand for teachers [as in equation (3-8)]. Once these were known, we could solve explicitly for the demand curve for each school board. The other information necessary is the distribution of each of the exogenous factors among school districts in a given market area. If the functional forms and distribution of exogenous variables were relatively similar for the school districts, the market demand curve might well be of the same form as equation (3-8).

II

While many of those who have analyzed wage determination for public employe treat the supply curve of labor as if it were perfectly elastic,[10] a plausible argument can be made that the supply curve may be positively sloped. This will be the case, for example, if the relative preference for teaching differs among people, and the supply price varies inversely with these preferences. Even here, however, while the supply curve of teachers to a market may be upward sloping, the supply curve to a school board located within a market may still be highly elastic, perhaps even perfectly elastic. The smaller the fraction of teachers in the market that are hired by a given school board, the more elastic the supply curve of teachers to the school board will be.

Our purpose in this section is to construct a framework for analyzing wage determination in a market where there are many school boards, and where the supply curve of teachers is upward sloping. Before proceeding, however, it is useful to discuss briefly some problems related to the scope of a labor market for teachers.

It is apparent that the geographic scope of a teachers' labor market is determined by the mobility of teachers. The problem of delineating the boundaries of any particular market is complicated by the fact that there is likely to be some teacher mobility among all areas in the country. Thus, deciding on the boundaries of a market is a process that requires the use of judgement, and may be the subject of some disagreement. For our purposes, we adopt a pragmatic approach and define a teachers' market to include those areas which most often find themselves competing for the same teachers.

The question of what is the size of each of the various teachers' labor markets is thus an empirical one—a question which, given the lack of any systematic study to date, has yet to be answered. This issue has been the source of some discussion between Baird and Landon, on the one hand, and Kasper, on the other—a debate which has as yet reached no resolution.[11] In our theoretical discussion, we nevertheless proceed as if all markets are clearly delineated. Our empirical estimates, however, are conducted under alternative assumptions as to the appropriate geographic scope for a teachers' labor market. In that way our findings will provide some indication of the sensitivity of estimates of the wage equation for teachers to assumptions about the scope of the labor market.

Let us now consider the case where there is a large number of school boards in a given teachers' market, so that each board faces a horizontal supply curve of teachers even though, for the market as a whole, the supply curve of teachers is positively sloped. Here the demand curves of each of the separate boards is of the same form as the one in equation (3-8) above. The overall market demand curve can then be obtained simply by aggregating the demand curves of the individual school boards.

III

The analysis of wage determination in a circumstance where a single buyer of teachers' services faces an upward sloping supply curve may be somewhat more complicated than is the analysis for the competitive case. This will be so if the school board in fact recognizes that the number of teachers it hires has an effect on the wage rate that it pays, and if it acts accordingly, i.e., if the school board justifiably behaves as though it were a monopsonist in this particular market. Contrastingly, if the board does not recognize that there is a positive slope to the supply curve of teachers, or if it does not perceive the importance of this with respect to salary policy and ac accordingly, teachers' salaries will be determined, as in Figure 3-2, by the intersection of the conventional demand and supply curves for teachers.

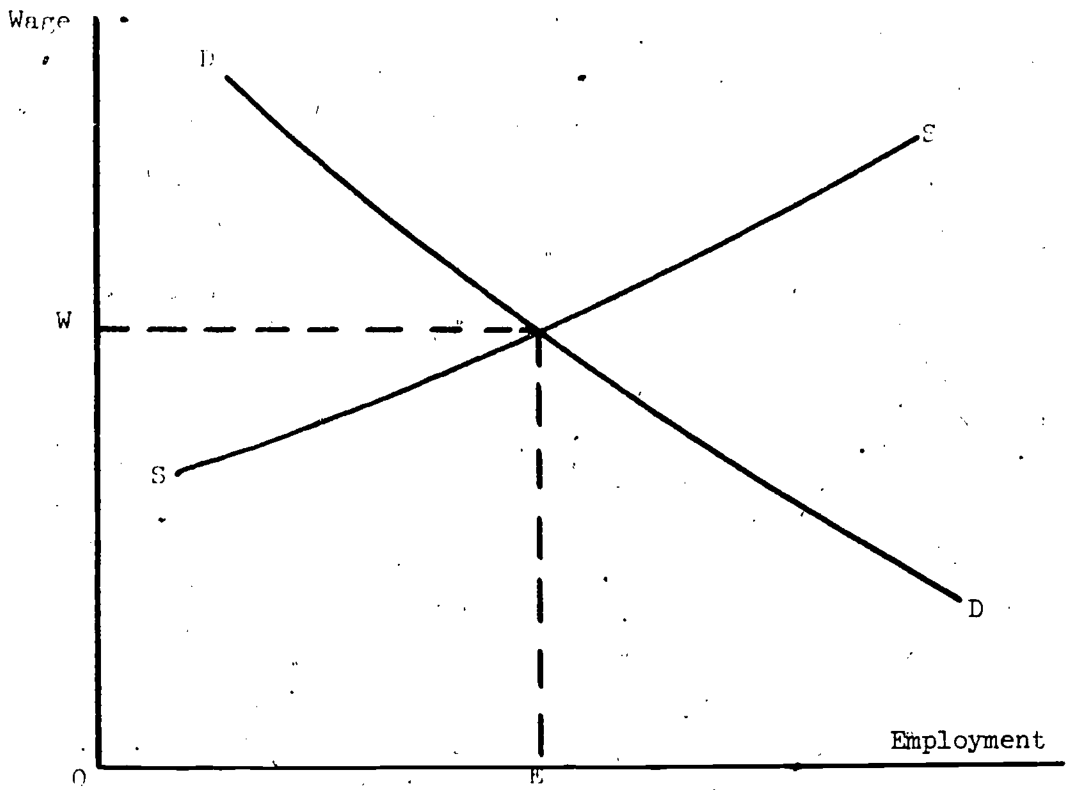


Figure 3-2

Let us assume that the school board recognizes that it is in a monopsony position. From the board's point of view, this implies that the marginal cost of hiring more teachers exceeds the going wage rate. For one thing, if new teachers are to be successfully recruited, each one must be paid a higher wage than the last teacher hired. For another, given the nature of the single salary schedule and the major difficulty involved in pushing a new teacher ahead of others who have been teaching in the system for some time and who are equally qualified in other ways, paying a higher wage rate to a new teacher will generally require corresponding raises for all those who are currently on the teaching staff. The bonus that has to be paid to all teachers on staff as hiring is expanded would raise the marginal cost of education considerably above what it would be if the school board faced an elastic supply curve of teachers. Thus, recognition of the significance of its monopsony position may have a strong dampening effect on hiring by a school board.[12]

To be more specific, given the supply curve of teachers

$$(3\text{-}9)\quad W = S(Tch, N, OC),$$

where the slope, $\frac{\partial S}{\partial Tch}$, is generally positive, the school board will hire teachers until the value of additional teachers' services is set equal to the extra cost of additional teachers. That is, the board will hire teachers until

$$(3\text{-}10)\quad St \cdot P \cdot \frac{\partial Q}{\partial Tch} = W + Tch \cdot \frac{\partial S}{\partial Tch}.$$ [13]

The term on the left hand side of the equation is the value of the marginal product of teachers. The meaning of this term was discussed in connection with the explanation of equation (3-7) above. It will be seen that on the right hand side of equation (3-10), in addition to the wage rate (W), there is a term: $Tch \cdot \partial S/\partial Tch$. This term measures the extra cost of paying a bonus to previously hired teachers as hiring is expanded. Rearranging equation (3-10), we have an equation for the demand curve for teachers by a school board which is a monoposonist:

$$(3\text{-}11)\quad W = St \cdot P \cdot \frac{\partial Q}{\partial Tch} - Tch\ \frac{\partial S}{\partial Tch}.$$

The supply curve for teachers, in accordance with the formulation given in equation (3-9), is drawn as SS in Figure 3-3. The demand curve for teachers which would obtain in a situation where there is no monopsony power on the part of the school board--as in equation (3-7) and (3-8)--is represented by DD in Figure 3-3.

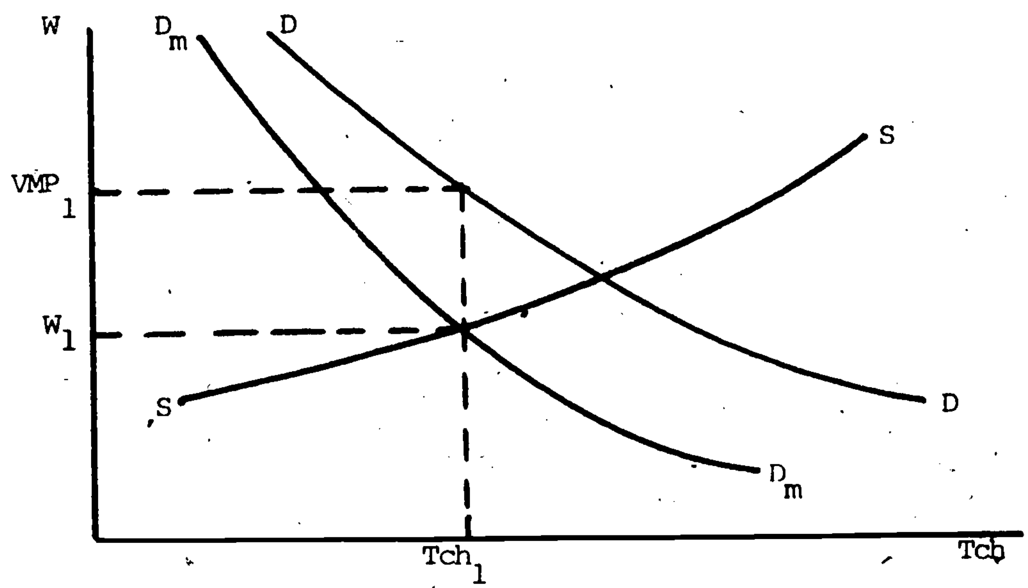


Figure 3-3

In contrast, Dm Dm depicts the demand curve for a school board which is in a monopsony position and faces the supply curve SS. As noted before, the vertical distance between DD and Dm Dm is equal to the term $Tch \cdot \frac{\partial W}{\partial Tch}$ in equation (3-11). Note that as drawn in Figure 3-3, $Tch \cdot \frac{\partial W}{\partial Tch}$ is greater in value the larger the number of teachers hired. There are two reasons for this: First, the slope of the supply curve, as drawn in that figure, increases directly with the number of teachers hired. Second, the overall cost of the "bonus" that must be paid as hiring is expanded is greater the more teachers there are already on staff. In equilibrium, the monopsony board will hire Tch_1 teachers at a wage of W_1. As indicated previously, the value of the marginal product produced by these teachers, VMP_1, exceeds the wage rate.

Up to now, we have avoided any discussion of specific functional forms for the various supply and demand curves, and have also postponed any discussion of problems of estimation. However, it is appropriate at this point to discuss the problem of identification, which is most clearly analyzed in the context of the microeconomic framework developed in this chapter.

Empirical analysis of supply and demand in a situation where there is competition in the teachers' labor market involves a straightforward extension of our discussion. Shifts in the exogenous variables in the labor supply curve, the exogenous variables in the demand curve held constant, trace out points that lie along the demand curve. The supply curve may be similarly identified.

The problem of identification becomes more complicated where monopsony power is exercized on the part of the school board. While the identification of supply in a market that is characterized by monopsony is straightforward, there will not be, in general, a stable demand curve for teachers which can be identified in the conventional way. The reason is that the slope of the supply curve appears--as in equation (3-11)--as a term in the demand curve. Thus, if the supply curve is not linear (as in Figure 3-3) and its slope is a function of the levels of the exogenous variables, then as the supply curve shifts with changes in these exogenous variables, corresponding shifts in the demand curve will occur. For example, if the supply equation is of the form:

$$\log W = a + b\ Tch,$$

or

$$\log W = \log a + b \log Tch,$$

where "a" is a constant that incorporates the opportunity cost to teachers and relative non-pecuniary returns, then at any level of Tch, a positive increment to "a" leads to a steeper supply curve.[14] Consequently, as the supply curve shifts up with increments to "a", the demand curve shifts down. The equilibrium solutions that correspond to the alternative supply curves SS, S'S', and S"S", where these curves are drawn to reflect increasing values for the exogenous variables, are illustrated in Figure 3-4. It can be observed that for the case drawn,

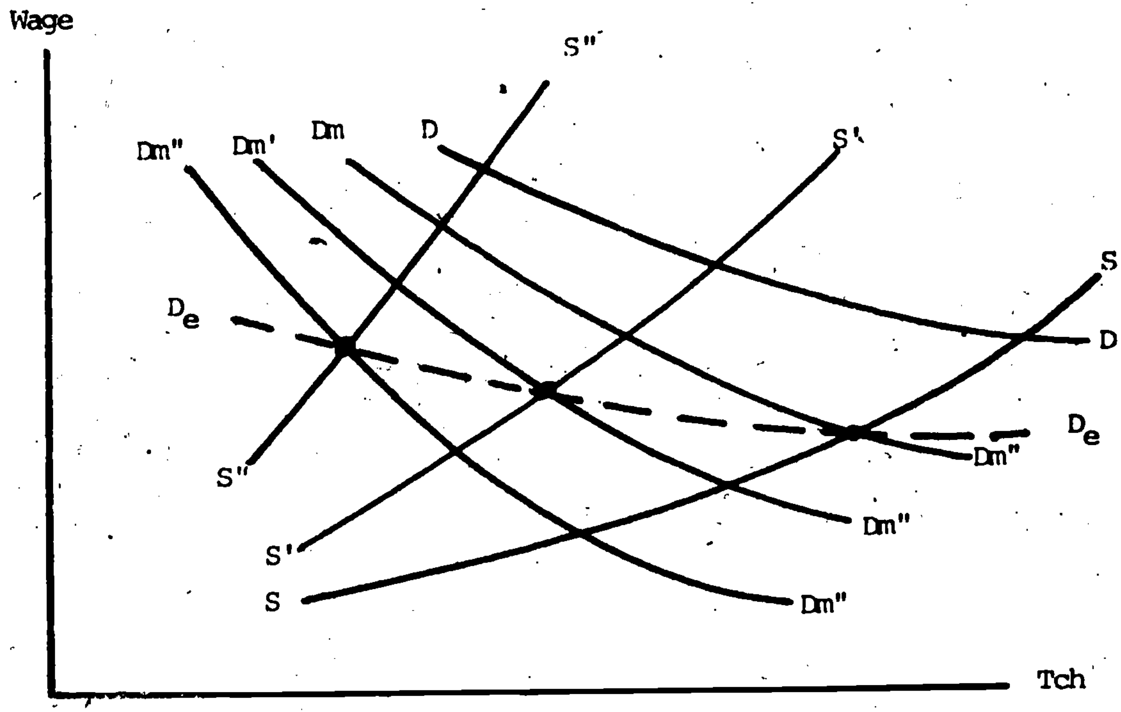


Figure 3-4

the equilibrium points lie along a line, D_eD_e, that is much flatter than is any one of the monopsonist's demand curves, DmDm, Dm'Dm', and Dm"Dm". Thus, if, as assumed, the relevant slopes of the supply curves become steeper as these curves shift up, the slope of the estimated demand curve will understate the true slope. The estimate of the slope of the demand curve will only be on the mark if the shifts in the supply curve are parallel. Finally, if what we believe to be the least likely possibility obtains--that is, if a situation pertains in which positive shifts in supply are accompanied by decreases in the relevant slope of the supply curve--the demand curve will be estimated so as to have a steeper slope than it actually does.

IV

We next deal with a case where there is more than one school board in a market, but where the number of them is sufficiently small so that each perceives that the supply curve of labor is positively sloped. In these circumstances of oligopsony, school boards may do a number of things. First of all, if each board recognizes the nature of the interdependence between its hiring policy and the hiring policies of the other school boards, all of the school boards may attempt to collude in one way or another. If each school district has a similar constituency, then, as the collusion becomes more perfect, the school boards together may behave as if there were only a single purchaser of teachers' services in the market. Here, then, the demand curve for teachers would approach the one that applies for analyzing the monopsony case.

A second possible mode of behavior for the school boards consists of a number of strategic interactions which would result if each board takes into account the effect that its hiring policy has on the other boards, as well as the effects that the eventual reactions by the other boards have on the market wage rate. Here, the exact outcome depends upon the precise nature of the behavior pattern assumed for rival school boards. As the literature on oligopoly behavior attests, there is a wide range of possible outcomes.[15]

A detailed analysis of these possibilities would take us far afield. It is useful to note, however, that for the most likely modes of behavior the demand curve for the market will probably lie between the demand curve that would be observed if there were pure monopsony in the market and the one that would be observed if there were a very large number of school boards acting independently. That is, the demand curves DD and DmDm in Figure 3-3 will probably bracket the market demand curves that are generated as a result of monopsony power and some interdependence of hiring policies among the school boards located in a given market.

A third oligopsonistic possibility is that of independent behavior. Here, each school board recognizes that as it expands its hiring, the wage rate is bid up. However, no board concerns itself with the effects of its own hiring policy on the labor market conditions faced by other boards.

An example will bring out the implications of this kind of behavior for the market demand for teachers. Assume that there are identical school districts within a given market, and that we are dealing with a decision to hire one more teacher for the entire market, or 1/n teacher for each school district, where "n" is the number of independently acting boards within the oligopsonistic market. From footnote 13 it is clear that if there were only one school board in the market the extra cost of hiring an additional teacher $\frac{dTC}{dTch}$ is given by:

$$(3\text{-}12)\quad \left(\frac{dTC}{dTch}\right) = W + \frac{\partial S}{\partial Tch} \cdot Tch,$$

where, as before, W is the wage rate, Tch is the number of teachers (per capita) employed in the market, and $\frac{\partial S}{\partial Tch}$ is the rate at which the wage rate increases as hiring is expanded. With n school boards in the market, the perceived cost to each of hiring 1/n additional teachers is:

$$(3\text{-}13)\quad \left[\frac{dTC}{dTch}\right]_i = \frac{W}{n} + \phi\, \frac{\partial S}{\partial Tch} \cdot \frac{1}{n} \cdot \frac{Tch}{n}\,.$$

W/n reflects the basic wage cost to each district of hiring an additional 1/n teacher. The other terms in equation (4-13) represent the perceived bonus that must be paid to all teachers already on the payroll. In this example, the term $\frac{\partial S}{\partial Tch} \cdot \frac{1}{n}$ indicates that as a single school board expands its hiring by 1/n teacher, the effect is to drive up the wage rate by 1/n times as much as if one full additional teacher is hired.

We recognize the fact that each board may not perceive the full effect that its expanded hiring will have on the market wage rate, and thus on its own cost of teachers. In particular, if school boards hire new teachers by bidding them away from other school districts, and the wage necessary to encourage someone to relocate between school districts is less than $\partial S/\partial Tch$, then, while this term represents the ultimate effect of expanded hiring by one school board of the market wage rate, the perceived effect by the board doing the hiring may be considerably less than $\partial S/\partial Tch$. Therefore, we have included the term, ϕ, which ranges between zero and one, to represent the fraction of the effect that a school board actually has on the market wage rate that it perceives itself to have. It seems reasonable that in practice ϕ is inversely related to n.

The final term in equation (3-13), Tch/n, indicates that as each board expands its hiring, it must pay the increment in wages to 1/n times as many teachers as there are in the market. No board considers the effect that its expanded hiring has on the wage bill that is paid by other school boards in the market. Thus, from the point of view of each of the isolated school boards, the cost of the bonus that must be paid to those already on staff is, at most, 1/n times the cost of the bonus that would be perceived for an identical expansion in hiring if there were a monopsony in the market. Summing across all boards in the market, we obtain an expression for the perceived cost of hiring one additional teacher to be shared equally by all school districts in the market:

$$(3\text{-}14) \quad \Sigma \left[\frac{dTC}{dTch}\right] = W + \phi \quad \frac{\partial S}{\partial Tch} \cdot \frac{Tch}{n} .$$

Here, i is the ith of the n school districts.

It will be remembered that the effective demand curve for teachers in a market where there is monopsony power (DmDm) can be obtained, as in Figure 3-3, by subtracting the bonus from the demand curve that would obtain if there were no monopsony power in the market (DD). It is apparent that for a given supply curve of teachers, if there is independent behavior by school boards, the greater the number of school boards in a market, the closer the market demand curve for teachers will be to DD.[16] Thus, combining equation (3-14) with the value marginal product conditions given in footnote 13 above, we have the following formulation for the demand curve for teachers:

$$(3\text{-}15) \quad W = ST \cdot P \cdot \frac{\partial Q}{\partial Tch} - \phi \cdot \frac{\partial S}{\partial Tch} \cdot \frac{Tch}{n} \cdot$$

Here, the first set of terms on the right hand side of the equation again represents the marginal product of teachers, and the second set of terms represents the reduction in demand that results from the effects of perceived monopsony power, weighted inversely by the number of school boards in the given teachers' market. Notice that as n approaches 1 (with θ = 1), we obtain the demand equation for a monopsony market structure (i.e., equation [3-11]). As n approaches infinity, we have the equation for market demand where there is competition in the labor market (equation [3-7]). In general, where there is independent behavior by school boards—where market interdependence is not recognized—the market demand curve for teachers will be between DD and DmDm in Figure 4-3. Thus, as seems reasonable, other things the same, the demand curve for a market where there is some monopsony power and independent behavior will be bracketed by the demand curves that obtain where in hiring there is a single monopsonist, on the one hand, and where there is competition, on the other.

V

The next step in shaping the analytical framework is to drop another of the simplifying assumptions that has constrained our analysis up to this point. Specifically, we no longer assume that all teachers are homogeneous. Instead, we explicitly incorporate into our analysis a number of measures of the kind of preparation that teachers have had, and of the teachers' ability to teach. The presumption is that these measures will bear a relationship to the outcome of the learning process. The dimensions of teacher quality include the following: the experience of the teacher, the amount of formal training the teacher has received, whether or not the formal training is in the field in which the teacher in fact teaches, the teachers' ability to communicate verbally, and the teachers' dedication to the job.

One way of introducing these dimensions of "teacher quality" into our analysis is to include them as separate arguments in the educational production function. Frey has taken this course in analyzing teacher salary determination for those special circumstances where the supply of each dimension of labor quality is perfectly elastic.[17] The crucial assumption which underlies this type of approach is that the public and the school board behave as if they are maximizing the amount of student learning given the constraints of the educational production function and the overall budget for the community. In turn, maximization implies that the number of teachers hired and the quality characteristics of these teachers are such that the marginal dollars spent on each type of educational input result in the same size increments to student learning, and that the value to the community of each such increment is set equal to the marginal cost of education.

There is little evidence that the differences in the teacher-student ratios that are observed across school districts are in fact associated with differences in learning.[18] Nevertheless, a hypothesis that demand for teachers is determined as if the public and school boards are attempting to maximize the value of education to the community, where education is produced by teachers and student time and demand for educational inputs is constrained by community income, is a reasonable starting point for analyzing the sources of demand for teachers. The intuitive feeling that class size must have an impact on student learning is deeply ingrained in public attitudes. Thus, it would seem to be a safe bet that even when confronted with evidence that class size has little discernible relationship to learning, the so-called man on the street or, indeed, the educational economist would not vote to save taxes by raising average class size substantially. Without massive new evidence to the contrary, the intuitive feeling that class size somehow must make a difference may frequently be expected to lead voters to behave as if more learning per student is produced in smaller classes than in larger ones.[19]

While the general public may also express a desire for high quality teachers, the demand for particular quality related teachers' characteristics is not likely to be as strong as the demand that is generated in favor of small classes. This is so for a number of important reasons.

First, there is no evidence that demonstrates a consistent link between some easily discernible teacher characteristic that is an indicator of teacher quality and educational output.[20]

Second, changes in teacher quality are not nearly as visible to the public and to school boards as are changes in teacher-student ratios. And similarly, the importance of these teacher characteristics to the learning process is not as clearly perceived as is the so-called importance of class size as a determinant of learning. Consequently, the fact, for example, that many mathematics courses in a particular school are being taught by people trained in social studies is unlikely to generate the kind of political repercussions that may result from overcrowded classrooms and split sessions.[21]

Third, the school board does not have control of the kind of instruments that would allow it to trade off the various dimensions of teacher quality against one another on the margin. For example, we have argued above that because the labor relations implications would be highly unfavorable, the school board, in the long run, cannot hope to exercise significant control over the average experience level of faculty members. Another factor which inhibits efficient control of teacher quality is the single salary schedule. The existence of this schedule prevents school districts from hiring to teach in each field only those who were trained in the field without paying a large premium to those in a discipline where there is a surplus of teachers.[22] Thus, in many cases, even if the school boards were willing to trade off among types of teacher quality, and to trade off between teacher quality and quantity, the policy tools which would permit an efficient trade-off are, for what are essentially institutional reasons, absent.[23]

Our skeptical view about the reasonableness of a model which postulates that school districts trade-off between educational quality and quantity is supported by the two pieces of direct evidence that have been derived from the Coleman data.[24] Drawing from a study of the Coleman data by Hanusek, Levin combined Hanusek's estimates of the marginal productivity of the two teacher characteristics that had a consistent relationship to student learning--teacher verbal score and teacher experience--with estimates of the costs of these characteristics. For Black students, the marginal product of a dollar spent on teachers' verbal ability was approximately five times that of the marginal product of a dollar spent on teachers' experience. For white students, the ratio was ten to one.[25] If the school districts were in fact maximizing output with respect to these dimensions of teacher quality, the marginal products per dollar spent on each type of teacher quality would have been the same.

The other piece of evidence which seems to indicate that school boards do not trade off among the various dimensions of labor quality and quantity so as to maximize output is contained in an article by Owen.[26] The dimension of educational quality dealt with in this article is teacher verbal ability--the dimension that Levin found to have the highest marginal product per dollar. Owen's estimates indicate that school boards do not offer higher salaries to teachers with higher verbal ability. As a result of the constraints of the single salary schedule and little direct opportunity for merit pay, we would not have expected direct price differentiation in the form of higher offers to those of higher verbal ability. But there is also no indication in Owen's results that school boards pay higher salaries to increase the quality of the pool of applicants for teaching positions. This is so even though the payment of higher wages followed by screening the excess supply of applicants for those of highest quality would seem to be a reasonable strategy for a school board that is a "maximizer" operating under the constraint of the single salary schedule to follow in order to increase the quality of teachers hired.

Owen does find that a higher wage, ceteris paribus, is associated with a higher quality faculty. But this result seems only to reflect the fact that high income communities pay higher wages and thus attract a higher quality pool of job applicants. There is no evidence here that school boards are behaving as they would if they were attempting to maximize educational output, i.e., we do not see that the higher wages reflect a conscious effort on their part to attract higher quality labor.

The obvious question suggested by the previous discussion is how does one explain the behavior of school boards? The answer to this question should shed light on the relationship of the various dimensions of teacher quality to the demand for teachers' services.

In our view, the goal of the school boards is to provide a reasonable amount of educational services (not necessarily the maximum amount possible given a budget constraint) while avoiding as many conflicts with teachers and parents as possible. Accordingly, the schedules for rewarding the formal training and experience of teachers, licensing requirements, and job requirements pertaining to other dimensions of teacher quality are set to be consistent with rules of thumb or principles that are generally accepted throughout the education profession. We do not wish to imply that a tendency for school boards to follow rules of thumb means that they will not react to market forces. This is obviously not the case. It simply means that reaction to certain market situations will not be the same as that predicted by maximizing theory.

To clarify the difference in the behavior of a school board which is a "maximizer" from that of a board that operates in accordance with rules of thumb, consider the following example: Suppose that after operating for some time under a particular salary schedule, a school board finds that a very large number of teachers in the district continues on to graduate school to earn more credits. As a result each faculty member receives a relatively high salary, which puts an unexpected strain on the budget. One obvious reaction of any school board would be to restrict new hires to those who have no advanced training. But if this option is not available--perhaps because the faculty is turning over slowly and there are no new openings--then the two types of school boards may be expected to react quite differently.

A school board which behaves as a "maximizer" is likely to follow a policy that calls for it to lower somewhat the premium paid for post-graduate education, still allowing perhaps for more formal education than was planned for when drawing up the original salary schedule. The increase in formal education allowed would reflect the effects of a greater relative preference for formal education on the part of faculty and thus a lower relative supply price for formal education than was at first thought to exist.

In contrast, a "satisficing" school board, which follows rules of thumb and thus operates in accordance with a widely accepted salary schedule, might react in a number of other ways. One possibility is for it to hold down salary increases over time so as to lower, relatively, average salaries across the board. Such a policy would, of course, have deleterious effects on other dimensions of teacher quality. Another possibility is for the school board to compensate for the higher than expected earnings for teachers by allowing class size to increase. A third possibility is for the school board to appeal to voters for an expanded budget to compensate for the higher level of teacher salaries.

Whatever the precise nature of this adjustment, once it is completed in each school system one would probably observe a higher level of formal training for teachers than was expected when the board originally planned the school budget. However, assuming that both types of school boards start from the same initial position, the ultimate mix that one observes among the various dimensions of teacher quality--and the relationship of quality to quantity--will probably be quite different for the two school districts. And, of course, the salary schedules will also be different.

The evidence that we have reviewed previously is not consistent with the maximization hypothesis. As an alternative, we have suggested that school boards behave as if they operate in accordance with broad rules of thumb and within generally accepted equitable guidelines--

what is commonly termed "satisficing" behavior. We find the alternate theory to be most appealing on a priori grounds. It postulates the kind of policy decisions that, in our view, are most likely to emerge in a market situation like that in public education where there is virtually a complete lack of competition, only a sketchy idea of how output is measured and produced--except perhaps for the strong conviction that smaller classes lead to more learning--and where political interrelationships appear to play a role at least as important as many of the market variables.

If we are correct and the only attempt at maximization by school boards involves manipulation of the teacher-student ratio, then the modifications of the supply and demand curves developed thus far in this chapter so that they reflect teacher quality effects are simple and straightforward. Consider first the supply side. Let Qual represent a vector of teacher attributes such as education, experience, and verbal ability. To allow for the quality effects on the supply price of labor, Qual should be included among the exogenous factors influencing labor supply. The expectation is that the quality dimensions are positively related to opportunity cost. Therefore, in the long run, where an individual is free to choose the level of training, higher values for the Qual variables will be associated with an upward shift in the supply curve.

Similarly, on the demand side some of the Qual variables may appear as exogenous factors in the demand curve. To expand somewhat on our previous example, if at a particular time the teachers in a school district have garnered unexpectedly high levels of experience, or have surprised the board by obtaining considerably more formal training than was at first expected, compensation in accordance with a standard salary schedule will mean that, if no budgetary adjustments are made, fewer teachers will be hired than was anticipated. In simple terms, a shift of the supply curve will cause a movement along the demand curve. However, if the teachers and school boards can then effectively advertise to sell voters on the need for smaller classes--perhaps pointing to the higher quality of teachers and higher salaries as the source of the problem--voters may then be persuaded to increase educational taxes, shifting demand out to the right. If the budget is often changed in response to exogenous shifts in teacher quality, then the relevant Qual variables should be included as exogenous factors in the demand curve for teachers.

VI

The analysis of union impact on teachers' salaries and education costs involves a number of complicated issues. First, previous studies of union behavior indicate that the impact of the union on wages will depend upon the goals of the union.[27] In some areas these goals may encompass only issues pertaining to wages; in other areas, job conditions may be a major focus of union concern.[28] Second, the union impact may be strongly influenced by the nature of the political organization that is responsible for setting salaries. Wellington and Winter have discussed in detail many of the possible organizational structures for financing education and the implications of these for union wage setting ability.[29] A third factor which is of importance in influencing the ultimate impact of a union on teacher salaries is the "price" elasticity of demand.[30] The more inelastic is demand, the less serious is the employment effect of union induced wage increases, and thus the more sizeable is the union impact on the wage bargain.

The fourth factor which may influence the size of union impact on wages is the degree of organization of the union. The effect of teachers' union organization on wages has been measured in a variety of ways in a growing number of studies.[31] The data utilized in these studies include cross-section data for large cities and for areas within a state, cross-state data, and cross-sectional time series data. Taken together these studies seem to indicate that the union impact on teachers' salaries is considerably less than are unions' effect on earnings in other sectors.[32]

One thing that should be considered in evaluating these studies is the age of teachers' unions. These unions began to emerge only in the middle 1960's. Thus, even if over the past few years they have exerted considerable influence on the size of salary increases for teachers, this does not mean that the union impact on the level of teachers' salaries is as yet large enough to be easily observed in cross-section studies.

A complete analysis of the impact of teachers' unions would consider the interactions of the various factors which affect union strength with the degree of union organization. However, such a comprehensive analysis would seem to be more than is necessary to answer one of the major questions that concern us in this study: what are the sources of factor cost differentials in education? For our purpose, it is adequate to deal with unions by including their influence as a factor in the reduced form version of the wage equation which is presented in the empirical chapter below.

VII

The teacher generally plays an important and a widely respected role in the community. In addition, teaching is, for many people, an attractive and a challenging profession. In some places, given a strong attraction of a teaching career to a reasonable fraction of the labor force, the market clearing wage for teachers may be quite low. However, the payment of too low a wage to teachers is likely to be difficult to reconcile with the importance of the role played by teachers. In those areas where the forces of supply and demand would ordinarily lead to a low level of teachers' salaries, there may be some social pressure to adjust that wage upward. In other words, the hypothesis set forth here is that in many communities there is a standard for a "fair teachers' salary". Such a standard may be geared to median community income, perhaps adjusted for the relative number of weeks worked; or the standard may reflect some community-wide concept of what it costs to "properly" bring up a family. In addition, the standard would probably be influenced by whether teachers are stereotyped in the community as prime wage earners or secondary workers.[33]

The "fair teachers' salary" standard may affect the wage rate for teachers in a community in a number of ways. One relatively simple possibility is illustrated in Figure 3-5. In that figure, the demand curve which would obtain in the absence of a community standard is represented by D_1D_2. The supply curve is given by S_1S_2.

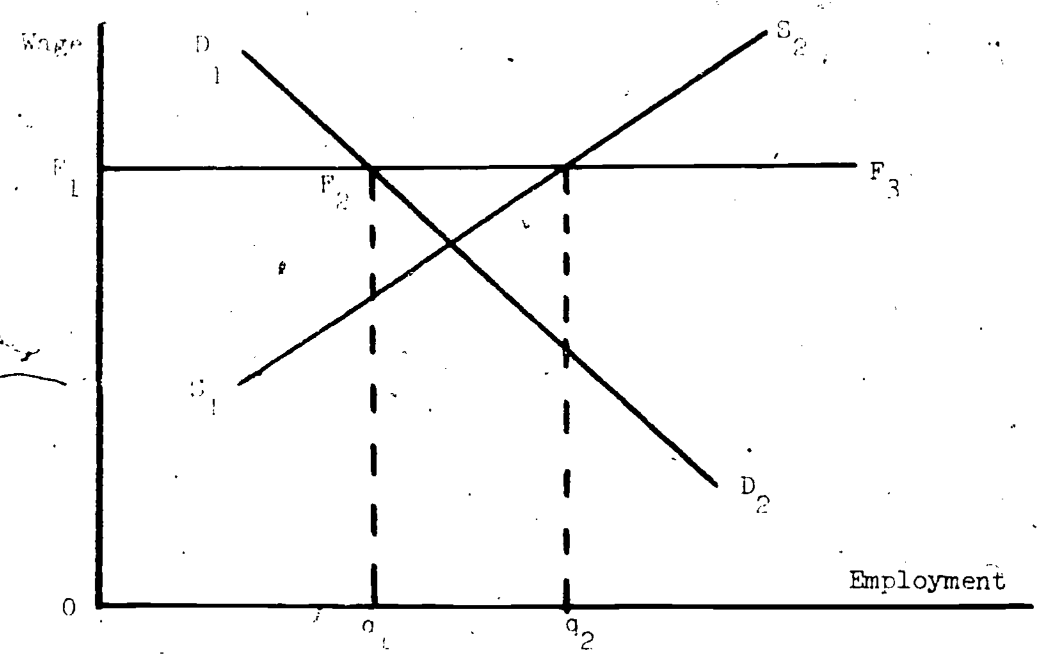


Figure 3-5

The community-determined "fair teachers' salary" is represented by F_1F_3. In this simple case, the effective demand curve for determining the wage rate is given by $D_1F_2F_3$. If, as in the diagram, S_1S_2 and D_1D_2 intersect at a wage below the standard wage, OF_1, then OF_1 is the wage rate paid. On the other hand, if D_1D_2 and S_1S_2 intersect at a wage at or above OF_1, the wage rate and employment are such that the marginal factor cost and marginal value product of teachers' services are equated.

Another possibility is that the eventual demand price for teachers at any quantity of teachers hired is a compromise between the marginal value product of teachers' services and the community standard for a fair wage. In notational form, we have:

$$(3\text{-}16) \quad W = F(\bar{W}, W_d),$$

where W_d is the demand price for labor, e.g., as derived above in equations (3-7) and (3-8), $\bar{W}$ is the community's concept of a "fair salary" and W is the demand price for teachers adjusted for productivity and community standards of fairness.[34]

In those cases where the wage rate paid is the "fair teachers' wage", there is the additional problem of deciding what is the appropriate level of employment. One possibility is that although the community will not pay teachers a wage rate below the "fair" standard, they hire teachers only to the point where the marginal value product of teachers' services equals the standard wage. For the example, in Figure 3-5 the implied level of employment would be Oq_1. In this circumstance, there is an excess supply of teachers equal to q_1q_2. Another possibility is that Oq_2 teachers are hired. While in this case the wage rate exceeds the value of the marginal product, there is no teacher unemployment in the community.

There are a number of implications of the existence of a "fair teachers' salary" for the supply and demand for teachers. Consider for example, a situation such as that pictured in Figure 3-5. In that case, small shifts in supply have no effect on the wage rate and may or may not have an effect on teacher employment. If employment is determined where the "fair wage" is set equal to the value of the marginal product, then modest shifts in supply will not affect employment. If employment is chosen to be at some other level, say Oq_2, shifts in supply may then be reflected in differing employment levels. Similarly, in Figure 3-5 it can be seen that although small changes in the productivity of teachers may affect the position of D_1D_2, they may have no effect on teachers' salaries. Analogous to what was said above, such shifts in demand may or may not have an impact on the employment level of teachers.

Further complications in the analysis follow from the realization that the attainment of the "fair teachers' salary" is only one of the goals facing the community. A detailed consideration of the alternatives would take us far afield, but one thing should be made clear. Trade-offs between the goal of a "fair teachers' salary" and the other educational and non-educational goals of the public sector may at times have unusual implications for the demand curve for teachers. For example, in areas where there are a large number of students enrolled in public schools, so that expenditures on education constitute a relatively large fraction of the local public sector budget, there may be some tendency to forego a portion of the utility gained in paying a "fair teachers' salary" in order to keep the education budget at what is viewed as a reasonable level.[35] This raises the possibility that larger enrollments in public schools may lead to lower, rather than to higher, teachers' salaries. Such a relationship would not be inhibited by constraints on the supply side as long as the "fair teachers' salary" exceeded the reservation price of teachers.

VIII

We have explored several alternative models of wage and employment determination in the labor market for teachers. These models range from a relatively straightforward supply and demand framework to others which incorporate the effects of market power and teacher quality, and finally the influence of community preferences for a "fair teachers' salary".

The theoretical analysis itself has, in a number of instances, pointed to serious problems that will be encountered in estimating the structural equations of some of the alternative models. Two such problems are associated with those versions of the analysis that presume that school boards are in a position to exercise market power. One is that the demand curve which is relevant to this analysis (e.g., equation (3-11)) is composed of a series of multiplicative and additive elements. As a result, estimation requires the use of some sort of an algebraic approximation to the true demand curve or the use of nonlinear estimating techniques. Another problem is that where there is market power on the part of the school board, the demand curve itself is not identified. What might at first appear to be the demand curve is likely to be, but will not necessarily be, flatter than the true demand curve. More serious than these problems are the very complicated ones that arise in analyzing wage determination in a circumstance where the public has a desire to see that the compensation of teachers is in accordance with the teachers' standing in the community. In this circumstance, observations of teachers' salary and employment may not be along either the conventional supply or demand curves. In addition, changes in factors exogenous to the supply and demand curves may, at times, have an effect on teachers' salaries and employment. At other times, differences in these exogenous factors may have no visible impact on salaries and employment.

It should be apparent that without relatively precise information on the way in which the standard for a "fair teachers' salary" is determined, it will be very difficult to obtain reliable estimates of the structural equations of a model in which the "fair teachers' salary" standard plays an important role. Moreover, as the results of our empirical analysis indicate, there is reason to believe that the "fair teachers' salary" concept does, in fact, play a role in influencing teachers' salaries.

The implication of the above is that it will be difficult to obtain accurate empirical estimates of the structural equations of the various models that have been developed in this chapter. The problems that have been raised with respect to estimating the structural equations of these models do not, however, seem to be quite as serious when it comes to estimating the reduced form wage equations implied by the models. An important reason for this is that reduced form estimates are less sensitive to the kind of specification error in which a variable is placed in the wrong structural equation, or in which it is included in too many or too few of the structural equations. Such errors are quite likely to occur in a model which includes an equation for the "fair teachers' salary" standard. For while we know that this standard may be influenced by variables that appear both in the supply and in the demand curves, we do not know precisely which variables are involved. Accordingly, we have decided to confine the empirical analysis, which is presented in the next chapter, to the estimation and manipulation of the reduced form wage equations that are suggested by the models that have been developed here.

FOOTNOTES FOR CHAPTER 4

[1]For a well-known exposition of the long-run model of occupational choice, see M. Friedman, Price Theory, revised edition, Chicago 1962, Ch. 11.

[2]For further discussion see A.L. Gustman, "On Estimating the Rate of Return to Education" Applied Economics, June 1973, pp. 89-99. For another measure of supply price of labor for entry into a labor market see, G.E. Johnson, "The Demand for Labor by Educational Category," Southern Economic Journal, 37, October 1970, pp. 190-204.

[3]A widely used measure of earnings which relates to earnings over a lifetime is the rate of return. See, for example, G.S. Becker and B.R. Chiswick "Education and the Distribution of Earnings", American Economic Review, 56, May 1966, pp. 358-69. Carol and Parry have measured the value of earnings discounted at various rates of interest, for over sixty occupations. These calculations were meant by the authors to suggest guidelines for rational occupational choice. A. Carol and S. Parry, "The Economic Rationale of Occupational Choice," Industrial and Labor Relations Review, 21, January 1968, pp. 183-196.

[4]For a discussion of teachers' salary schedules, see J.A. Kershaw and R.N. McKean, Teacher Shortages and Salary Schedules, New York 1962.

[5]If parents and students are sensitive to differences in school quality, the size of the student body in the public schools in an area may vary as a result of change in the size of the teaching staff. More specifically, differences in school quality may affect the tendency to drop out and the propensity to enroll in private schools. See A.L. Gustman and G.B. Pidot, Jr. "Interactions Between Educational Spending and Enrollment," Journal of Human Resources, Winter 1973, pp. 3-23. School quality may also influence enrollments if it has an effect on the decisions of families to locate in different geographical areas, e.g., in the city or in its suburbs.

[6]This is a simplified version of the type of educational production function which has been employed in a number of recent articles on the demand for education. See, for example, W.W. McMahon, "An Economic Analysis," of the Major Determinants of Expenditures on Public Education," Review of Economics and Statistics, 52, August 1970, pp. 242-52. Also see J.C. Hambour, L. Phillips, H.L. Votey, Jr., "Optimal Community Educational Attainment: A Simultaneous Equation Approach," Review of Economics and Statistics, 55, February 1973, pp. 98-103.

[7]As in the articles cited above, for lack of available data, we ignore the capital input.

[8]The demand curve in (4-6) is specified so that the price of education depends on the average level of learning per student and the number of students. A more complicated formulation might also consider the distribution of learning [e.g., the variance of Q], with, for example, the value of additional Q depending on its distance, for a particular student, from the average value of Q for all students.

[9]Analyses of this type have been undertaken by Hambour et al., op. cit. and by D.E. Frey in his "Wage Determination in Public Schools and the Effects of Unionization," in D.S. Hamermesh, editor, Labor in the Public and Nonprofit Sectors, Princeton University Press, forthcoming. The general assumption is that the goal of the school board is to maximize the surplus value of education over cost, i.e, the net value of education (NV), subject to the constraint provided by the production function of equation (3-3). In accordance with Hambour et al. we note that the goal of the school board may be written as

$$\text{Max } (NV) = \int P dTp - W \cdot Tch,$$

subject to $Q = Q(St, Tch, SES, Pop)$

Substituting from (4-4) above:

$$\text{Max } (NV) = St \int P dQ - W \cdot Tch,$$

subject to $Q = Q(St, Tch, SES, Pop)$.

The solution is given by:

$$\text{Max } \theta = St \int P dQ - W \cdot Tch - \lambda\,(Q - Q\,[St, Tch, SES, Pop]).$$

Solving we have:

$$\frac{d\theta}{dQ} = St \cdot P - \lambda = 0,$$

$$\frac{d\theta}{dTch} = -W + \lambda \frac{\partial Q}{\partial Tch} = 0, \text{ and}$$

$$St \cdot P = W / \partial Q / \partial Tch.$$

Thus, for a maximum, it is necessary that

$$\frac{\partial Q}{\partial Tch} \cdot St \cdot P = W,$$

where $\frac{\partial Q}{\partial Tch} \cdot St \cdot P$ is equal to the value of the marginal product of a unit of teacher's services.

[10]With the notable exception provided by the work of Landon and Baird, those who have conducted the other studies of unions and the teacher labor market that are cited in this paper have all assumed that the supply curve of teachers is perfectly elastic. J.H. Landon and R.N. Baird, "Monopsony in the Market for Public School Teachers," American Economic Review, 61, December 1971, pp. 966-71.

[11]R.N. Baird and J.H. Landon, "Comment," Industrial and Labor Relations Review, 25, April 1972, pp. 410-416 and H. Kasper, "Reply," ibid., pp. 417-423.

[12]The discussion here is couched in too-simple terms. Boards have substantial latitude in exercising their monopsonistic position, although often this is constrained by the need to negotiate master contracts. Given the existence of salary schedules for determining payments to teachers, boards can adjust the overall level of the schedule by merely raising the first-step salary with commensurate adjustments in other steps, by increasing (or decreasing) the wage gap between salary steps, by altering this number of steps in a given salary track, by changing the number of tracks, or any combination of these. The discussion glosses over these complexities of the teachers' wage determination process.

[13] The maximization procedure that underlies equation (3-10) above is essentially the same as that contained in footnote 9, which pertains to equation (3-?). The school board, to achieve its goal of maximizing the net value of education to the community, maximizes θ where

$$\theta = St \int P(St, Q, INC, Y, Z)dQ - W \cdot Tch - \lambda\ (Q - Q[St, Tch, SES, Pop]).$$

In solving this, we have as before:

$$\frac{\partial \theta}{\partial Q} = St \cdot P - \lambda = 0.$$

However, for $\frac{\partial \theta}{\partial Tch}$, utilizing equation (3-9), we have:

$$\frac{\partial \theta}{\partial Tch} = -W - Tch \cdot \frac{\partial S}{\partial Tch} + \lambda \frac{\partial Q}{\partial Tch} = 0.$$

The difference from the result in footnote 9 reflects the non-zero value for the slope of the supply curve, $\frac{\partial S}{\partial Tch}$. Combining the equations for $\partial\theta/\partial Q$ and $\partial\theta/\partial Tch$, we obtain equation (3-10) above.

[14] The slope of the supply curve, $\frac{dW}{dTch}$, at Tch = T*, is equal to b(a + bT*) for the semi-log case, and is equal to $\frac{b}{T^*}$ (log a + b log T*) for the log-log case. In both instances, it is clear that the slope is a positive function of "a".

[15] For example, see G.L. Nordquist, "The Breakup of the Maximization Principle," reprinted in D.R. Kamerschen, editor, Readings in Microeconomics, Cleveland 1967, pp. 278-298.

[16] Landon and Baird, op. cit. use the number of school boards in the county as an inverse measure of monopsony power. They find empirically that this measure does have the expected relationship to wage rates negotiated by small and moderate size school boards. If their results are correct, they indicate that in these areas the mobility of teachers may be quite limited, and thus that the size of a market is quite small. See also Kasper, "Reply," op. cit.

In their article in the American Economic Review (op. cit.), Landon and Baird note that the monopsony effect appears to be weaker in the larger cities. They attribute this finding to the fact that all of the school districts in the large cities probably have some degree of monopsony power. For our sample of 83 large city school districts, we find that on the average, there are 31 school districts in each relevant SMSA area. Moreover, the populations in the central cities account on the average for only 40 percent of the corresponding SMSA population. This suggests the possibility of extensive competition for teachers in many of the large urban areas. If the competition in these areas is greater than elsewhere in the state, this would of course explain the Landon and Baird findings of relatively weak monopsony effects in urban areas. For further discussion of this point, see the empirical chapter below.

[17] D. Frey, op. cit.

[18] See, for example, H. Levin, "A Cost-Effectiveness Analysis of Teacher Selection," Journal of Human Resources, V (No. 1), Winter 1970, pp. 24-33, and the literature cited therein.

[19] A recent Gallup poll supports the view that the public believes that class size is an important determinant of learning. Specifically, Gallup finds that almost 80 percent of parents and non-parents alike believe that small classes make a great deal of difference to student achievement and progress. G.H. Gallup, "Fifth Annual Gallup Poll of Public Attitudes Toward Education," Phi Delta Kappan, September 1973, p. 41.

[20] In addition to Levin, op. cit., see Coleman, et al., Equality of Educational Opportunity, U.S. Office of Education, 1966, and L.J. Perl, "Family Background, Secondary School Expenditure, and Student Ability," Journal of Human Resources, VIII, No. 2, Spring 1973, pp. 156-181. A review of the relevant literature is contained in H.A. Averch, et al., "How Effective is Schooling? A Critical Review and Synthesis of Research Findings," Rand Corporation Report to the President's Commission on School Finance, December 1971.

[21] Our contention here is not that the public is unconcerned about teacher quality. There is evidence to the contrary (Gallup, op. cit., p. 39). Rather, it is that there is no reliable index of teacher quality that can be easily perceived by the public.

[22] For a discussion of this problem, see J. Kershaw and R. McKeon, op. cit. See also H.M. Levin, "Recruiting Teachers for Large City Schools," unpublished manuscript, Brookings Institution, 1968.

[23] The Chairman of a local school board indicates that the only time the board has manipulated the steps or tracks in the pay schedule, they did so by adding a track for those attaining 15 post-masters degree credits between the M.A. and M.A. plus 30 tracks. They did this to raise salaries for a fraction of the teachers (those who had between 15 and 30 post-M.A. credits) in a year when the across board increase was well below what the teachers had expected. The purpose was to quiet somewhat teacher objections to the new contract. The chairman expressed strong doubts that manipulation of relative salaries within the schedule would have any impact on teacher qualifications, or that formal qualifications beyond three years' experience have any effect on student learning.

[24] Given what are now well known problems with the Coleman data, caution is called for in applying any results derived from these data. For further discussion, see S. Bowles and H.M. Levin, "The Determinants of Scholastic Achievement, An Appraisal of Some Recent Evidence," Journal of Human Resources, 3, Winter 1968, pp. 3-25; and C. Jencks, Inequality, op. cit.

[25] H.M. Levin, op. cit., p. 32. It should be noted that Levin uses a reduced form wage equation to estimate the marginal cost of each type of quality input. For these estimates to be useful in estimating marginal cost, one would have to assume that the supply of each type of labor quality is perfectly elastic.

[26] J.D. Owen, "Toward a Public Employment Wage Theory: Econometric Evidence on Teacher Quality," Industrial and Labor Relations Review, 25, January 1972, pp. 213-222.

[27] For a general discussion, see for example A.M. Cartter, Theory of Wages and Employment, Homewood, Ill. 1959.

[28] Hall and Carroll find that unions have a significant impact on class size. Their results are quite puzzling, however. They indicate that teachers' unions raise class size proportionately more than they raise salaries. Thus the effect of teachers' unions, according to their study, is to lower the per student costs of education! W.C. Hall and N.E. Carroll, "The Effects of Teacher Organizations on Salaries and Class Size", Industrial and Labor Relations Review, January 1973, pp. 834-41.

[29] H.H. Wellington and R.V. Winter, Jr., The Unions and the Cities, Washington, D.C. 1971.

[30] For a discussion in the context of public employment in general, see R.G. Ehrenberg, "The Demand for State and Local Government Employees," American Economic Review, June 1973, pp. 366-379.

[31] These studies include H. Kasper, "The Impact of Collective Bargaining on Public School Teachers," Industrial and Labor Relations Review, 24, October 1970, pp. 57-72; R.N. Baird, and J.H. Landon, "Comment," op. cit.; H. Kasper, "Reply," op. cit.; R.J. Thornton, "The Effects of Collective Negotiations on Relative Teacher's Salaries," Quarterly Review of Economics and Business, Winter 1971, pp. 37-46; W.C. Hall and N.E. Carroll, "The Effect of Teacher Organizations on Salaries and Class size," op. cit.; R.W. Schmenner, "The Determinants of Municipal Employee Wages," Review of Economics and Statistics, 55, February 1973, pp. 83-90; D.E. Frey, "Wage Determination in Public Schools and the Effects of Unionization," op. cit.; D.E. Frey, "Wage and Employment Effects of Collective Bargaining in New Jersey," unpublished Ph.D. dissertation, Princeton 1973.

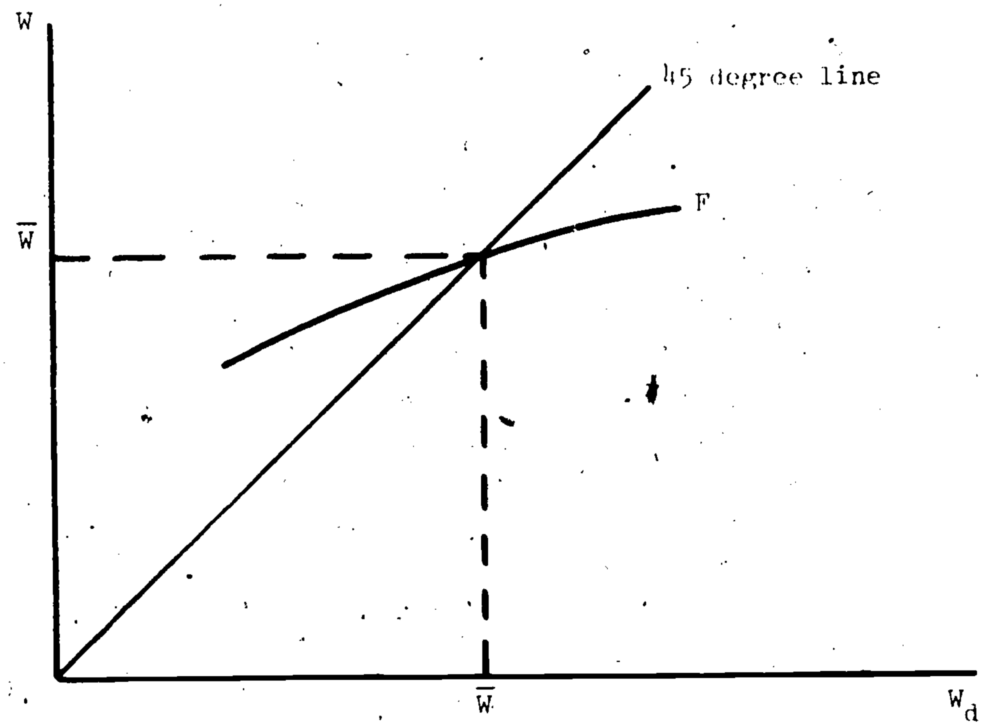
[32] In summarizing the results of recent work, Kasper states: "The Baird-Landon results on medium size cities suggest a positive effect of 4.9 percent on starting salaries from teacher representation; the Thornton results, for large cities, a 3.7 percent effect using the same variables; my work using different measures of average salaries seems to span the gap ranging from 0-4.9 percent, with greater confidence toward the lower end. All these results seem to be fairly consistent with each other and the results which Ashenfelter recently produced for firemen. As the song

puts it, 'seven and a half cents [isn't] a helluva lot,' and I do not think this is either." H. Kasper, "Reply," op. cit., p. 423.

The highest estimate of the effect of teachers' unions is contained in Schmenner. He estimates that an increase from zero to 100 percent union membership will increase teachers' wages by 12 to 14 percent (op. cit., p. 90).

[33]For a related analysis which contains the microtheoretic framework for analyzing the trade-off between the attainment of a fair distribution of income or a higher level of individual consumption, see R.H. Scott, "Avarice, Altruism, and Second Party Preferences," Quarterly Journal of Economics, 86, February 1972, pp. 1-18. It should be noted that the existence of a "fair teachers' salary" standard may cut two ways. That is, if the forces of supply and demand (exclusive of the influence of the "fair salary") would bring about a high teachers' wage, the impact of the salary standard may be to lower teachers' salaries.

[34]One possible functional relationship between W and W_d is pictured in the figure below and is labelled F. It can be seen that over the relevant range, the greater the difference between W_d and $\bar{W}$, the larger the compensating difference between W and W_d.



A specific functional form which suggests itself and underlies the diagram in this figure is

$$W = W_d\left(\frac{\bar{W}}{W_d}\right)^{\psi}.$$

The importance of the "fair wage" to the community is reflected in the size of the parameter ψ. If ψ is zero, then W is equal to W_d, and the community concept of a fair wage for teachers will have no effect on the demand price for teachers. If ψ has a value of 1, the community will always offer the "fair wage" $\bar{W}$, as its demand price.

It should be noted that F may not be symmetrically distributed around the fair wage. For example, the pressure to adjust wages to the community standard may be greater where actual earnings fall below the community standard than when they exceed it. To test for such a non-symmetric structure for F, we would need a good indication of the value of $\bar{W}$ within a community.

[35]Some support for a view that total spending on education is determined predominantly by community income and wealth and is not influenced very strongly by public school enrollments is contained in Gustman and Pidot. They find that, at least for large city school districts in 1962, spending on education increased much less than proportionately with public school enrollments. A.L. Gustman and G.B. Pidot, Jr., "Interactions Between Educational Spending and Enrollments," Journal of Human Resources, 8, Winter 1973, pp. 3-23.

Chapter 4

TEACHERS' LABOR MARKET:

Empirical Analysis

The analysis of the previous chapter suggests that reliable estimates of the structural equations that constitute the basic elements of a model of the labor market for teachers will be difficult to come by. A pragmatic alternative to an attempt to estimate the structural equations is an empirical analysis which focuses on a reduced form equation. The dependent variable of the reduced form equation is teachers' salaries. The exogenous factors that are normally included in the supply and demand curves for teachers are the independent variables. It should be recognized that estimates of the reduced form equation cannot provide answers to the questions raised about the precise nature of the supply and demand curves for teachers. Nevertheless, these estimates are likely to provide what are rough but relatively reliable answers to questions that are of considerable importance to the pursuit of public policy.

In particular, the estimates of the reduced form equations should provide an indication of the relative importance of supply versus demand related factors in determining teachers' salaries. As we have noted previously, supply-side factors may lead to significant differences in teachers' salaries among geographic areas. If this is in fact the case, then programs which attempt to equalize educational opportunity by equalizing spending per student (adjusting perhaps for differential needs for compensatory education) without allowing for the effects of the teachers' salary differentials in different labor markets are likely to fail. That is, while such programs may eliminate some sources of educational inequality, they create a situation where factor cost differentials are likely to play an important role as a source of inequality of educational opportunity. Contrastingly, if it turns out that supply-side factors are not a major reason for salary differentials, then efforts to equalize opportunity by equalizing spending per student (adjusted for need) may well succeed.

I

There are a number of factors which our previous analysis suggests ought to be included in a reduced form equation that is meant to explain variations in teachers' salaries among areas. A formulation which utilizes, for the most part, the notation of the previous chapter is as follows:

(4-1) $W = f(OC, QUAL, UN, N, Enr, Pop, SES, INC, Y, Z, n, \bar{W})$.

Here: OC = opportunity cost of teaching,

QUAL = a vector of teacher attributes such as education and experience,

UN = union influence,

N = a measure of the non-pecuniary advantages of teaching,

Enr = number of students enrolled in public schools,

Pop = population,

SES = an index of the socioeconomic status of students,

INC = income,

Y = a vector measuring other sources of funds for financing public education,

Z = a vector which measures other factors that influence demand for education (e.g., taste or demand for non-educational services),

n = a measure of monopsony power, and

$\bar{W}$ = the community's fair wage standard for teachers.

The dependent variable, W, is a measure of the money salary paid to teachers. It is important to note that this variable does not include a measure of the value or the cost of fringe benefits. The data on fringes are scattered and are incomplete for our sample of cities and states. Accordingly, if there is a systematic positive relationship between fringe benefits and salaries, our results may understate the importance of factor cost differentials as a potential source of inequality of educational opportunity. Studies of non-wage benefits and their relation to wages in other labor markets have pointed to the existence of such a positive relationship.[1]

A precise description of the data used to measure teachers' salaries and the independent variables in our empirical analysis is given in Appendix A. The data are all cross-sectional. There are two samples. One sample is for the school districts (or related areas) for 83 central cities out of the 113 central cities of the 85 largest SMSA's. The other sample is for the 48 contiguous states. All data are for the period around 1969-70.

The first four terms listed in equation (4-1) represent the influence of supply-side factors. The rationale for including these factors in the analysis follows directly from the specification of equation (3-1) and from the discussions in sections V and VI of the previous chapter. The opportunity cost of entering the teaching profession in the different areas in our samples is represented by the variable OC. The opportunity cost is measured for each area as a weighted average of the salaries of male professional managerial and kindred personnel and of the earnings of female nurses. The weights for these presumed representative alternative salaries for male and female teachers are the corresponding employment levels by sex for teachers employed in the public schools of each central city or state.

Another dimension of opportunity cost relates to the quality of the teacher labor force. This dimension is represented here by the term QUAL in equation (3-7). There are two variables that in practice we use to measure QUAL: the proportion of teachers who have received a Masters degree (MA) and the median age of teachers (AG). The former variable is available only for the sample of cities. The latter variable is intended for use as a measure of teacher experience and is available for both samples.

The effects of market power on the supply side are represented by UN. The specific measures of union power to be utilized in our estimates are COMP, NEG, and AFT. These variables measure, respectively, whether or not there is a comprehensive agreement between the school board and a group representing the teachers; whether or not there is a negotiation agreement; and whether or not the recognized organization in a district with a negotiation agreement is the American Federation of Teachers.[2] Thus, these variables are dummy variables, taking on a value of 0 or 1 in accordance with conventional estimating practices.

The non-pecuniary aspects of a teaching position are represented by the term N in equation (4-11). One dimension of the pleasantness of the job is related to relative class size. Standardizing for number of hours taught per teacher, this can be represented by the student-teacher ratio. Since the reduced form equation is obtained by equating the quantities of teachers supplied and demanded (allowing, of course, for any excess supply associated with the existence of a "fair teachers' salary"), a variable which indicates the number of teachers employed does not appear in the reduced form. While a variable which indicates the number of public school students does appear there, the primary purpose of including it is to measure the demand for education rather than the working conditions of teachers. A second dimension of the attractiveness of teaching is, for a number of individuals, related to the racial mix of the student body.[3] For this reason we include the percentage of the population in the central city that is not white (NW) as an independent variable in the wage equation.

The remaining variables are essentially demand related. The first of these, as mentioned briefly above, is the number of students enrolled in public schools (ENR). Intuitively, one might expect that an analysis that is based on a simple supply and demand framework would imply, population (POP) held constant, a direct positive relation between public school enrollments and the position, or height, of the demand curve for teachers. However, this is not necessarily the case. For example, it can be shown that in a system where learning per student is produced as a positive function of the teacher-student ratio and the demand curve for output is formulated so that price is a negative function of the total stock of education produced, inelastic demand for education may mean that higher enrollments are associated with a shift to the left in the demand curve for teachers.[4]

Essentially, what happens in such a model is that the stock of education produced is higher the greater the number of students in the public school system. This has the effect of driving down the price of a unit of education to the point where, as enrollments increase, the overall demand for teachers declines. An implication of such a model is that total expenditures on teachers' services ought to be lower, ceteris paribus, in those areas where public school enrollments are higher. This implication is somewhat in conflict with previous empirical findings to the effect that, while current spending per student is lower in areas with higher enrollments, total current expenditures are higher.[5] And on the face of it, despite the fact that it is technically possible, it would seem unreasonable to believe that a community in fact responds to higher enrollments by hiring fewer teachers and paying them a lower wage.

A somewhat more plausible reason for expecting a negative coefficient on the enrollment variable in the wage equation for teachers follows from the model developed above wherein the community demand for teachers is influenced by the concept of the "fair teachers' salary". Consider a situation where such a community is under pressure from enrollments, and at the same time is in a situation where demand for education and other public services is such that only slight expansion in the education budget to finance a large teacher labor force is possible. The community may, nevertheless, be in a position to both hire more teachers than it has previously and at the same time pay, after an adjustment period, a relatively lower teachers' salary. To put it another way, as long as community preferences generally lead to premium payments to teachers in the absence of severe pressure from enrollments (i.e., wage-employment points are frequently above the supply curve), more teachers may be hired in a community at a relative wage that is lower than normal without the community having to hire teachers who are of very low quality.

Another demand-related factor is the socioeconomic status of students' families (SES). SES may play an important role in the production of education. It is measured by three variables: the median education of the adult population (ED); median family income (INC); and the percentage of families that are poor (POOR). These variables are also related to the budget constraint of the community and to other factors (Z) such as the community's taste for education and its demand for other services. The demand for other services is commonly represented by two variables, population density (POP DEN) and/or the degree of urbanization (URB).

The last of the variables that pertains to the production function for education is the proportion of public school students who are enrolled in high school (HS). The purpose of including this variable in the wage equation is to allow for the effects of systematic differences in hiring requirements for teachers employed in elementary and in high schools.

In addition to community income, a number of other factors (Y) affect the size of the community's budget constraint. These include the market value of local property (PROP), the proportion of that property that is commercial or industrial (CorI) and the relative amounts of revenue received by school districts from the state government (ST Rev) and from the federal government (FED Rev). Another budget-related factor pertains to the fiscal relationship between the school board and the local government. The variable DEP indicates whether or not the school board is dependent on some other local governmental unit.

To measure the effects on teachers' salaries of the exercise of market power on the part of school boards, we include as independent variables in the wage equation the number of school districts in the SMSA (NO) and the relative size of the population of the relevant central city (or central county) as compared to the SMSA (CC POP/SMSA). An alternative indicator of concentration of power in the hands of school boards is (CC ALL/SMSA), where CC ALL/SMSA measures the proportion of the population in the SMSA who live in central city areas. The variables that measure the importance of central cities in their respective SMSA's may also bear some relation to the opportunity cost of teaching in central city school districts. This will be so if employment conditions outside the central cities are systematically different from those inside the central cities. In that case, the measures of relative importance of central cities will provide an indication of the availability of substitute opportunities to teaching in central cities, which in turn may have a systematic effect on wages paid in central city school districts.

A number of the variables that have been mentioned above may be expected to also bear a relationship to the community standard for a "fair teachers' salary". Two of these variables are the opportunity cost measure and median family income. Another variable that may bear a relation to the community's teachers' salary standard is the proportion of teachers who are female (FEM). While its importance may fade with time, the question of whether most teachers are "breadwinners" or are secondary workers is a question that is likely to be of considerable importance to many school districts as a criterion for setting teachers' salaries. It would seem reasonable to expect that given our method of constructing the opportunity cost variable, this variable should pick up the overall effects of discrimination against women in the community. Accordingly, a finding of a significant negative coefficient on the percent female variable (FEM) would seem to constitute evidence in support of the "fair teachers' salary" hypothesis.

The remaining variables included in the wage equation measure the change in population from 1960 to 1970 (POP CH), and whether the market is located in the northeastern (NE), southern (SO), or western (WEST) regions of the country. The population change variable is meant to standardize for the effects on salaries of recent growth of the community. The three dummy variables for region of the country are included to standardize for sources of regional difference in salaries that have not been allowed for in the wage equation.

In summary, the reduced form wage equation which we intend to estimate for our sample of central city school districts is given by:[6]

(4-2) W = f(OC,MA,AG,COMP,NEG,AFT,NW,ENR,POP,ED,INC,
POOR,POP DEN,HS,PROP,CorI,ST REV,FED REV,
DEP,NO.,CC POP/SMSA,FEM,POP CH,NE,SO,WEST,ε_1),

where W = Average earnings of all public classroom teachers in the district, 1968-69.

OC = Opportunity cost for public school teachers.

MA = Proportion of teachers with an M.A. or higher degree.

AG = Median teacher age.

COMP = Dummy variable, value of 1 indicates the existence of a comprehensive agreement, 0 otherwise.

NEG = Dummy variable, value of 1 indicates the existence of a negotiation agreement, 0 otherwise.

AFT = Dummy variable, value of 1 indicates representation by the American Federation of Teachers, 0 otherwise.

NW = Proportion of population that is nonwhite.

ENR = Number of enrollments in public schools.

POP = Population of central city (or central county).

ED = Median education of persons 25 years and older.

INC = Median family income.

POOR = Percent of families below poverty level.

POP DEN = Population density per square mile.

HS = Proportion of public school students in high school.

PROP = Market value of taxable real property per capita.

CorI = Proportion of the value of property that is commercial or industrial.

ST REV = Proportion of public school revenue from state sources.

FED REV = Proportion of public school revenue from federal sources.

DEP = Dummy variable with value of 1 if school district is fiscally dependent, 0 otherwise.

NO = Number of school districts operating in the SMSA.

CC POP/SMSA = Population of central city or county where district is located over SMSA population.

CC ALL/SMSA = Proportion of SMSA population that lives in central cities.

FEM = Proportion of public school teachers who are female.

POP CH = Population change 1960 to 1970.

NE = Dummy variable with value of 1 for location in northeast region, 0 otherwise.

SO = Dummy variable with value of 1 for location in southern region, 0 otherwise.

WEST = Dummy variable with value of 1 for location in western region, 0 otherwise.

Σ_1 = Random error term.

The comparable equation for state data is given by:

(4-3) W = g(OC,AG,COMP,NEG,AFT,NW,ENR,POP,ED,INC,POOR, URB,HS,PROP,CorI,ST REV,FED REV,FEM,POP CH, NE,SO,WEST,Σ_2).

The variable definitions are the same for the states as for the cities with the following exceptions:

W = Average annual salaries all public elementary and secondary teachers, 1969-70.

COMP = Proportion of full-time teachers employed in districts with comprehensive agreements.[7]

NEG = Proportion of professional instructional staff in the state represented by an organization for negotiation purposes.

URB = Proportion of population in the state living in urban areas (used for states instead of population density).

Σ_2 = A random error term.

Variables which are included in the regressions based on city data but not in those based on data for states are MA, DEP, NO, and CC POP/SMSA. The first of these variables is not available on a statewide basis. The remaining three variables do not have readily available analogs in terms of state data.

The regression equations are estimated in log-linear form. We do this because the utility theory and production function framework that underlie the supply and demand curves for teachers lead us to expect a multiplicative relationship between the independent variables and the dependent variable. In addition, the coefficient estimates obtained for a log-linear regression have the convenient property that they are direct measures of elasticities.

II

The results for the city and state regressions specified in equations (4-2) and (4-3) are presented in columns 1 and 3 of Table 4-1.

TABLE 4-1

Regression Results*
(Log-Log Regression Format)

	Equation			
	City Sample (1)	City Sample (2)	State Sample (3)	State Sample (4)
OC	.7128 (3.7700)	.6619 (5.4200)	.5915 (1.6400)	.6529 (4.1500)
MA	.0307 (1.2000)	.0396 (1.8600)		
AG	-.0240 (-0.1200)		-.0303 (-0.0900)	
COMP	-.0163 (-0.8300)		-.0019 (-0.7600)	
NEG	-.0024 (-0.0900)		.0017 (0.5900)	
AFT	.0144 (0.6300)		.0000 (0.0000)	
NW	.0326 (1.8200)	.0252 (2.2000)	-.0012 (-0.0700)	
ENR	-.1210 (-1.6800)	-.1486 (-2.8000)	-.4081 (-1.6300)	-.2307 (-2.5200)
POP	.1310 (1.9400)	.1546 (3.0800)	.4154 (1.6500)	.2387 (2.6900)
ED	-.1434 (-0.8400)		.2989 (1.0100)	
INC	-.2250 (-0.9700)		.3130 (0.6700)	.3203 (2.7000)
POOR	-.0987 (-1.2600)		-.0002 (0.0000)	
POP Den (URB)**	-.0074 (-0.4100)		-.0757 (-0.8900)	-.0687 (-1.6800)
HS	.0438 (0.9800)		-.1191 (-0.3600)	
PROP	.0400 (1.2100)	.0390 (1.5700)	.0333 (0.7000)	.0647 (2.3700)
CORI	.0198 (0.5900)		.0092 (0.2000)	
ST REV	.0546 (1.9200)	.0532 (2.4000)	.0583 (1.8900)	.0478 (2.6400)
FED REV	.0044 (0.1900)		.0032 (0.1000)	
DEP	.0470 (1.9900)	.0377 (2.0500)		
NO	.0057 (0.4700)			
CC ALL/SMSA	-.0492 (-1.6700)	-.0586 (-2.2900)		
FEM	-.4057 (-2.2700)	-.3889 (-2.6700)	.0052 (0.0200)	

Table 4-1 (continued)

	Equation			
	City Sample (1)	City Sample (2)	State Sample (3)	State Sample (4)
POP CH	-.0109 (-0.1800)		-.0557 (-0.3900)	
NE	-.0461 (-1.4900)	-.0453 (-1.7800)	-.0264 (-0.6200)	
SO	-.0542 (-1.8300)	-.0540 (-2.4600)	-.0071 (-0.2000)	
WEST	.0151 (0.4700)		.0274 (0.6300)	
INT	6.3123 (2.2300)	4.1864 (3.0300)	-.1014 (-.0300)	-.2491 (-0.4100)
$\bar{R}^2$	.7181	.7522	.8732	.9093
SE	.0627	.0587	.0478	.0404

* t statistics in parentheses.

** POP DEN for City Sample; URB for State Sample.

From these results, it can be seen that the supply-related variables exhibit coefficient estimates that, in general, appear to be consistent with our a priori expectations. The finding of insignificant coefficient estimates for both the teachers' age and union variables may, at least in part, be due to little important independent variation in these variables. The median age of teachers in the city sample is 35.6 years with a standard deviation of 1.8 years. For the state sample the corresponding statistics are 37 years and 1.8 years.[8] These median ages are high enough to indicate that a large number of teachers in each sample are likely to be receiving the maximum increment for experience. Thus, minor variations in age may not be reflected in differences in the level of teachers' salaries.

The situation is similar with respect to the unionization variable for our sample of large cities.[9] Over 79 percent of the school districts covered in our sample have some type of negotiated agreement. Moreover, there are a number of other things that may make the impact of teachers' unions on salary levels difficult to detect. First, as we have mentioned previously, the relatively recent emergence of unions as a force directly influencing teachers' salaries means that the cumulative effect of unions on wage levels may be quite small. This is despite the fact that unions may have had strong impact on recent salary increases. The second thing to be considered is the possibility that spillovers from the union to non-union cities may reduce the observed impact of unions. The essential mechanism here is that non-union school boards pay higher salaries to avoid unionization. Third, it must be recognized that differences in degree of union strength are not reflected in variations in the NEG variable. Accordingly, the coefficients estimated for this union variable do not reflect the effects of differences in the strength of unions on teachers' salaries. Fourth, there is the fact that the general effects of unionization in an area are likely to be reflected to some extent in the opportunity cost variable. At the same time, the degree of unionization of teachers may reasonably be expected to vary in accordance with the degree of unionization of all workers in the area. As a result, a portion of whatever impact there is of teachers' unions on teachers' salaries may be picked up by the opportunity cost variable.[10] Arguments analogous to the preceding may explain why the other measure of strength of union organization, COMP, also does not exhibit a coefficient estimate that is significantly different from zero.

The findings for the state sample with respect to union impact are consistent with the findings for cities. Again, the coefficient estimates for the union variables are not statistically significant. This may reflect the existence of a truly weak union impact on the level of teachers' salaries, or it may reflect the fact, as discussed in the previous chapter, that the state is not the appropriate unit of aggregation for teachers' labor markets.

It should be noted that our finding of no significant union impact on teachers' salaries differs from, but does not contrast sharply with the findings of previous studies. As we indicated in the preceding chapter, these findings have generally been to the effect that the impact of unions on teachers' salaries is relatively weak. The fact that the formulation of the wage equation estimated here is different from those estimated in the other studies, and in particular that our specification of the wage equation is somewhat more comprehensive than are the others, may account for what differences there are in the findings.

On the demand side, two things should be commented on. First, there are the negative coefficient estimates for the enrollment variable (population held constant). This result, in accordance with our discussion of the previous chapter, is consistent with a view that the earnings of teachers are, at least at times, influenced by a community standard for a "fair teachers' salary".[11] Some further support to this view is given by the finding of a negative coefficient for the percent female (FEM) variable in the equation estimates that are based on city data.[12]

The second thing to note in connection with the demand-related variables is that a number of the estimated coefficients are not significantly different from zero. Many of these independent variables measure closely related phenomena, e.g., income, education, wealth, and poverty. Thus, a considerable amount of collinearity among the independent variables is to be expected and may be responsible for the insignificant coefficient estimates.

Also of interest in our empirical findings are the following: First, it appears that those school districts that are fiscally dependent on another form of local government pay higher salaries to their teachers than do the independent school districts. This finding implies that where public control over expenditures is relatively indirect, expenditures will be higher than otherwise. Second, our results indicate that the more important is employment in central city areas within an SMSA, the lower are the salaries for those teachers who are employed in the central cities.[13] A third finding of interest is that in the case of cities located in the Northeast and in the South, other things the same, teachers' salaries are lower than they are in cities located elsewhere in the country.

As we noted above, we expected some collinearity among the independent variables and this may account for the fact that a number of the coefficient estimates are not statistically different from zero. Whatever the underlying reasons for this, it would be useful to have an estimate of each regression equation that does not include variables with coefficient estimates that are very low relative to their standard errors. Accordingly, we have serially eliminated from the wage equations those variables with t-statistics that are less than 1.5. The estimates of the wage equations with these variables eliminated are presented in column 2 and 4 of Table 4-1.

III

The empirical estimates of the wage equation presented in Table 4-1 can be used to isolate the importance of supply-side factors as a source of teachers' salary differentials. This is accomplished by predicting from the regression equation the level of teachers' salaries that would result for each of the areas in our sample under conditions where the demand-side variables are held constant (e.g., at their mean value) while supply-side variables take on their actual values for each area. Specifically, the following steps should be taken: First, using an appropriate regression equation, multiply the coefficients estimated for each of the supply-side variables by the actual value of the corresponding independent variables for the observation in question. Second, multiply the coefficients estimated for the demand-side variables by the mean values for the corresponding variables computed over the entire sample.[14] Third, add the various products of the coefficients and variables to the constant in the regression equation. The antilog of the sum is equal to the wage rate predicted for the area in question.

Tables 4-2 and 4-3 contain the data on actual and projected wage rates for our samples of cities and states. In column 1 of each table is the actual wage rate. The wage rates in columns 2 and 4 are predicted from the regressions under conditions where all independent variables are permitted to vary. The projections in column 2 for the city sample are based on the regression of column 1 in Table 4-1 Those in column 4 are based on the regression of column 2 in Table 4-1. The projections for the states in columns 2 and 4 of Table 4-3 are derived from the results in the regressions of columns 3 and 4 in Table 4-1. Columns 3 and 5 of Tables 4-2 and 4-3 are based on regressions of columns 1 and 2 in the case of the cities and of columns 3 and 4 in the case of the states, both sets from Table 4-1. The difference between the wages projected in columns 3 and 5 from those projected in columns 2 and 4 is that for the latter set of projections, only the supply-side variables are allowed to vary from area to area. The demand variables are held constant at their mean values.

A number of things are apparent from these results. First, the statistics on range and coefficient of variation of the wages predicted from the regression equation where all variables are unconstrained are less than the comparable statistics which are based on the raw data on teachers' salaries. The reason is that the predicted salaries do not reflect the effects of random factors. Second, the ranges and the coefficients of variation for the salary estimates that are predicted under the procedure where demand-side factors are held constant while supply-side factors are left to vary are less than are the comparable statistics for the salary levels that are predicted with all independent variables free to vary. Nevertheless, the variation in teachers' salaries that is due only to supply-side factors is considerable. The standard deviation estimates range from just under \$500 to a little over \$600, while the estimates for the coefficient of variation are between 5.7 and 7.6 percent. These figures, as well as those for the range, indicate

TABLE 4-2

Actual and Predicted Salaries for Teachers in City School District Sample

District	Actual Salary ($'s) (1)	Predicted Salary ($'s): From Regression 1: No Variables Held Constant (2)	From Regression 1: Demand Variables Held Constant (3)	From Regression 2: No Variables Held Constant (4)	From Regression 2: Demand Variables Held Constant (5)
1. Phoenix	8,814	8,921	8,583	8,958	8,806
2. Anaheim, Cal.	9,187	9,833	9,225	9,682	9,387
3. Garden Grove, Cal.	9,300	9,151	8,888	9,050	8,896
4. Santa Ana, Cal.	9,052	9,402	9,271	9,344	9,273
5. Fresno, Cal.	9,752	8,813	8,567	8,800	8,530
6. Los Angeles	10,043	9,747	9,584	9,686	9,443
7. Long Beach	9,994	9,719	9,342	9,683	9,341
8. Sacramento	9,533	9,731	9,350	9,738	9,251
9. San Bernardino	10,598	9,878	9,309	9,882	9,340
10. Ontario, Cal.	8,677	8,884	8,590	8,985	8,771
11. San Diego	9,898	9,290	9,029	9,387	9,141
12. Oakland	9,835	9,860	9,731	9,974	9,760
13. San Francisco	10,249	10,244	9,654	10,164	9,382
14. San Jose	10,029	9,374	9,522	9,253	9,459
15. Denver	8,209	8,502	8,628	8,464	8,637
16. Bridgeport, Ct.	8,841	9,097	8,408	9,049	8,425
17. Hartford	8,922	8,677	8,641	8,750	8,649
18. Wilmington, Del.	9,006	9,162	8,558	9,211	8,497
19. Broward Co., Fla.	8,298	8,435	8,609	8,794	8,588
20. Duval Co., Fla.	7,572	7,179	8,317	7,260	8,284
21. Dade Co., Fla.	9,112	9,014	8,818	8,975	8,769
22. Pinellas Co., Fla.	8,367	8,028	7,992	7,837	8,010
23. Atlanta	7,485	7,411	8,410	7,476	8,313
24. Chicago	9,697	9,214	9,035	9,169	8,943
25. Indianapolis	8,689	8,879	9,148	8,918	9,267
26. Kansas City, Ks.	7,195	7,586	8,091	7,408	8,043
27. Wichita, Ks.	7,968	7,827	8,243	7,944	8,439
28. Louisville, Ky.	8,056	7,952	8,496	7,902	8,454
29. New Orleans	7,552	7,604	8,588	7,688	8,484
30. Baltimore	8,748	8,539	8,786	8,449	8,719
31. Boston	9,250	8,998	8,670	9,085	8,662
32. Springfield, Mass.	8,390	8,564	8,345	8,422	8,250
33. Worcester, Mass.	8,974	8,955	8,213	9,048	8,439

Continued--

Table 4-2 (continued)

District	Actual Salary ($'s) (1)	Predicted Salary ($'s): From Regression 1: No Variables Held Constant (2)	From Regression 1: Demand Variables Held Constant (3)	From Regression 2: No Variables Held Constant (4)	From Regression 2: Demand Variables Held Constant (5)
34. Detroit	10,009	9,944	9,690	9,866	9,557
35. Minneapolis	8,844	8,916	8,255	8,718	8,269
36. St. Paul	9,413	9,209	8,435	8,915	8,308
37. Kansas City, Mo.	8,184	8,263	8,697	8,084	8,565
38. St. Louis, Mo.	8,654	8,724	8,521	8,507	8,461
39. Omaha	8,080	7,920	8,606	8,044	8,690
40. Jersey City	7,389	8,622	8,600	8,623	8,642
41. Patterson, N.J.	8,643	8,521	8,469	8,447	8,382
42. Albany, N.Y.	8,693	9,326	8,462	9,614	8,623
43. Schenectady	9,070	8,700	8,195	8,520	8,298
44. Buffalo	8,956	9,108	8,144	8,957	8,247
45. New York City	9,696	10,521	9,619	10,299	9,529
46. Rochester	9,710	9,010	8,373	9,052	8,474
47. Syracuse	9,021	8,071	7,673	8,272	7,846
48. Mecklenberg Co., N.C.	7,405	7,367	8,020	7,311	7,972
49. Greensboro, N.C.	7,249	7,806	8,269	7,789	8,229
50. High Point	7,341	7,623	7,948	7,410	7,931
51. Akron, Ohio	7,935	8,148	8,504	8,264	8,569
52. Canton, Ohio	8,363	8,026	7,874	7,959	7,882
53. Cincinnati	8,261	8,579	8,436	8,748	8,521
54. Cleveland	8,214	8,725	8,670	8,579	8,572
55. Columbus, Ohio	7,385	7,434	8,029	7,617	8,094
56. Dayton, Ohio	8,881	8,106	8,144	8,204	8,213
57. Youngstown, Ohio	8,957	8,558	8,390	8,420	8,323
58. Warren, Ohio	7,804	8,135	8,194	8,250	8,307
59. Toledo, Ohio	7,864	8,338	8,258	8,331	8,236
60. Oklahoma City	6,830	7,040	8,157	7,027	8,181
61. Tulsa	7,081	6,784	8,173	6,962	8,324
62. Portland, Ore.	8,146	9,013	8,509	8,923	8,668
63. Allentown, Pa.	8,126	8,191	7,786	8,050	7,896
64. Harrisburg, Pa.	7,218	8,022	8,016	8,237	7,938
65. Philadelphia	9,295	9,213	8,801	9,126	8,749
66. Providence	9,037	8,334	7,889	8,298	7,919
67. Knoxville, Tenn.	7,103	7,522	7,574	7,650	7,626
68. Memphis	7,183	7,706	8,433	7,787	8,364

Continued--

Table 4-2 (continued)

District	Actual Salary ($'s) (1)	Predicted Salary ($'s) From Regression 1: No Variables Held Constant (2)	Predicted Salary ($'s) From Regression 1: Demand Variables Held Constant (3)	Predicted Salary ($'s) From Regression 2: No Variables Held Constant (4)	Predicted Salary ($'s) From Regression 2: Demand Variables Held Constant (5)
69. Nashville, Tenn.	7,593	7,295	7,687	7,384	7,746
70. Beaumont, Tex.	7,147	7,255	8,176	7,249	8,193
71. Port Arthur, Tex.	7,203	7,019	7,840	6,732	7,846
72. Dallas	7,282	7,353	8,416	7,394	8,364
73. El Paso	6,829	6,572	7,735	6,740	7,835
74. Fort Worth	6,731	7,018	8,091	7,044	8,104
75. Houston	7,134	7,616	8,661	7,663	8,613
76. San Antonio	6,369	6,988	8,022	6,951	8,052
77. Salt Lake City	7,380	8,097	7,487	8,135	7,663
78. Norfolk, Va.	7,820	7,268	7,979	7,266	7,899
79. Richmond, Va.	7,915	7,385	8,447	7,304	8,325
80. Seattle	9,086	9,288	8,916	9,739	9,008
81. Everett, Wash.	9,287	8,740	8,417	8,763	8,437
82. Tacoma, Wash.	9,053	9,254	8,641	9,338	8,789
83. Milwaukee	9,827	8,522	8,363	8,576	8,492
MEAN	8,465	8,454	8,498	8,453	8,510
STANDARD DEVIATION	986	886	513	875	487
COEFFICIENT OF VARIATION	0.117	0.105	0.060	0.104	0.057
RANGE	4,229	3,949	2,244	3,567	2,134

TABLE 4-3

Actual and Predicted Salary for Teachers in State Sample

State	Actual Salary ($'s) (1)	Predicted Salary ($'s): From Regression 3: No Variables Held Constant (2)	Predicted Salary ($'s): From Regression 3: Demand Variables Held Constant (3)	Predicted Salary ($'s): From Regression 4: No Variables Held Constant (4)	Predicted Salary ($'s): From Regression 4: Demand Variables Held Constant (5)
1. Alabama	6,817	6,860	7,619	6,916	7,566
2. Arizona	8,715	8,765	8,597	8,762	8,642
3. Arkansas	6,277	5,930	6,968	6,092	6,843
4. California	10,324	10,078	9,439	10,052	9,528
5. Colorado	7,760	8,364	8,450	8,269	8,446
6. Connecticut	9,271	9,457	8,967	9,636	9,021
7. Delaware	9,015	8,975	8,756	9,068	8,808
8. Florida	8,410	8,238	8,225	8,140	8,188
9. Georgia	7,278	7,127	7,713	7,196	7,651
10. Idaho	6,884	7,490	7,709	7,360	7,623
11. Illinois	9,569	9,540	8,793	9,490	8,890
12. Indiana	8,832	8,547	8,432	8,514	8,435
13. Iowa	8,398	7,983	8,164	7,809	7,915
14. Kansas	7,620	7,789	8,046	7,788	8,004
15. Kentucky	6,939	7,303	7,927	7,503	7,887
16. Louisiana	7,028	7,051	7,743	7,078	7,686
17. Maine	7,572	7,227	7,774	7,256	7,703
18. Maryland	9,383	9,307	8,960	9,452	9,028
19. Massachusetts	8,770	9,092	8,848	9,091	8,881
20. Michigan	9,823	9,498	9,128	9,497	9,201
21. Minnesota	8,658	8,734	8,607	8,755	8,591
22. Mississippi	5,798	5,891	7,135	5,907	7,026
23. Missouri	7,844	8,167	8,312	7,879	8,066
24. Montana	7,606	7,470	7,806	7,314	7,728
25. Nebraska	7,354	7,303	7,746	7,258	7,675
26. Nevada	9,248	9,176	9,076	9,309	9,178
27. New Hampshire	7,789	7,607	8,035	7,683	7,961
28. New Jersey	9,150	9,588	9,094	9,778	9,171
29. New Mexico	7,796	7,423	8,071	7,287	8,058
30. New York	10,390	10,070	9,075	10,062	9,158
31. North Carolina	7,494	7,381	7,776	7,346	7,551
32. North Dakota	6,696	7,167	7,898	7,118	7,800
33. Ohio	8,300	8,715	8,543	8,777	8,552
34. Oklahoma	6,882	7,264	7,936	7,285	7,913
35. Oregon	8,814	8,467	8,579		8,592
36. Pennsylvania	8,858	8,860	8,476	8,763	8,477
37. Rhode Island	8,776	8,512	8,361	8,418	8,339
38. South Carolina	6,883	7,022	7,543	7,112	7,304
39. South Dakota	6,403	6,315	7,349		7,259
40. Tennessee	7,050	7,026	7,689	6,915	7,427
41. Texas	7,277	[illegible],370	7,890	7,489	7,805
42. Utah	7,643	[illegible]704	8,154	7,745	8,129
43. Vermont	7,960	[illegible],195	8,026	8,196	7,963
44. Virginia	8,070	7,935	8,110	7,968	8,092
45. Washington	9,237	9,328	8,744	9,155	8,774
46. West Virginia	7,650	7,523	8,057	7,454	7,838
47. Wisconsin	9,000	8,588	8,441	8,634	8,440
48. Wyoming	8,271	7,918	8,195	7,983	8,183
MEAN	8,075	8,070	8,229	8,069	8,187
STANDARD DEVIATION	1,073	1,029	553	1,032	625
COEFFICIENT OF VARIATION	0.133	0.128	0.065	0.128	0.076
RANGE	4,592	4,187	2,471	4,155	2,685

that teachers' salaries, after demand conditions are standardized, may differ in the extremes by as much as $2,500 or $2,600 around a mean salary of over $8,000.

The overall implication is that in a situation where wages differ as they do among our largest cities and among the 48 contiguous states, a program which prescribes equal dollar expenditures per student in all areas is unlikely to eliminate most of the interarea variation in teachers' salaries. Therefore, such a program is unlikely to in fact result in equal provision of teachers' services among areas. For example, if our estimates of wage differentials under conditions of stable demand can be extended, then if all jurisdictions were, under an equal opportunity program, to spend equal dollar amounts on teaching services, the districts with lowest salary levels might be able to purchase as much as 16 percent more in the way of real teachers' services than would the average district. Similarly, those in districts with the highest teachers' salaries might purchase as much as 16 percent less in the way of real teachers' services than would the average district.

IV

While the simulated results above pertain to large cities or states, an approach similar to ours might be taken if one wished to predict the supply-related salary differentials within any particular state. However, caution is called for here. The one thing that would have to be dealt with very carefully in conducting an in-state analysis is the question of the geographic scope of the teachers' labor market. In some states, there may effectively be only one teachers' labor market. In others, there may be a considerable number of them. For some states, the within-state variation in wages, especially that between rural and urban areas, probably exceeds the comparable variation in our samples. In other states it is likely to fall short of it. Thus, any judgment for particular states would have to be made on a case-by-case basis.

In concluding this chapter, two more precautionary comments seem to be in order. First, the estimates that we have derived are based on a model which presumes long-run equilibrium. These estimates can be used for designing policy only as it pertains to the long-run situation. Thus, to the extent that an excess supply of teachers had built up by 1968-69 and 1969-70 and that this had an effect on teachers' salaries, our results may not be completely accurate. It is important to note in this context, however, that what data are available seem to indicate that the excess supply situation did not become serious until the early 1970's.[15] Second, for reasons similar to the above, our projections of the effects of variations in supply-side factors on teachers' salary differentials are likely to be less meaningful during the current period where there is short-run excess supply of teachers than they will be in the long-run.

[1]See, for example, A.L. Gustman and M. Segal, "Wages and Wage Supplements, and the Interaction of Union Bargains in the Construction Industry," Industrial and Labor Relations Review, 25, January 1972, pp. 179-185.

[2]A comprehensive agreement is, in structure, the most formal type of agreement, usually containing statements of the parties to the agreement, effective and expiration dates, and items negotiated and agreed to by the parties. It also includes some or all of the items on procedural agreements. Procedural Agreements deal only with procedures. The results of negotiation do not become part of a procedural agreement, but revert to board rules, regulations, teachers' handbook or other written documents. The incorporation of such negotiated items into a procedural agreement generally transforms it into a comprehensive one. National Education Association, Negotiation Agreements Provisions for Teachers, 1972 edition, p. xii.

[3]See H.M. Levin, "Recruiting Teachers for Large City Schools," op. cit., ch. 4 and p. 640; M. Fleischmann, et al., Report of the New York State Commission on the Quality, Cost and Financing of Elementary and Secondary Education, 1972, Volume 3, p. 13-E.23.

[4]To use our notation in a specific example, let output per student be given by:

$$Q = a\,(Tch/ENR)^{\alpha}.$$

If the price of output is given by

$$P = b(Q \cdot ENR)^{-\delta},$$

then teachers' value of marginal product, which is assumed here to be the demand price, is equal to:

$$W = ENR \cdot \partial Q/\partial Tch \cdot P = a^{1-\delta}_{\alpha}\ Tch^{\alpha(1-\delta)-1}\ ENR^{(1-\alpha)(1-\delta)}.$$

[5]The effect of enrollment changes on the wage is given by the following term:

$$\frac{\partial W}{\partial ENR} = (1-\alpha)(1-\delta)\ a^{1-\delta}_{\alpha}\ Tch^{\alpha(1-\delta)-1}\ ENR^{(1-\alpha)(1-\delta)-1}.$$

Increased enrollment will shift the demand curve to the left as long as $\alpha<1$ and $\delta>1$, i.e., as long as there are decreasing returns to scale to teaching services and at the same time the demand curve for the stock of education produced in the community is inelastic. It is of interest to note that if $\alpha = 1$, an increase in enrollment has no effect on the stock of education produced in the public schools. The reason is that for the particular production function used in this example, the extra learning gained by the additional student who enters the system is just balanced by the learning lost by all previous students who now attend a school with a larger average class size. Gustman and Pidot, op. cit.

[6]For more complete definitions of the variables, see the appendix to this chapter.

[7]As an alternative measure to COMP, we also use COMP', the proportion of school districts in the state with comprehensive agreements.

[8]The means and standard deviations for all variables are given in Appendix B.

[9]All three measures of unionization have been included as independent variables in columns 1 and 3 of Table 4-1. Versions of these two equations were also estimated in which only one or two of the union related measures appear. In no case do these union related variables exhibit t-statistics that equal or exceed 1.0.

[10]For both the sample of cities and of states in our sample, the opportunity cost variable used in our regressions (log OC) is correlated .45 with the NEG (negotiation agreement) variable.

[11]There is at least one alternative to the "fair teachers' salary" hypothesis that may account for the finding of a negative coefficient for the enrollment variable in the salary equation. In this alternative case, as in the "fair salary hypothesis", it is presumed that <u>ceteris paribus</u>, total expenditures on education are not very elastic with respect to the level of public school enrollments. As a result, where enrollments are high, teachers' salaries are likely to be low. However, unlike the "fair salary hypothesis", in the alternative case, it is presumed that employment-salary observations fall along the supply curve for teachers. Those school districts that pay a lower salary because enrollments are high are able to do so only because they hire relatively lower quality teachers. The quality adjustment may take the form of hiring a larger than normal fraction of teachers' college graduates, or of permitting more of a mismatch between the field that a teacher was trained in and the field that he or she teaches in than do other districts. Whatever the exact nature of these quality adjustments, it should be remembered that if the alternative view is the correct one, then these quality adjustments must be of a kind that are not correlated with the proportion of teachers who have earned at least an M.A. degree. This measure has been included as an independent variable in the regression equation for cities.

As we noted previously, there is reason to believe that enrollments respond positively to school quality (see Gustman and Pidot, <u>op. cit.</u>). Accordingly, we estimated a version of the wage equation where enrollments are treated as an endogenous variable. As the theory would lead us to believe, the absolute value of the coefficient estimated for the enrollment variable increased for both samples when simultaneous equations techniques were used. To avoid a complicated dynamic analysis, we do not treat the enrollment variable as being simultaneously determined when we predict below the wages that would be observed under an equal opportunity plan.

[12] Here again, a finding that is consistent with the "fair teachers' salary" hypothesis is also consistent with an alternative view. Specifically, the negative coefficient for the percent female variable could conceivably be the result of simultaneous interaction between the percent female and the teachers' salary variables. This will be so if the supply of male teachers is more elastic than is the supply of female teachers to that in those areas where teachers' salaries are relatively high, males account for a relatively greater proportion of the teachers' labor force.

[13] When we estimated a version of the wage equation in which the population of the central city in question divided by the SMSA population (CC POP/SMSA) was used instead of the ratio of the total population of all central city areas in an SMSA to that of the SMSA (CC ALL/SMSA), the coefficient for CC POP/SMSA was not statistically significant.

[14] The variables which are considered to be supply-side variables and thus vary among areas are CC, MA, AG, COMP, NEG, AFT, and NW. For purposes of generating the projections, other variables are held at their mean values for the sample as a whole.

It should be noted that the effect of holding the demand variables at their arithmetic mean values instead of their geometric mean values is to cause a slight discrepancy between the mean wages computed from the predictions where all variables are free to vary and those computed from predictions where only supply-side variables are free to vary.

[15] See National Education Association, Teacher Supply and Demand in Public Schools, 1972, pp. 6 and 7. See also the statistics in that volume on the proportion of teacher education program graduates who in fact upon graduation, enter into classroom teaching. Ibid., p. 20.

Chapter 5

IMPLICATIONS FOR EDUCATIONAL POLICY

The results derived from the preceding econometric estimates suggest that standardization of demand among school districts in different market areas is apt to leave untouched a sizable fraction of the wage differences among school districts. While the precise effects on wages of various kinds of equal opportunity programs will be somewhat different from those shown in Tables 4-2 and 4-3, we believe these findings provide a rough indication of the orders of magnitude involved. That is, the increased equality on the demand side of the market that results from equal opportunity programs will leave intact a substantial part of the intermarket teachers' salary differentials. What differentials do in fact remain, once such a program is instituted, will depend on a number of things. Most importantly, the size of the differentials before a program is established will make an appreciable difference, as will the kind of equal opportunity program that is adopted.

The simplest type of a plan for equalizing educational opportunity among the school districts located within a particular area is one in which tax collections are centralized for all districts and funds are distributed on a per student basis. When this funding mechanism is followed, if the proportion of funds spent on non-teaching services is relatively constant among districts, each school district's demand curve for teachers' services will exhibit something close to unit elasticity. In more complicated funding plans--where taxation varies with such things as income, quality of education, and eventually, perhaps, with degree of municipal overburden--the demand curve for teachers within each district will resemble more closely the kind of a demand curve that underlies the demand-constant wage projections for Tables 4-2 and 4-3.[1]

Thus, as is apparent from the above, any meaningful predictions as to the wage differentials that will result from various types of equal opportunity programs will have to be based on a highly complicated procedure. Since these programs have the effect of changing one of the structural equations which helps to determine the level of teachers' salaries, accurate prediction will require a full knowledge of the structural equations in the model of the teachers' labor market. And, even this may not be sufficient. Our results with respect to the variable which measures whether or not the school district is financially dependent on other local governments suggest that the structure of government organization may have an effect on demand. We do not currently have the kind of information that is needed to predict the effects of changes in the nature of the financing and funding schemes for education on the demand for teachers' services.

Similarly, it would be difficult to predict what the effects of an equal opportunity program on community preferences for a "fair salary" standard for teachers might be. When expenditure determination is centralized, such preferences with respect to a "fair salary" standard may change.

In sum, there are two things to note that have important implications with respect to the design of equal educational opportunity programs. First, even after such programs are established, there is likely to be considerable variation among areas in the cost of teachers' services. And second, it will be extremely difficult in the time before such a program is instituted to obtain reliable estimates as to the precise nature of the salary differentials to expect once the equal opportunity program is instituted.

A major implication of the fact that substantial wage differentials among areas are likely to persist after an equal opportunity program is instituted is that any equal opportunity program which does not take intermarket factor cost differentials into account is not likely to result in true equality of opportunity. This follows from the results of our reduced-form estimates. If, as estimated, the ratio of salaries in the highest to lowest paid areas will be 1.3 or 1.4 to 1.0, students that receive equal dollar allotments may receive real resource allotments that differ in amount by this ratio. These real resource differences will not be easy to eliminate. Since it will be quite difficult to estimate the exact size of the expected factor cost differentials, it is unlikely that these can be allowed for directly in any legislative formula for bringing about equal opportunity.

Given the complexity of the wage determination process in the factor market, simple solutions to the problems brought about by the existence of interarea cost differentials are not likely to be completely effective. For example, one approach to circumventing the effects of supply side caused differences in teachers' salaries, which at first blush may appeal to law-makers, is to mandate identical levels of teachers' salaries or salary schedules for all school districts. The effect of such a policy would be to change the form but not the fact of interarea cost differences. With equal salaries mandated for all districts, one would expect to observe relatively high turnover rates for teachers in the high-cost as compared to the low-cost districts. One would also expect to observe the same kind of inequality among districts in various dimensions of teacher quality--e.g., the proportion of teachers who were not formally trained in the subject areas that they teach in.

Another simple approach which may initially seem appealing is to adjust spending allowances per student in each school district in accordance with teachers' salary scales in the district. This kind of program will have the effect of underwriting teachers' salaries negotiated at the local level. Accordingly, once such a program is established, it is likely to lead to higher costs than previously for teachers' services for all school districts. Any effort to alleviate this problem through cost sharing will again place the wealthier school districts in a relatively advantageous position and, thus, will be inconsistent with the goal of equality of opportunity.

From the previous discussion it appears that those who design equal education opportunity programs are unlikely to overcome the problems caused by interarea factor cost differentials either by taking what are relatively straightforward and simple approaches to the problem or by attempting to incorporate in their policy design the results of sophisticated econometric studies. The former approaches are not likely to do the job; the latter approaches will most likely lead to formulae that are too unreliable to form the basis for legislation.

There is one policy which, in theory at least, will lead to equality of real resource usage for students living in different school districts. At the same time, this policy appears to involve a reasonable approach to legislation. It would involve the establishment of a regulatory body with a mandate to adjust salary structures and per student spending allowances for all districts within its jurisdiction so as to bring about equality of real resources purchased for all districts. The regulatory agency would be expected to utilize any and all expertise that is called for and to collect those data that are deemed necessary for it to carry out its function. Since the approach of such an agency could be flexible and pragmatic, a much stronger role could be played by the results of econometric studies than if rigid and unvarying funding formulae were built directly into legislation. At the same time, such real input dimensions as class size, teacher turnover rates, and various kinds of teacher characteristics could be established as the immediate targets of wage and spending policy. If reasonable tradeoffs among the various targets were established, the regulatory agency might well succeed in attaining the goal of equal educational opportunity.

Prudence requires us to point out, however, that while such an agency has the potential for bringing about true equality of educational opportunity, there remains a real danger that with time it will become just another part of the educational bureaucracy, and that it will ultimately have a deleterious effect on the costs and overall efficiency of the educational system. There certainly will be strong temptation to meet whatever policy targets are established by turning the targets into legal requirements. For example, one possibility is to legislate a ceiling for the number of teachers with no formal training in mathematics that are permitted to teach mathematics courses. Given the current institutional setting (e.g., the single salary schedule), such targets are likely to be met in all school districts only if current overall salary levels are raised substantially and/or if unregulated dimensions of teacher quality are permitted to adjust in a compensatory manner.

Thus, the choice facing the policy maker may be a difficult one. The costs of a program designed to eliminate a very real source of inequality of educational opportunity seem likely to increase--perhaps sharply--with the potential effectiveness of the program. And there is no ready guide as to where to draw the line.

FOOTNOTES FOR CHAPTER 5

[1]One well known plan in which tax rates vary in accordance with family income and school quality is the Family Power Equalizing Plan. For a description, see J. E. Coons, W. H. Clune III, and S. D. Sugarman, Private Wealth and Public Education, Cambridge: Harvard Press, 1970. For a summary and a critique of this plan, see C. S. Benson, "Economic Analysis of Institutional Alternatives for Providing Education," in R. L. Johns, et al., Economic Factors Affecting the Financing of Education, Gainesville, 1970, pp. 143-157.

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APPENDIX A

SOURCES AND DESCRIPTION

OF THE DATA

The dependent variable:

W Average earnings of public school classroom teachers in the district 1968-9.
Source: National Education Association, 24th Biennial Salary Survey of Public-School Professional Personnel, 1969, Research Report 1969-R7, Table A, column 6.

The independent variables:

OC Opportunity cost for public school teachers calculated as follows: percent of teachers employed by local government in the SMSA who are male (1970), multiplied by the median earnings in 1969 of males, 16 years and older, in professional, managerial and kindred occupations, plus the product of percent teachers employed by local government in the SMSA who are female (1970), times the median earnings of female registered nurses in the SMSA who worked 50 to 52 weeks in 1969.
Source: U.S. Bureau of the Census, Census of Population: 1970, Detailed Characteristics, Nos. 2-52, Table 173 for the number of male and female teachers from which the percentages were calculated and Table 176 for median earnings of nurses. Census of Population: 1970, General Social and Economic Characteristics, Nos. 2-52, Table 89 for central cities and Table 122 for the counties.

MA Proportion of public elementary and secondary classroom teachers in the district with MA or higher degrees, Fall 1969.
Source: U.S. Office of Education, Statistics of Local Public School Systems Fall 1969: Pupils and Staff, Table 4, columns (7 and 9) as a percent of the sum of columns (3 + 5 + 7 + 9). Included are full-time and part-time teachers, reported on the basis of degree granted or completed, rather than on the basis of credit hours that could make a degree. There are indications that certain school districts included other instructional staff in addition to classroom teachers.

AG Median Age of all employed teachers in the SMSA where the central city (or county in five cases) is located, 1970.

All pre-K, K, elementary and secondary school teachers are included, not only those employed by public schools. Data on ages are given in the source by sex and grade level of teachers. Variable 9 is actually the weighted average of these individual median ages using as weights the number of all employed teachers.
Source: U.S. Bureau of the Census, Census of Population: 1970, Detailed Characteristics, Nos. 2-52, Table 174 for median ages and Table 173 for the number of all employed teachers.

COMP Dummy variable. Value of 1 indicates that the district has a comprehensive negotiation agreement, as opposed to negotiation procedures or no agreement at all.

Source: National Education Association, Negotiation Agreements Provisions for Teachers, 1972 Edition; Part I, Scope of Agreement and Association, Board and Trustee Rights Provisions, pp. 1-63. Only agreements in effect through 1969-70 were considered.

NEG Dummy variable. Value of 1 indicates that there is some kind of a negotiation agreement in the school district (comprehensive or procedural). Included are districts with agreements through 1969-70.

Source: National Education Association, Negotiations Agreements Provisions for Teachers, 1972 Edition; Part I, Scope of Agreement and Association, Board and Trustee Rights Provisions, pp. 1-45.

AFT Dummy variable. Value of 1 indicates that the recognized organization in districts with negotiation agreements (procedural or comprehensive) is the American Federation of Teachers. If districts recognize a combination of organizations that includes the AFT, then they are treated as AFT districts.

Source: National Education Association, Negotiation Agreements Provisions for Teachers, 1972 Edition; Part I, Scope of Agreement and Association, Board and Trustee Rights Provisions, pp. 1-45. Only districts with negotiation agreements through 1969-70 were considered.

NW Proportion of the population in the central city (or the county in five cases) that is non-white, 1970. According to the Bureau of the Census, "non-white" includes "Negro, Japanese, Chinese, Philipino, Indians and others".

Source: U. S. Bureau of the Census, Census of Population: 1970, General Population Characteristics, U. S. Summary, Table 66 for central cities; Nos. 11 and 35, Table 34 for the counties.

ENR Total enrollment (grades pre-kindergarten, kindergarten, 1-12, elementary and secondary unclassified and postgraduates) in the school district, Fall 1969, times the adjustment factor, in order to adjust to central city (or county in 5 cases).

Adjustment Factor = Public School Enrollment (grades 1 to 12) in the central city (or county) in 1970, according to the Census, divided by enrollment in the same grades in the school district, Fall 1969.

Source: U. S. Office of Education, Statistics of Local Public School Systems Fall 1969: Pupils and Staff, Table 2 for district enrollment.

U. S. Bureau of the Census, Census of Population: 1970, General Social and Economic Characteristics, Nos. 2-52, Table 83 for central cities and Table 120 for the counties.

POP Population, 1970. Data are for central cities, except in five cases where we used county data because of county-wide school districts. Included in central city data are "rural" areas of cities, as indicated by the census, in order to conform with district and property data.

Source: U. S. Bureau of the Census, Census of Population: 1970, Number of Inhabitants, U. S. Summary, Table 31 for central cities, Table 32 for counties.

ED Median school years completed by persons 25 years and older in the central city (or the county in five cases), 1970.
Source: U. S. Bureau of the Census, Census of Population: 1970, General Social and Economic Characteristics, U. S. Summary, Table 187 for central cities; Nos. 11 and 35, Table 43 for the counties.

INC Family median income. 1969 income of 1970 families in the central city, or county in five cases.
Source: U. S. Bureau of the Census, Census of Population: 1970, General Social and Economic Characteristics, U. S. Summary, Table 188 for central cities; Nos. 11 and 35, Table 44 for the counties.

POOR Percent of families in the central city (or county in five cases), below the poverty level, 1970. "Poverty level", as defined in the 1970 census, is a composite of several factors such as income, quality and condition of housing, level of nutrition, etc.
Source: U. S. Bureau of the Census, Census of Population: 1970, General Social and Economic Characteristics, U. S. Summary, Table 188 for central cities; Nos. 11 and 35, Table 44 for the counties.

POP DEN Population density per square mile, 1970. Central city or county population divided by the corresponding land area.
Source: U. S. Bureau of the Census, Census of Population: 1970, Number of Inhabitants, U. S. Summary, Table 31 for the central cities; Nos. 11 and 35, Table 9 for the counties.

HS High school enrollment (grades 9-12) as a percent of total enrollment (grades pre-kindergarten, kindergarten, 1-12, unclassified and postgraduates) in public schools, Fall 1969.
Source: U. S. Office of Education, Statistics of Local Public School Systems Fall 1969: Pupils and Staff, Table 2 (column 15 minus columns 16, 17, 23) and the result calculated as a percent of column 2. Data by school district.

PROP Market value of real property subject to local general property taxation per capita (1971), calculated as follows: The assessed value of all real property subject to local general property taxation (after deduction of partial exemptions and including state and locally assessed property) was divided by the aggregate assessment-sales price ratio of measurable sales of all types of real property, and the result divided by 1970 population.

All data are for central cities and, in five cases, for the county. However, certain adjustments had to be made in the case of central cities where the data were not available. We used county data. For multi-county central cities where data were available for only one "part" of the city (the main county) the market value of property was calculated, as described above. It was then multiplied by the ratio of central city population (POP) to the population of the geographical area in question (county or "part" of central city) to compute the adjusted market value.

Source: U. S. Bureau of the Census, Census of Governments: 1972, Volume 2, Taxable Property Values and Assessment Sales-Price Ratios, pt. 1, Table 4 for the assessed value, pt. 2, Table 11 for the assessment-sales price ratio.

COR I Percent of the gross assessed value of locally assessed taxable real property that is commercial and industrial, 1966.
Source: U. S. Bureau of the Census, Census of Governments: 1967, Vol. 2, Taxable Property Values, Table 19.

For 7 cities (Garden Grove, San Bernadino, and Ontario, Calif.; Schenectady, N.Y.; High Point, N.C.; Warren, Ohio; Harrisburg, Pa.) data were not available. Estimates were obtained by adjusting the available data on the percent commercial and industrial property in the county where the city belongs by the ratio of:

$$\frac{\text{\% commercial and industrial in all SMSA's in the state}}{\text{\% commercial and industrial in all counties that belong to SMSA's in the state}}$$

(Source for these estimates: Tables 7, 18, 19).

ST REV Percent of the revenue of the school district (1969-70) that came from the state. Federal funds distributed to districts through the state are not included.
Source: U. S. Office of Education, ELSEGIS III, Part B - Finances: 1969-70, Data Tape. Variable D on the tape as a percent of the sum of tape variables ($C + B_{14} + D + E_{15}$).

FED REV Percent of the revenue of the school district (1969-70) that came from the Federal Government. Included are federal funds distributed to districts through the state government. Only cash receipts are accounted for, not commodity receipts.
Source: U. S. Office of Education, ELSEGIS III, Part B - Finances: 1969-70, Data Tape. Variable E_{15} on the tape calculated as a percent of the sum of tape variables ($C + B_{14} + D + E_{15}$).

DEP Dummy variable. Value of 1 indicates that the school district is fiscally dependent, as opposed to fiscally independent from the local government.
Source: U. S. Bureau of the Census, Census of Governments: 1967, Vol. 4, No. 1, Table 8 and Vol. 5.

NO Number of operating school districts in the SMSA where the central city, or the county, is located, 1970.

This number is the sum of the number of operating districts in each component county (or part of county) of the SMSA. Included are all districts, even if an SMSA extends into more than one state.
Source: U. S. Bureau of the Census, Census of Population: 1970, Number of Inhabitants, Nos. 2-52, Table 13 and U. S. Summary, Table 32 for the SMSA component counties. U. S. Office of Civil Rights, Directory of Public Elementary and Secondary Schools, Fall 1968 and Directory of Public Elementary and Secondary Schools, Fall 1970, and

U. S. Office of Education, Education Directory: Public School Systems 1969-70 for the number of operating school districts in the SMSA component counties.

CCPOP/SMSA Population in the central city (or the county in five cases) where the school district is located, divided by the total population in the SMSA, 1970.
Source: U. S. Bureau of the Census, Census of Population: 1970, Number of Inhabitants, U. S. Summary, Tables 32 and 34.

CC ALL/SMSA Total central city population in the SMSA where the district is located, divided by total population in the SMSA, 1970.
Source: U. S. Bureau of the Census, Census of Population: 1970, Number of Inhabitants, U. S. Summary, Tables 32 and 34.

FEM Proportion of elementary and secondary teachers employed by local government in the SMSA who are female, 1970.
Source: U. S. Bureau of the Census, Census of Population: 1970, Detailed Characteristics, Nos. 2-52, Table 173.

POP CH Population change in the central city (or the county in five cases) from the 1960 to the 1970 Census.
Source: U. S. Bureau of the Census, Census of Population: 1970, Number of Inhabitants, U. S. Summary, Table 31 for central cities and Table 32 for the counties. The data were adjusted as follows: (.01 x percent population change 1960-1970) + 1.

NE Dummy variable. Value of 1 indicates that a city is in the North Eastern region of the U. S.
Source: U. S. Bureau of the Census method of classification.
North East = Conn, Me, Mass, NH, RI, Vt, NJ, NY, Pa.

SO Dummy variable. Value of 1 indicates that a city is in the Southern region of the U. S.
Source: U. S. Bureau of the Census method of classification.
South = Dela, DC, Fla, Ga, Md, NC, SC, Va, W. Va, Ala, Ky, Miss, Tenn, Ark, La, Okla, Tx.

WEST Dummy variable. Value of 1 indicates that a city is in the Western region of the U. S.
Source: U. S. Bureau of the Census method of classification.
West = Ariz, Colo, Idaho, Mont, Nev, N. Mx, Ut, Wyo, Alask, Calif, Haw, Ore, Wash.

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STATE DATA

The dependent variable:

W Average annual salary of all public elementary and secondary school teachers, 1969-70.

Source: National Education Association, Estimates of School Statistics, 1970-71 (includes revised 1969-70 data), Research Report 1970--R15, p. 32, Table 7, Col. 5.

The independent variables:

OC Opportunity cost for public school teachers calculated as follows: percent female public school teachers multiplied by median earnings of female registered nurses who worked 50 to 52 weeks in 1969, plus the product of percent male public school teachers and the median earnings in 1969 of males in professional, managerial and kindred occupation.

Source: National Education Association, Estimates of School Statistics, 1970-71, Research Report 1970--R15 (includes 1969-70 revised data), p. 30, Table 5, columns 5 and 6 as a percent of column 7. U. S. Bureau of the Census, Census of Population: 1970, General Social and Economic Characteristics, Nos. 2-52, Table 57 for median male earnings; Detailed Characteristics, Nos. 2-52, Table 176 for median earnings of nurses.

AG Median age of all employed elementary and secondary school teachers, 1970. All teachers are included, not only public school employees.

Source: U. S. Bureau of the Census, Census of Population: 1970, Detailed Characteristics, Nos. 2-52, Table 174 for the median age of teachers by sex and grade level. Variable 84 is the weighted average of these individual median ages, using the number of all employed male and female elementary and secondary teachers as weights (Table 173).

COMP Teachers (full-time only) in districts with comprehensive agreements in the state, as a percent of all public school teachers in the state, Fall 1970. Only districts with comprehensive agreements through 1969-70 are considered.

Sources: National Education Association, Negotiation Agreement Provisions for Teachers, 1972 Edition, Part I - Scope of Agreement and Association, Board and Teacher Rights Provisions, pp. 1-45 and 46-63 for the name of the districts with comprehensive agreements. U. S. Office of Civil Rights, Directory of Public Elementary and Secondary Schools, Fall 1970, and Office of Education, Directory of Public Elementary and Secondary Day Schools 1968-9, Volumes I-V, for the number of teachers in districts with comprehensive agreements. U. S. Office of Education, Statistics of Public Schools, Fall 1970, Table 3, p. 14, column 2 for the number of all public school teachers in the state, 1970.

NEG Professional instructional staff represented by an organization (NEA, AFT, etc.) for negotiation purposes in the state, as a percent of total instructional staff in all public schools in the state, 1969-70.

Source: National Education Association, Negotiation Research Digest, Volume 3, No. 10, June 1970, Table D-1, page 31, column 2 for the number of instructional staff represented. National Education Association, Estimates of School Statistics 1970-71 (includes revised data for 1969-70), Research Report 1970--R15, p. 30, Table 5, column 11 for the number of all staff.

AFT Professional instructional staff represented by American Federation of Teachers for negotiation purposes, as a percent of total instructional staff in the state, 1969-70.

Source: National Education Association, Negotiation Research Digest, Vol. 3, No. 10, June 1970, Table D-1, col. 6 for the number of instructional staff represented by AFT. National Education Association, Estimates of School Statistics, 1970-71, (includes revised 1969-70 data), Research Report 1970--R15, p. 30, Table 5, col. 11 for the number of instructional staff.

NW Percent of the population that is non-white, 1970. "Non-white" includes "Black, Japanese, Chinese, Filipino, Indians and others" according to the census.

Source: U. S. Bureau of the Census, Census of Population: 1970, General Population Characteristics, U. S. Summary, Table 60.

ENR Enrollment in public elementary and secondary schools in the state, Fall 1969.

Source: U. S. Office of Education, Statistics of Public Schools, Fall 1969, Table 6, p. 16, column 2.

POP Population by state, 1970.

Source: U. S. Bureau of the Census, Census of Population: 1970, Number of Inhabitants, U. S. Summary, Table 14.

ED Median school years completed by persons 25 years and older in 1970.

Source: U. S. Bureau of the Census, Census of Population: 1970, General Social and Economic Characteristics, Nos. 2-52, Table 43.

INC Median Family Income in the state (1969 income of 1970 families).

Source: U. S. Bureau of the Census, Census of Population: 1970, General Social and Economic Characteristics, Nos. 2-52, Table 44.

POOR Percent of families below the poverty level in the state, 1970. "Poverty level" is defined by the Census as a composite of many characteristics such as income, quality and condition of housing, nutritional level of family, etc.

Source: U. S. Bureau of the Census, Census of Population: 1970, General Social and Economic Characteristics, Nos. 2-52, Table 44.

URB Percent of the population in the state that is urban, 1970. Indicates population living in "central cities" and "other urban areas" as defined by the Census.

Source: U. S. Bureau of the Census, Census of Population: 1970, Number of Inhabitants, U. S. Summary, Table [illegible].

HS Public high school enrollment (grades 9-12 and secondary unclassified) as a percent of total public school enrollment in the state, Fall 1969.

Source: U. S. Office of Education, Statistics of Public Schools, Fall 1969, Table 6, pp. 16-7, column 14, minus column 20, as a percent of column 2.

PROP Market value of real property subject to local general property taxation (1971) per capita, calculated as follows: The assessed value (after deduction of partial exemptions) of locally and state assessed real property subject to tax was multiplied by 100 and the result divided by the percent of assessed value to sales price of sold properties (aggregate assessment-sales price ratio) to obtain the market value of state and locally assessed real property; this was then divided by the population (POP).

Sources: U. S. Bureau of the Census, Census of Governments: 1972, Vol. 2, Taxable Property Values and Assessment-Sales Price Ratios, pt. 1, Table 4 for the assessed value, pt. 2, Table 2 for the assessment-sales price ratio.

C or I Percent of the gross assessed value of locally assessed taxable real property that is Commercial and Industrial, 1966.

Source: U. S. Bureau of the Census, 1967 Census of Governments, Volume 2, Taxable Property Values, Table 5, pp. 35-6.

ST REV Percent of the revenue of public elementary and secondary schools in the state that came from state sources, 1969-70. Federal funds distributed to schools through the state are not included.

Source: National Education Association, Estimates of School Statistics, 1970-71 (includes revised 1969-70 data), Research Report 1970--R15, p. 34, Table 9, col. 3 as a percent of sum of columns 2 + 3 + 4.

FED REV Percent of the revenue of public elementary and secondary schools in the state that came from federal sources, 1969-70. Includes federal funds distributed to schools through the state government.

Source: National Education Association, Estimates of School Statistics 1970-71 (includes 1969-70 revised data), Research Report 1970--R15, p. 34, Table 9, column 2 as a percent of sum of columns 2 + 3 + 4.

FEM Percent of public elementary and secondary school teachers in the state who are female, 1969-70.

Source: National Education Association, Estimates of School

Statistics, 1970-71 (includes revised 1969-70 data), Research Report 1970--R15, p. 30, Table 5, columns 5 and 6 as a percent of column 7.

POP CH Population change from the 1960 to the 1970 Census.
Source: U. S. Bureau of the Census, Census of Population: 1970, Number of Inhabitants, U. S. Summary, Table 15. The data were adjusted as follows: (.01 x percent population change 1960-70) + 1.

NE Dummy variable. Value of 1 indicates that a state is in the North Eastern region of the U. S., as defined by the U. S. Bureau of the Census.

North East = New England (Conn, Me, Mass, NH, RI, Vt) plus Middle Atlantic Division (NY, NJ, Pa).

SO Dummy variable. Value of 1 indicates that a state is in the Southern region of the U. S. as defined by the U. S. Bureau of the Census.

South = South Atlantic Division (Dela, DC, Fla, Ga, Md, NC, SC, Va, W. Va) plus East South Central Division (Ala, Ky, Tenn, Miss) plus West South Central Division (Ark, La, Okla, Tx).

WEST Dummy variable. Value of 1 indicates that a state is in the Western region of the U. S. as defined by the U. S. Bureau of the Census.

Western Region = Mountain Division (Ariz, Colo, Idaho, Mont, Nev, N. Mx, Ut, Wyo) plus Pacific Division (Alaska, Haw, Calif, Ore, Wash).

COMP School districts with comprehensive negotiation agreements as a percent of all operating school districts in the state, 1969-70.
Source: U. S. Office of Education, Statistics of Public Schools, Fall 1969, Table 2, p. 9, column 3 for the number of all operating school districts in each state. National Education Association, Negotiation Agreement Provisions for Teachers, 1972 Edition, Part I, Scope of Agreement and Association, Board and Teacher Rights Provisions, pp. 1-63 for the number of districts with comprehensive agreements.

APPENDIX B

MEANS AND STANDARD DEVIATIONS OF THE VARIABLES

CITY DATA

Variable	Mean	Standard Deviation
W	$8,465	$986
OC	$8,021	$683
MA	28.77%	10.16%
AG	35.59 years	1.79 years
COMP	0.4578	0.5012
NEG	0.7952	0.4060
AFT	0.2169	0.4146
NW	19.79%	12.54%
ENR	103,455	155,977
POP	553,024	974,297
ED	11.70 years	0.73 years
INC	$9,480	$943
POOR	10.62%	3.10
POP DEN	5,778.11	4,573.75
HS	27.86%	4.42%
PROP	$8,809	$2,[illegible]
C or I	32.20%	10.[illegible]
ST REV	35.67%	12.33%
FED REV	8.37%	3.51%
DEP	0.2771	0.4503
NO	31.40	32.25
CC POP/SMSA	39.98%	23.55%
CC ALL/SMSA	45.73%	16.34%
FEM	70.21%	5.72%
POP CH	1.1235	0.2915
NE	0.1807	0.3871
SO	0.2771	0.4503
WEST	0.2410	0.4303

STATE DATA

Variable	Mean	Standard Deviation
W	$8,075	$1,073
OC	$7,674	$897
AG	36.95 years	1.79 years
COMP	22.91%	24.92%
NEG	40.69%	27.57%
AFT	5.13%	9.22%
NW	10.42%	8.85%
ENR	941,963	940,009
POP	4,195,540	4,361,410
ED	11.82 years	0.68 years
INC	$9,051	$1,379
POOR	11.75%	5.27%
URB	65.59%	14.14%
HS	28.67%	1.49%
PROP	$9,632	$2,873
C or I	22.63%	6.43%
ST REV	40.04%	14.56%
FED REV	8.84%	4.58%
FEM	67.92%	5.69%
POP CH	1.1310	0.1259
NE	0.1875	0.3944
SO	0.3333	0.4764
WEST	0.2292	0.4247
COMP'	8.99%	16.49%