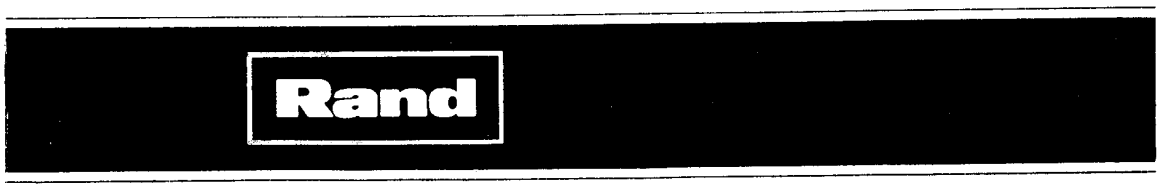
The Financial Condition of Teacher Retirement Systems

Richard B. Victor
with the assistance of
Sara R. Pease



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PREFACE

This report was produced under a research contract from the National Institute of Education, U.S. Department of Health, Education, and Welfare. Its purpose is to inform educational policymakers about the financial condition of teacher retirement systems (TRSs). The report describes the problem of assessing TRS financial condition, ranks the various systems according to crude indicators of financial condition, and suggests research to improve the ability to assess TRS financial condition in the future.

Although jargon—special language—inevitably pervades discussions of retirement systems, its use has been held to a minimum in this report. Upon first appearance, technical terms are briefly defined. More complete explanations of these terms are contained in a companion study, N-1519-NIE, *The Characteristics of Teacher Retirement Systems*, by Sara R. Pease, November 1980. For more technical discussions of these concepts, the reader is referred to any basic actuarial text.

This report benefited from the helpful comments of Rand colleagues Richard Fernandez, Craig Foch, Thomas K. Glennan, and Aaron Gurwitz.

SUMMARY

The financial condition of public employee retirement systems, including teacher retirement systems (TRSs), has become a matter of public concern, intensified by recent debate over the future of the Social Security System and the very critical report of the Congressional Pension Task Force. Many observers suspect serious problems in TRSs although they have little systematic evidence to go on because of the technical difficulty of assessing TRS financial condition.

This report provides some basic data about TRS financial condition. It reviews how to assess TRS financial health, discusses the serious empirical problems that impede accurate assessment, suggests several lines of research to improve assessment capability, and brings together published data on TRS financial health.

ASSESSING FINANCIAL CONDITION

The financial condition of any organization is determined by its ability to meet its current and future financial obligations. In principle, that criterion applies to TRSs, but there are additional complexities. First, unlike firms or governments, TRSs have no independent revenue-raising authority; instead they must rely on state and local government contributions. Second, there are competing claimants for limited state and local revenues: other public employees, consumers of public services, recipients of transfer payments, and the like. Consequently, assessing the financial condition of TRSs is tantamount to assessing the ability of the underlying state and local governments to keep their pension promises in light of their revenue-raising capacity and nonpension claims on revenues. It follows that *the assessment of TRSs' financial health must transcend examination of the balance sheets of individual retirement systems.*

EMPIRICAL PROBLEMS IN ASSESSMENT

Assessing TRS financial condition, although conceptually straightforward, presents many difficult empirical problems. Aside from serious data deficiencies, the difficulty of projecting financial variables 30 or more years into the future gives rise to the thorniest problems:

- The uncertainty inherent in long-range projections of TRS obligations, and of state and local government expenditures and revenue-raising capacity.
- An inadequate understanding of the process by which public revenues and expenditure levels are determined.
- The absence of reliable estimates of a wide variety of known relationships on which to base projections.

Given these problems, accurate and comprehensive assessments are currently impractical. For now, the best we can hope to do is to reduce imprecision by improving our qualitative and quantitative understanding of the underlying relationships.

The most serious problems would disappear, however, if TRSs would change the way in which they promise benefits. Currently, all of them base promised benefits on expected future salary levels and career length. This "defined benefit approach" requires long-term assumptions about variables that are difficult to forecast, such as the rates of salary increase, turnover rates, retirement rates, investment earnings, and the like. If TRSs promised benefits on the basis of the *actual contributions* made by employees and employers during the employee's career—the "defined contribution approach"—these empirical problems would disappear and TRS financial condition would be much easier to assess. The salient question would then become benefit adequacy; and problems of inadequate benefits may be more easily remedied ex post than are problems of inadequate financial health.

INDICATORS OF FINANCIAL CONDITION

As long as TRSs remain defined benefit plans, with their attendant empirical problems, assessments must rely on crude indicators of financial condition. We use three such indicators to compare the financial statistics of TRSs and their underlying jurisdictions:

- Balance-sheet indicators
- Debt-related indicators
- Ability-to-pay indicators

Caveat: For some systems, it may be misleading to compare actuarially derived measures of TRS financial condition across systems, because of differences in actuarial assumptions, asset valuation techniques, and costing and funding methods.

For each indicator, we list the systems that appear much better off and worse off than the average system—the extreme quartiles. These are indicators of *relative* financial position. Since we cannot determine

the absolute financial condition of the average system, we cannot say that those in the lowest quartile are in financial trouble; yet if any are in financial trouble, they are likely to be among those listed in the lowest quartile.

Balance-Sheet Indicators

The estimated *unfunded liabilities* (the excess of liabilities over assets) of TRSs total $60 billion and are probably much greater; however, we cannot say whether or not this is excessive. Individual systems' unfunded liabilities (UFLs) range from $309 to $55,299 per member. The figure for the median system is $8,903. Local TRSs have larger UFLs per member than state TRSs.

Debt-Related Indicators

The median state would have to contribute $60 annually per student to fully amortize school employee UFLs (over 30 years at 8 percent interest). These *amortization payments* range from $2 per student in New Hampshire to $231 in New York. Amortizing UFLs in this way would require more than 10 percent of current school operating expenditures in at least five states (Indiana, California, Rhode Island, Louisiana, and Washington).

Unfunded pension obligations (pension debt) are only one form of debt incurred by or on behalf of state and local governments. Governmental units regularly issue debt instruments (market debt) to finance construction and other expenditures. Some states incur heavier pension debt; others accumulate relatively more market debt. As total school borrowing (pension and market) increases, the proportion "borrowed" from pension funds by underfunding increases rapidly.

Ability-to-Pay Indicators

A large pension and market debt does not necessarily mean that a state has problems; the state may have adequate capacity to handle the debt. The states whose future promises to contribute to TRSs are suspect are the ones that lack that capacity. As a crude indicator of which states deserve further scrutiny, we examine state *debt-equity ratios* (the proportion of the market value of property that is burdened by pension and market debt). The median state has "mortgaged" 2.8 percent of its property as school debt, but several states have mortgaged more than twice that amount. We also examine the debt-equity ratio

for all state and local debt plus school-employee UFLs. By this measure, the median state has "mortgaged" 10 percent of its property to the state and local sector. The eastern states have burdened more of their future revenues than have their western counterparts. Two states have encumbered far more of their tax bases than the others—Alaska (32 percent) and New York (35 percent)—but there are crucial differences between the two. Alaska is growing rapidly; it is borrowing to build for the future. New York is not growing very rapidly; one suspects it is borrowing to pay for the past.

Implications of Future Trends

Political, economic, and demographic trends may improve or worsen states' debt positions. These trends include declining enrollments, inflation, fiscal limitation, and interregional population migration. Of the 18 states with the highest debt-equity ratios, nearly 40 percent are growing slower than the national average; more than half have experienced enrollment declines greater than the national average; nearly half make automatic annual cost-of-living adjustments in benefits (typically 2 to 4 percent) and are more vulnerable to inflation; and in 9 of those states, revenue-raising capacity is limited by state or local fiscal limitation, or both. In 6 of those states, three or more adverse trends have converged (California, Indiana, Michigan, Nebraska, Ohio, and Rhode Island). New York deserves special scrutiny even though it has neither automatic post-retirement cost-of-living adjustments nor fiscal limitation, because its debt-equity ratio is so large (.35 versus a median of .10) and its growth rate is so low (0.8 versus a median of 4.0). Unanticipated inflation may be the saving grace for TRSs that might otherwise suffer financial problems with capped benefit adjustments for inflation: Because tax bases (and hence revenues) increase faster than pension obligations, such TRSs' financial condition will improve in real terms. Only Maryland passes on the entire change in the cost of living to its retirees.

RESEARCH DIRECTIONS

To improve the ability to assess TRS financial condition, future research should focus on:

- Improving actuarial assumptions to improve estimates of benefits owed by TRSs;

- Measuring the absolute fiscal capacity of state and local government;
- Estimating time-series determinants of state and local expenditures;
- Understanding state and local government borrowing behavior; and
- Analyzing the effect of inflation on each of the above.

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I. INTRODUCTION

This is a study of the financial condition of teacher retirement systems (TRSs). By this we mean state and local government retirement systems that include public elementary and secondary school teachers as members. It describes the problem of assessing the financial condition of these systems, brings together published information on their financial health, and suggests several lines of research to improve the ability to assess TRS financial condition. The study is intended primarily for educational policymakers at all levels of government who are concerned about the continued capacity of state and local governments to provide current or expanded levels of educational services, in light of the burdens placed on future revenues by retirement costs.

Substantial recent concern has been expressed about the financial condition of public employee retirement systems, including TRSs. Many states have commissioned extensive studies of their systems.[1] At the federal level, Congress exempted public employee retirement systems (PERSs) from the Employee Retirement Income Security Act (ERISA) of 1974—a wide-ranging effort to regulate the conduct of retirement plans in the private sector and guarantee the integrity of benefits promised thereunder.[2] At the same time, Congress mandated a study of current PERS financing and fiduciary standards and an assessment of the need for federal legislation and standards. After two years of study, the Congressional Pension Task Force concluded that there is a need for reform of disclosure, reporting, fiduciary, and funding practices.[3]

If financial problems arise for TRSs, the consequences could be serious. Not only do these systems involve enormous sums of public monies (assets exceed $50 billion), but also the retirement security of more than 4 million teachers depends upon the financial integrity of TRSs. Financial problems could produce rising pension costs, thus burdening state and local revenues, necessitating cuts in services, increases in taxes, or reductions in benefits, and hastening the decline of certain areas already in fiscal trouble. Moreover, financial problems

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[1]See, for example, Kentucky Legislative Research Commission, *An Analysis of Retirement and Benefit Plans for Kentucky State Employees,* Research Report No. 128, October 1975; and Office of Fiscal Affairs, New Jersey State Legislature, *New Jersey's Contributing Public Employee Pension Programs,* March 1976.

[2]P.L. 93-406. For a succinct legislative history and excellent summary of this lengthy and complex legislation, see McGill (1978), pp. 33-57.

[3]U.S. House of Representatives (1978), pp. 1-4.

could threaten the retirement expectations of teachers and disrupt the nation's capital markets, in which public pension funds are significant investors and public bodies are significant borrowers.

Such concern about TRSs is not new.[4] It has become more urgent, however, with the confluence of alleged current funding problems and several political, economic, and demographic developments. Unanticipated inflation, declining enrollments, fiscal limitation, and migration from the "Snowbelt" to the "Sunbelt" may accelerate the deterioration of any marginal systems. Consequently, there is an urgent need to assess the financial condition of TRSs and identify which systems are likely to experience financial distress, and when.

Early diagnosis of TRS financial problems is critical. Many current decisions have *long-run implications* for pension costs and the financial condition of TRSs. For example, a benefit improvement awarded to a youthful teaching force will engender relatively small current costs but substantial future costs as the teaching force ages. A decision to less than fully fund the normal cost of accruing benefits will generate unfunded liabilities (UFLs) that cannot be readily repaid in a single year but must be amortized with long-term cost consequences.

If these promised benefits and associated costs could be easily rescinded as they came due, early diagnosis would be less critical. Once benefit levels are established, however, the costs are *difficult to reverse.* In many jurisdictions, retirement benefits are afforded at least some degree of constitutional protection.[5] Even in those instances where they are permissible, retrospective benefit reductions are likely to encounter substantial political resistance. As a corollary, where prospective benefit reductions are achieved, the improvement in financial condition would be *realized only several decades later,* with a substantial turnover in the system's teaching force. Unless financial problems are diagnosed early, they may be difficult to avoid.

Unfortunately, little is known about TRS financial condition. Although most systems undergo regular actuarial valuations, these are assessments of financial condition in only a very limited sense. More comprehensive assessment is needed.

Comprehensive assessments are difficult, however. Accordingly, Sec. II below takes a first step by reviewing how they might be obtained in the future, and discusses some of the more formidable empirical problems. Section III, on the basis of published data, presents several empirical indicators of TRS financial condition and identifies the systems that are "worse than average" by each indicator. Then the effects

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[4]Commission on Pensions, City of New York (1916).

[5]For a discussion of constitutionally based restrictions on the impairment of public employee retirement benefits, see *Harvard Law Review* (1977), pp. 992-1005.

of inflation, declining enrollment, growth and decline, and fiscal limitation are appraised. Throughout the report, we suggest additional research to improve the ability to assess TRS financial condition. These suggestions are summarized in Appendix C.

II. ASSESSING THE FINANCIAL CONDITION OF TEACHER RETIREMENT SYSTEMS

Although assessing TRS financial condition is conceptually straightforward, it presents many difficult empirical problems. Aside from serious data deficiencies, the thorniest problems arise from the difficulty of projecting financial variables 30 or more years into the future.

In this section, we first describe the conceptual problem of assessing TRS financial condition. In doing so, we conclude that assessments must look beyond TRS balance sheets to the capacity of state and local governments to make their promised contributions to TRSs. Next, we describe several of the more formidable problems of projecting the values needed for a comprehensive assessment. We also describe how TRSs might avoid the most serious empirical problems by changing the way in which they make benefit promises. We conclude this section with a note on TRSs and intergenerational transfers.

DETERMINING FINANCIAL CONDITION

The financial condition of any organization is determined by its ability to meet its current and future financial obligations. In principle, that criterion applies to TRSs, but there are additional complexities. First, unlike business firms or governments, TRSs have no independent revenue-raising authority; instead they must rely on state and local government contributions.[1]

To assess the financial condition of a TRS, its obligations are compared with its current reserves and state or local government promises for future contributions. That is, one condition that a TRS must meet is:

$$P_T \leq A + C \qquad (1)$$

[1]Our discussion is directed to state-level TRSs; local systems are treated by analogy. We ignore employee contributions to the retirement system. There are obvious limits to the proportion of salary that employers can require employees to contribute. These limits are affected by the time preference of the employee, alternative market opportunities, the rules and rates governing the taxability of salaries, pension contributions, pensions and other income, and the political strength of the employees.

where P_T = present value of current and future TRS benefit payments;
A = current assets; and
C = present value of promised contributions.

As a rule, most TRSs choose a value for "C"—promised future contributions—that exactly satisfies the equality condition in Eq. (1). (Systems that fail to meet the condition in Eq. (1) are implicitly promising to increase contributions in the future.)

However, the financial condition of a system that passes this test is only as good as the integrity of the promises by underlying jurisdictions to contribute. These promises are suspect if the various claims on future state and local revenues exceed the ability to pay these claims; that is, if:

$$R < P_{NT} + X \tag{2}$$

where R = present value of maximum current and future revenues of state and local governments;
P_{NT} = present value of net (unfunded) current and future TRS pension benefits ($P_T - A$); and
X = present value of other current and future expenditures by state and local governments.

Therefore, *the assessment of TRS financial health must transcend the balance sheets of individual retirement systems and examine the ability of the promisors (state and local governments) to make the promised contributions.* In the remainder of this section, we describe the elements of Eq. (2): TRS pension obligations, other state and local expenditures, and revenue-raising capacity.

Pension Obligations

How are promised retirement benefits valued? Before answering this, we distinguish between two often confused concepts of cost: the value of pension *obligations* and the value of pension *contributions.* While "costs" could refer to either, we use "costs" to mean the value of obligations; we use "contributions" to mean monies paid into the retirement system accounts. Actuaries are commonly concerned with both obligations and contributions. First, they estimate the present value of benefit obligations (pension costs); then they distribute this cost over some time period, determining the path of contributions necessary to fund the obligations.

Actuaries use a variety of approaches to value pension obligations (see Pease (1980), Sec. IV). Within each approach, a large number of variations are possible. In the following discussion, we oversimplify actuarial methodology in order to describe the basic structure of how pension obligations are valued.

We define retirement costs as the present value of the stream of benefits that the retirement system expects to pay:[2]

$$V = \sum_{t=0}^{T} E(B_t)\,(1 + r_t)^{-t} \tag{3}$$

where V = retirement costs;
$E(B_t)$ = expected benefit payments in year t;
r_t = discount rate;
T = arbitrary time horizon for assessment (e.g., 30 years).

The discount rate is merely the interest rate the TRS expects to earn on its assets in each year. (Actuaries assume a constant interest rate over the entire assessment period.) Expected benefits is the aggregate amount in each year that the TRS expects to pay to retirees. Computing expected benefits is quite complex. While the computations are not reviewed here, the major elements are of interest to us. They are:

- The benefit formula
- Actuarial assumptions about:
  - Salary
  - Career length
  - Inflation
  - Duration of retirement
  - Rate of return on assets
- Employee characteristics.

The annual benefit that a retiree receives is determined by a TRS *benefit formula.* There are nearly as many formulas as there are systems (see Pease (1980), Sec. III). Most relate benefits to the retiree's salary and career length, in the following way:

$$B_t = \alpha \times SAL \times EXP \tag{4}$$

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[2]We limit our analysis to annual retirement benefits. TRSs also pay survivor benefits, disability benefits, etc., which we ignore here. See Pease (1980), Sec. III.

where α = benefit parameter;[3]
SAL = salary prior to retirement;
EXP = service credits.[4]

At retirement, the annual amount that the TRS must pay for each retiree is certain (in a world of stable prices or no cost-of-living adjustments). It is determined from the benefit formula, given the retiree's salary and service credits. Prior to retirement, however, the TRS must project what the salaries and service credits of future retirees will be for each year during the next 30 years or more. Traditionally, these projections are made by actuaries and are called *actuarial assumptions*. Some assumptions may be analytically derived; others are best guesses. In addition to assumptions about the rate of change of salaries, the TRS must make assumptions about when and how many members will end employment (by retirement, termination, death, disability, and voluntary separation), take extended leaves of absence, and enter with eligible service credits. Taking the current characteristics of the employees (age, sex, salary, service credits, etc.), actuaries apply these and other assumptions to estimate what the characteristics (salary and service credits) of retirees will be in each future year. These characteristics are inputs for the benefit formula in determining expected benefits.

Many systems also adjust benefits upward in post-retirement years to offset the effects of inflation. Benefits are usually increased by some cost-of-living factor (θ) that is less than the change in the Consumer Price Index (CPI):

$$B^*_t = (1 + \theta_{t-1})B_{t-1} \tag{5}$$

where $t = R, R + 1, \ldots, D$;
D = age at death;
R = age at retirement.

To value adjusted benefits (B^*_t), assumptions must be made about post-retirement adjustments for *inflation*.

While the benefit formula determines annual benefits for retirees, total retirement costs depend upon the number of years these benefits are collected. Additional actuarial assumptions are made about the *duration of retirement*. Both retirement age and mortality probabilities must be estimated.

To review, the TRS estimates retirement costs by estimating benefit obligations in each of the next 30 or more years. To do so, it brings together a large number of factors, many of whose values are uncertain.

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[3]Typically $.017 < \alpha < .025$; see Pease (1980), Sec. II.

[4]That is, credits for years teaching in state plus time spent in other eligible activities (e.g., military service, teaching in other states). See Pease (1980), Sec. III.

Using the assumed rate of return on TRS assets, these annual sums are discounted to produce a single-valued estimate of TRS retirement obligations. This estimate is only as good as the underlying assumed values.

Other State and Local Expenditures[5]

TRS obligations are only one of many potential claims on current and future government revenues. Other claims include the present values of:

- Expenditures on public services (S_0);
- Debt service payments and repayments of outstanding debt (D_0);
- Promised contributions toward pension obligations in other retirement systems (P_0); and
- Expenditures on account of deferred maintenance (M_0^F).

The present value of these non-TRS claims (X_0) is given in Eq. (6):

$$X_0 \equiv S_0 + D_0 + P_0 + M_0 \tag{6}$$

Together, unfunded TRS pension obligations (P_{NT}) and X_0 comprise the present value of all claims on current and future government revenues.

Revenue-Raising Capacity

State and local government revenues are raised from a variety of sources: property, sales, income, and excise taxes; user fees; and intergovernmental grants. Taxes are levied by multiple levels of government. In this discussion we assume a homogeneous tax base and single

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[5]The expenditure and revenue-raising decisions of the state and multiple local governments must be considered in assessing the financial condition of state TRSs. The large number of governmental units adds markedly to the conceptual complexity and empirical difficulty of such assessments. Our ultimate concern is the ability of each to pay its pro rata share of promised pension contributions. To assess this, we are interested in projections of the non-TRS expenditures for each governmental unit. We are similarly interested in the revenue-raising capacity of each; however, these measures are not independent across jurisdictions. Tax increases in one locality may increase the revenue-raising capacity of lower-taxing locations. Moreover, states and localities potentially levy against the same tax base.

The multiple units of governments and their interdependence add immeasurable complexity both to modeling efforts and to estimating the underlying structural relationships. For the purposes of this report, we assume that a single unit of government is responsible for expenditure and revenue-raising decisions in each state. As a result, the conceptual discussion becomes straightforward. Yet even with this strong simplifying assumption, the empirical problems remain formidable.

tax rate. In principle, the analysis can be extended to multiple levels of government and revenue sources, but it becomes far more complex. In any year, revenues (R_t) for a governmental unit are the product of the tax rate and tax base:

$$R_t = \gamma_t B_t \tag{7}$$

where γ_t = tax rate in t;
B_t = tax base in t.

We are interested in the maximum amount of revenue that a state or local government can raise. While economists have had great difficulty measuring the absolute fiscal capacity of governmental units, Gurwitz (1977) proposes the following sensible conceptualization of absolute fiscal capacity. In the short run, states can tax away all of the tax base that exceeds a minimum subsistence level for residents and business. In the long run, however, such a tax policy cannot be sustained, because residents and business will flee to lower-taxing jurisdictions and potential entrants will be discouraged. In the long run, there exists an intertemporal schedule of tax rates (γ^*_t) that maximizes the present value of governmental revenues. Gurwitz calls these the long-run revenue-maximizing (LRRM) tax rates.

- For tax rates greater than the LRRM rate ($\gamma_t > \gamma^*_t$), the gain in revenue from higher rates is exceeded by the lost revenue from a shrinking tax base, so it pays to lower taxes.
- For tax rates less than the LRRM rate ($\gamma_t < \gamma^*_t$), the loss in revenue from lower rates is not fully offset by growth in the tax base that results, so it pays to increase taxes.

The tax base changes in response to tax rates for two reasons. First, higher taxes reduce the supply of the factors that bear the tax. For example, a tax borne by labor results in a decline in the supply of labor. A tax borne by capital reduces the incentives to build "high rises," for example. Reducing the supply of factors reduces the level of economic activity in the jurisdiction—hence, the tax base. Second, higher differential taxes lead some residents and businesses to locate in lower-taxing jurisdictions, reducing economic activity in the higher-taxing jurisdiction—hence, its tax base. (A differential tax is the tax rate difference between two jurisdictions.) These tax-base changes in response to tax-rate changes are measured by the "elasticity of the tax base with respect to the tax rate."

If we know the exogenous determinants of the tax base and the elasticity of the tax base with respect to the tax rate, we can determine the LRRM tax rates (γ^*_t) and tax base in each period. From the tax rates

and tax base, we can compute the maximum present value of revenue raised—that is, the revenue-raising capacity of a jurisdiction.

With this information, we can compare revenue-raising capacity with TRS and other claims on revenues. If total claims exceed the ability to pay, the state's choices include any one or a combination of the following:

- Cut promised TRS pensions.[6]
- Default on debt.
- Cut other promised pensions.
- Cut services.

Note that where claims exceed revenues in the long run, *raising taxes to raise additional money in the short run has the net effect of reducing revenue in the long run, making the shortfall even greater in the long run.*

EMPIRICAL PROBLEMS: PROJECTING TRS OBLIGATIONS, OTHER EXPENDITURES, AND REVENUES

In view of concerns about TRS financial condition and the potentially serious consequences of financial distress, assessments of TRS financial condition are imperative. Attempts to appraise TRS financial health, however, encounter many formidable empirical problems. The most difficult are:

- The uncertainty inherent in long-range projections of TRS obligations, and of state and local government expenditures and revenue-raising capacity.
- Inadequate understanding of the process by which public expenditure and revenue levels are determined.
- Absence of reliable estimates of a wide variety of known relationships on which to base projections.

Given these problems, accurate and comprehensive assessments are currently impractical. For now, the best we can hope to do is to reduce the imprecision of our assessments by improving our qualitative and quantitative understanding of the underlying relationships.

Projections of anything 30 or more years into the future strains the credibility of social science research for most problems. While projections are always subject to error, they are likely to be more precise

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[6]This may not be a lawful option. See *Harvard Law Review* (1977), pp. 992-1005, for a discussion of restrictions on impairment of retirement benefits.

where, inter alia, the projection period is shorter; the underlying relationships are simpler and better understood; and the relationships are historically stable and expected to remain so.

Projecting pension obligations, other state and local expenditures, and revenue-raising capacity requires us to identify and quantify a large number of interrelated factors. While many are theoretically well understood, economic and political theory provides little guidance with respect to others. While some are empirically well specified, others are not and await additional empirical research. While some have been stable, others are historically unstable or are expected to change during the projection period. As a result, a few parameters and variables of interest can be reliably forecast for the long run (e.g., mortality); others can be forecast with relative confidence in the short run—say, five years—but not in the long run (e.g., salaries, retirement rates); however, some are unknown even in the short run (e.g., tax rate elasticity of the tax base).

Pension Obligations

To project pension obligations, we must project, for each of the next 30 years or more, such values as:

- Employee salaries;
- Career length (turnover rates, retirement decisions);
- Mortality rates;
- Investment rates of return;
- Inflation.

Mortality rates, while historically declining in the United States, are not subject to sudden fluctuation and, of the many required data, can be most reliably projected for the long run. The other variables are either subject to large fluctuations, or are products of imperfectly understood relationships, or both. For example, there is a substantial theoretical and empirical literature on the determinants of state and local government employee salaries.[7] Salaries are related to market conditions (supply and demand), and the strength of unionism in the jurisdiction. Estimates of the qualitative relationships are largely based on single-year cross-sections. As such, they provide useful guidance for short-run projections, at best. Therefore, despite the availability of these cross-section estimates, our ability to make long-run projections of salaries is limited. First, cross-section results provide little insight into the stability of the parameter estimates over

[7]For a review, see Victor (1977), Sec. II.

time. Second, market conditions are subject to large fluctuations over the next 30 years. And finally, the cross-section estimates are based on data from years of relatively stable prices and widespread growth in real fiscal capacity. More recently, we have seen rapidly rising price levels and real decline or slow growth for some jurisdictions. The reliability of the estimates in light of changed conditions limit the utility of the salary-determinants literature for projections.

Similar problems afflict projections of the other variables. While retirement and turnover rates, for example, can be modeled using neoclassical economic theory, the underlying determinants are not always well specified. They can be estimated from the historical experience of the TRS, but the stability of the relationships is questionable, in light of current levels of inflation and slow growth in some jurisdictions. Moreover, recent attempts to project the rate of inflation, even in the short run, have proven unreliable. Long-run projections, at this stage of development of a theory of inflation, are rarely attempted. Yet the effects of sustained inflation pervade many relationships. Our still rudimentary theoretical and empirical understanding of the genesis and effects of inflation seriously undermines confidence in any long-run projections.

The current state of the art is of limited use in formulating accurate actuarial assumptions about the future. Additional research may improve our ability to estimate future pension obligations. This reseach includes:

- Time-series estimates of salary determinants;
- Theoretical and empirical work on the effects of inflation on salaries, turnover rates, retirement decisions, and rates of return; and
- Empirical work testing the symmetry of the salary determinants, retirement decisions, and turnover rates in periods of growth and decline.

State and Local Expenditures

Other claims on state and local revenues are expenditures for goods and services, debt (with interest), non-TRS pension obligations, and deferred maintenance. Among those components, the largest is expenditures for goods and services; it is also the most complex to project, conceptually and empirically. The substantial theoretical and empirical work on public sector expenditure determinants provides a solid beginning for projections.[8] The theoretical literature proceeds from a

[8]For a review of this literature, see Barro (1978), Sec. VI.

constrained maximization framework. It concludes that state and local government expenditures are related to decisionmaker and community tastes, income, intergovernmental grants, and input prices. To project expenditures many years into the future, we need future values of these exogenous determinants as well as estimates of the current and future relationships between expenditures and the exogenous determinants. As to the first, we can only acknowledge the uncertainty inherent in any long-run projections; as to the latter, the estimates available in the literature are of limited utility for projections for several reasons. First, like the salary determinants estimates, expenditure determinants estimates are largely the product of single-year cross-sections. The stability of these relationships for projections is suspect—especially in light of current levels of inflation and slower growth or decline in fiscal capacity for some areas. Second, most work examines general local governments or school districts; little work has been done on the expenditure behavior of state governments.[9]

Despite the substantial theoretical and empirical base on expenditure determinants, further research could materially improve the ability to forecast expenditures. This research includes:

- Time-series estimates of expenditure determinants.
- Estimates testing the symmetry of the underlying relationships during growth and decline.
- Estimates of the effects of inflation on expenditures.
- Estimates of state expenditure determinants.
- Research on intergovernmental fiscal interactions.

Revenue-Raising Capacity

To date, computing current measures of absolute fiscal capacity has stymied economists.[10] Projecting future revenue-raising capacity, in the manner Gurwitz proposes, is a difficult and uncertain task—yet one that is critical for assessments of TRS financial condition, as well as for innumerable other public policy problems. In principle, projections could be obtained from a dynamic simulation model of local economic activity. The principal elements of this model are:

- Current values of the tax base and tax rates.
- Projections of the exogenous and endogenous determinants of the tax base.

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[9]Ibid., p. 135.

[10]See ibid., Sec. III, for review. The best measures are of *relative* fiscal capacity.

- Empirical estimates describing the relationships between the tax base and its exogenous and endogenous determinants.

Governments tax many sources: personal and real property, retail sales, individual and corporate income, and the like. Together these form the tax base. Apart from the often difficult questions of tax incidence, valuing the current tax base is relatively straightforward.

Many factors determine the size of the tax base, such as population flows, transportation, energy and labor costs, and the price of land.[11] Determining their future values brings us back to the inherent uncertainty of projections. The attempt to assess how these factors will influence the future size of the tax base is limited by the imprecise estimates of the underlying structural relationships, and uncertainty about the stability of these relationships.

Central to the Gurwitz approach to defining revenue-raising capacity are estimates of the elasticity of the tax base with respect to tax rates. The empirical literature is not very helpful here. For example, empirical work[12] has not found a significant relationship between taxes and industrial location—perhaps, however, because serious methodological and specification problems stood in the way.[13] Likewise, studies of residential location also fail to find a significant relationship.[14] However, the capitalization literature confirms the effect of tax rates on the demand for housing, and hence on residential location.[15] Further research—both methodological and empirical—may clarify the relationship between taxes and the tax base. Additional research on the exogenous determinants of the tax base is also needed.

The Simultaneous Determination of Pensions, Other Expenditures, and Revenues. Thus far we have talked about pension obligations, other expenditures, and revenues as if they were independent, but expenditures and revenues are simultaneously determined for the most part. We might hypothesize that pension obligations are also determined together with revenues and expenditures. Higher pension obligations may result in higher revenue-raising requirements to fund them; simultaneously, greater revenues may lead to higher pension benefits—either because of taxpayer preferences or employee pressure. Alternatively, higher benefits may be only weakly related to revenues, as additional contributions are not made and UFLs accumulate. Likewise, pension benefits and "other expenditures" might be simultane-

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[11]Summarized in Vaughan (1977), Sec. IV.

[12]Thompson and Mattila (1959), ACIR (1963), Levin (1974).

[13]Vaughan (1977), p. 73. See Vaughan and Vogel (1979) for a review of this literature.

[14]Mayo (1971), Friedman (1975).

[15]Oates (1966) found that two-thirds of the differences in tax rates between municipalities had been capitalized. Smith (1970) found a $1 difference in property taxes associated with a $14 to $21 difference in property values.

wise, pension benefits and "other expenditures" might be simultaneously determined. Expenditures on higher salaries and more staff certainly increase future pension obligations; at the same time, the funding of increased pension obligations out of relatively fixed revenues reduces what remains for other expenditures.

Most expenditure models assume that revenues are exogenous. Inman (1978) models expenditures and revenues in a simultaneous structure. Still to be formally considered in the literature are the relationships between pension obligations, revenues, and expenditures. Empirical descriptions of these relationships can yield important insights into the incentives of decisionmakers to raise benefits or incur unfunded liabilities. Such estimates can also indicate what will happen to pension benefits and contributions as fiscal stress persists in selected localities.

DEFINED CONTRIBUTION VERSUS DEFINED BENEFIT PLANS

The most serious empirical problems encountered in assessing TRS financial condition arise from the manner in which the systems currently promise retirement benefits. In general, benefits can be determined in either of two ways. Under a *defined contribution* plan, promised benefits are directly related to the actual employer and employee contributions into employees' accounts in the system. Benefits are essentially payments of an annuity purchased at retirement with the accumulated contributions plus interest thereon. In such a plan, contributions are *by definition* exactly sufficient to pay promised benefits, and the retirement system is always in good financial condition.[16] TIAA-CREF is a prominent example of a defined contribution plan.

By contrast, all teacher systems (and the overwhelming majority of all publicly administered systems) are *defined benefit* plans. Here, the employer promises to pay specific retirement benefits determined by a formula relating benefits to employee salary and career length. Unlike a defined contribution plan, promised benefits are unrelated to actual contributions. The separation of what is promised from what is reserved to fulfill the promise gives rise to the need to assess the future capacity of the promisor to meet retirement benefit obligations. *If TRSs used the defined contribution approach, the most difficult problems of assessing TRS financial condition would disappear.*[17]

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[16]The adequacy of benefits may still remain in question, of course; however, it is likely to be easier to supplement inadequate benefits ex post than to reduce benefits in fiscally troubled areas.

[17]Routine accounting issues would remain, but the troublesome actuarial and economic problems of projecting future liabilities, expenditures, and revenue-raising capacity would disappear.

A DIGRESSION ON INTERGENERATIONAL TRANSFERS

We have suggested that TRSs are in good financial condition if the underlying jurisdictions are able to make good on promised future contributions. One implication is that it is reasonable to underfund pensions if long-run fiscal capacity is adequate to make up the underfunding in the future.

Some observers argue, however, that pension obligations should be fully funded as they accrue—that each cohort of residents and businesses should pay the full cost of pensions related to services they receive.[18] These observers contend that underfunding means cheaper services for current taxpayers and more expensive services for future taxpayers; underfunding therefore may result in intertemporal transfers, raising serious questions of intergenerational equity.

If significant intertemporal transfers result, these observers are correct about the equity issues. However, there is some theoretical reason (and some empirical support) to believe that the size of intertemporal transfers may be smaller than they first appear—that is, if the pension funding behavior of governments is capitalized into the market value of property, intergovernmental transfers are reduced by the capitalization effect.[19]

As unfunded pension liabilities (UFLs) accumulate, purchasers may not be deceived by the relatively low tax payments (tax price) made for a given bundle of services. They realize that tax prices ultimately will rise to amortize the UFLs. As a result, purchasers offer less for a property encumbered by UFLs than for property that is not so encumbered. While sellers of property benefit from low-cost services, they also suffer capital losses on their property. The residents who buy property subject to UFLs, in fact, pay more for the same basket of services while the UFLs are being amortized. But as the UFLs are steadily reduced, purchasers of their property will increase their offers. Thus, the victims of high-cost services are the beneficiaries of capital gains. Whether or not these capital gains (losses) exactly offset the higher (lower) priced services is unclear. General equilibrium modeling and simulation can shed more light on this question.

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[18]Tilove (1976), pp. 131-141.

[19]See footnote 15 above. The conclusion holds for taxes other than property taxes to the extent their long-run incidence is on land.

III. INDICATORS OF FINANCIAL CONDITION

While it is important to identify TRSs that are in or approaching precarious financial condition, the formidable empirical problems discussed in Sec. II make it impractical to attempt comprehensive assessments in this report. Instead, we rely on less comprehensive, much cruder indicators of TRS financial condition. We use three types of indicators here to examine the financial statistics of TRSs and their underlying jurisdictions:

- Balance-sheet indicators
- Debt-related indicators
- Ability-to-pay indicators.

The ability-to-pay indicators are superior to the others because they relate claims on revenues to the ability to pay those claims. The balance-sheet indicators are the traditional barometers of TRS financial health. The debt-related indicators give the reader a sense of how much future school revenue is burdened by pension liabilities and other school debt. In going from balance-sheet to ability-to-pay indicators, we are moving toward the more conceptually correct assessment of TRS financial condition that is described in Sec. II.

For each indicator, we list the systems that appear much better off or worse off than the average system—the extreme quartiles. Since we cannot determine the absolute financial condition of the average system, we cannot say that those in the lowest quartile are in financial trouble; but if any are in financial trouble, they are likely to be among those listed in the lowest quartile.

BALANCE-SHEET INDICATORS

The traditional barometers of TRS financial health compare the obligations of retirement systems with their accumulated assets. We call them "balance sheet" indicators because they are constructed exclusively from data found in TRS financial and actuarial reports.

The most common such measure is the difference between assets and accrued liabilities. An excess of liabilities over assets is often termed the "unfunded liability" or "supplemental liability"; it reflects the likely shortfall in meeting pension promises if contributions were to continue at current levels.

This unfunded liability (UFL) is the product of the actuarial projections described in Sec. II. UFL is not a standard yardstick that can be readily applied across TRSs, however.[1] Estimates of UFLs vary widely in *accuracy*. Computation of the accrued liability component of the UFL is very sensitive to the accuracy of the actuarial assumptions used. Some systems use assumptions that are closely related to their actual experience. For example, Texas assumes a 6 percent rate of salary growth. Actual experience shows a 6.5 percent rate of growth in average instructional staff salary from 1970-1979. Similarly, California assumes a 5.5 percent rate of salary growth, while experiencing annual increases of 6.5 percent in average instructional staff salary during the 1970s. However, other systems use assumptions that seriously understate their experience. Minnesota during the 1970s has averaged 7.25 percent annual salary growth, but assumes a figure of 3.5 percent. The state of Washington assumes a 5 percent salary growth rate, but the annual rate averaged 9 percent in the last decade. If Minnesota and Washington used more accurate assumptions, their estimated UFLs would be much greater than currently reported.

These differences in actuarial assumptions, as well as differences in asset valuation methods and actuarial costing methods, make it difficult to compare UFL estimates across systems.[2] As we have shown, the accuracy of these assumptions varies substantially from one system to the next. Consider three hypothetical systems identical in size and true financial condition. The first uses actuarial assumptions that are correct. The second uses conservative assumptions that overstate the accrued liability. But the third, because it uses liberal assumptions that understate the accrued liability, falsely appears to be healthier than the other two.

Even if all TRSs used equally accurate actuarial assumptions, differences in the methods for valuing assets would impede the comparison of reported UFLs. Some systems value at cost; others use market value. During a "bull market," or when interest rates are falling, those valuing at market will appear in better condition than those valuing at cost—even if their portfolios are identical. Of course, the reverse is true during a "bear market," or when interest rates are rising. Consequently, variations in UFLs are partly attributable to variations in asset valuation method, instead of to actual financial health.

The UFL measure also varies with the funding method used by the

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[1]For one thing, the reader should distinguish between *reported* UFLs and those computed on the basis of a consistent set of assumptions and procedures. The latter are subject to reliable intersystem comparison. The former may diverge from the latter for a variety of reasons, including errors in choosing actuarial assumptions.

[2]In addition, what are called "unfunded liabilities" occasionally differ across sytems. Systems that use the term differently are obviously not comparable.

TRS. For a given system, an "accrued benefit method" and a "projected benefit method" will yield different estimates, as will an "aggregate method" versus an "individual method."[3] For this additional reason, the UFL measure presently reported has limited usefulness for intersystem comparisons of financial condition or aggregation where systems use different funding methods.

The UFL measure also suffers from a sensitivity to the age and size of the system. Newer systems may show relatively large UFLs because they begin with prior-service liabilities. These are obligations created by granting benefits to employees on the basis of service credits antedating the establishment of the TRS. As the systems age, these liabilities may be amortized and UFLs reduced. The size of the system is also an important determinant of absolute size of the UFL. Large systems are likely to have larger UFLs than smaller systems, simply because they have more members accruing benefits.

With these caveats, we present UFL estimates for TRSs because no better balance-sheet indicators of financial condition can be constructed from published data. The measures are constructed from data from the systems' own annual reports and actuarial valuations, and should be interpreted with the caveats firmly in mind. The figures for UFLs are those reported by the TRSs.

The Pension Task Force estimates that the total reported UFLs for all state and local government systems in 1975 was $100 billion to $120 billion. This estimate is based on actuarial assumptions that are unrealistically low. Using more realistic assumptions, the Task Force increases those figures to $150 billion to $175 billion.[4] Other estimates have ranged as high as $270 billion.[5] The wide variation in estimates is evidence of the sensitivity of this measure to actuarial assumptions, asset valuation methods, and computational methodology. Using a sample of all systems that include teachers,[6] listed in Table B.1, App. B, we estimate total UFLs for TRSs to be at least $59.8 billion, using *current* TRS assumptions.[7]

Column (1) of Table B.1 presents the systems' own estimates of their UFLs. Of course, large systems have large UFLs, while small systems have smaller ones. For comparison purposes, the UFL per member (UFL/M) is a better measure than absolute UFL because it is

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[3]For explanations of these actuarial models, see Pease (1980), Sec. II; or for a more technical discussion, see any basic actuarial text, such as McGill (1977).

[4]U.S. House of Representatives (1978), p. 165.

[5]Munnell and Connolly (1976).

[6]Three types of systems include teachers: teachers only, school employees, and general public employees. See Pease (1980), Sec. III, for further discussion.

[7]A few systems are missing from the sample (Connecticut, Massachusetts, Boston, Oklahoma, Omaha, and Virginia). To estimate their UFLs, we assume them to have UFLs per member equal to the mean for all systems ($11,693).

less sensitive to system size. Column (2) in Table B.1 presents estimates of the UFL/M. These range from very small—New Hampshire ($307), Iowa ($403), and South Dakota ($442)—to more than 100 times larger —New York City ($55,299), St. Paul ($38,368), California ($35,082), and Rhode Island ($30,216). The median system is Colorado ($8,908). Table 3.1 presents the state and local systems in the upper and lower quartiles. The lower quartile ranges from $307 to $3,776, the upper quartile from $16,554 to $55,299.

Table 3.1

EXTREME QUARTILES OF TEACHER RETIREMENT SYSTEMS: UNFUNDED LIABILITIES PER MEMBER

Upper Quartile	UFL/M ($)	Lower Quartile	UFL/M ($)
New York City, N. Y.	55,299	New Hampshire	307
St. Paul, Minn.	38,369	Iowa	403
California	35,682	South Dakota	442
Rhode Island	30,216	Alaska	497
Indiana	27,575	Nebraska	1,023
Washington	27,434	Arkansas	1,181
Minneapolis, Minn.	27,100	Des Moines, Iowa	1,592
Chicago, Ill.	25,782	Kansas	1,659
New York	25,497	Vermont	1,995
Denver, Colo.	22,727	Utah	2,280
Montana	20,786	Wisconsin	2,391
Ohio	20,211	Arizona	2,558
Louisiana	19,900	South Carolina	2,778
Detroit, Mich.	18,067	Wyoming	3,489
Kentucky	16,554	New Jersey	3,776

Statewide UFL/M are generally less than local UFL/M, as Table 3.2 demonstrates. If this represents systematic behavioral differences between state and locally administered systems, the trend toward consolidation of state and local TRSs should mean the extension of better funding practices. At the same time, consolidation of local systems into state systems means an implicit transfer of money of the state's taxpayers to the localities' taxpayers as the former assume the higher UFLs.

TRSs have diverse memberships. Some include only local school teachers; some include teachers and higher education professionals; some include all local school employees; and others include various combinations of school and nonschool employees. Because of our interest in the burden of pension promises on school revenues, we adjust the UFL estimates to reflect only those attributable to local school

Table 3.2

COMPARISONS OF STATE AND LOCAL TEACHER RETIREMENT SYSTEMS

System	UFL/M	System	UFL/M
Colorado	8,908	Minnesota	10,015
Denver	22,727	Duluth	5,634
Georgia	11,312	Minneapolis	27,100
Fulton County	9,424	St. Paul	38,369
Illinois	15,908	Missouri	8,969
Chicago	25,782	Kansas City	7,908
Iowa	403	St. Louis	5,582
Des Moines	1,592	Oregon	7,524
Michigan	11,304	Portland	11,684
Detroit	18,067	Wisconsin	2,391
		Milwaukee	9,700

employees.[8] Because later comparisons are made on a state-by-state basis, we combine state and local systems in each state. Column (1), Appendix Table B.2, presents the UFLs that are attributable to local school employees, by state. These total at least $41.5 billion. By combining state and local TRSs for each state, we can better compare the statewide burdens of UFLs across states. Column (2) of Appendix Table B.2 lists the average UFL/M for a state's TRS. The median state (Florida) has incurred $8,253 in UFLs per school employee. According to Table 3.3, the UFL/M of the lower quartile of states ranges from $307 to $2,830; the upper quartile ranges from $13,404 to $35,682.

While regions are not homogeneous, definite regional patterns can be discerned (see Fig. 3.1). Most of the states with higher than average adjusted UFLs per member are east of the Mississippi. The industrial North Central states tend to have much higher than average adjusted UFLs per member, while the agricultural North Central states are much lower than average. The Southwestern states have extraordinarily low adjusted UFLs per member.

[8]We do so by assuming a uniform UFL/M for all school employees in a state: those who are members of the TRS and those who are members of other retirement systems. Thus, adjusted UFLs are defined as follows:

$$\text{AdjUFL} = \text{UFL/M} \times \text{SE};$$

where M = active members, and
SE = local public school employees.

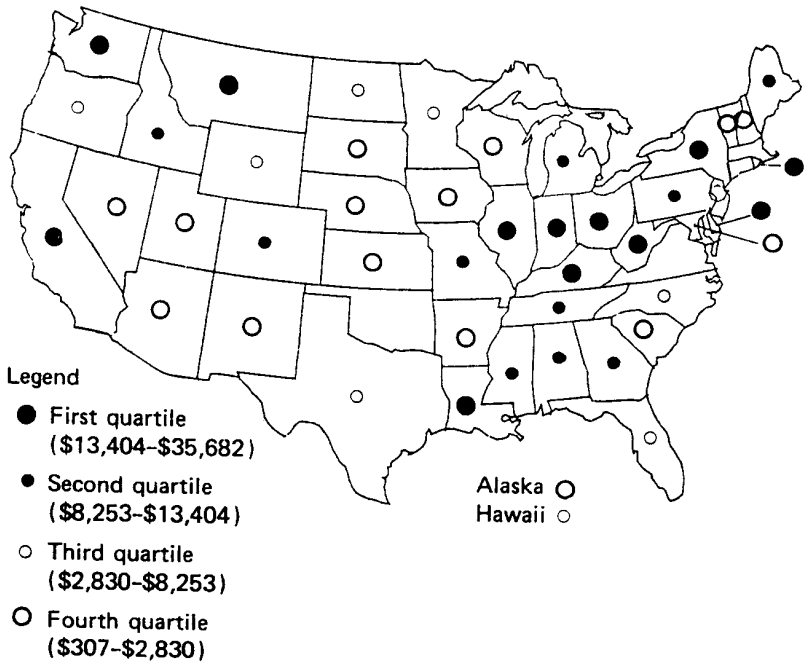

Fig. 3.1—School-employee unfunded liabilities per active member

Table 3.3

EXTREME QUARTILES OF STATES: SCHOOL EMPLOYEE UNFUNDED LIABILITIES PER MEMBER

Upper quartile	UFL/M ($)	Lower Quartile	UFL/M ($)
California	35,682	New Hampshire	307
New York	33,126	Iowa	411
Rhode Island	30,216	South Dakota	442
Indiana	27,575	Alaska	497
Washington	27,434	Nebraska	1,023
Montana	20,786	Arkansas	1,181
Ohio	20,211	Kansas	1,659
Louisiana	19,900	Vermont	1,995
Illinois	18,306	Utah	2,280
Kentucky	16,554	Arizona	2,558
Delaware	16,253	South Carolina	2,778
West Virginia	13,404	Wisconsin	2,830

DEBT-RELATED INDICATORS

Accrued pension liabilities are promises to make payments, however uncertain, in the future. In this regard, TRS unfunded liabilities resemble state and local government debt. Some states have incurred larger claims—both pension and other—on future revenues than have others. The larger the total claims on future revenues, ceteris paribus, the less money is available for educational and other services.

To what extent must future revenues go to fund unfunded pension liabilities? Some states have incurred less than $100 per pupil in UFLs; others, like Rhode Island and New York, have accumulated more than $2,500 per pupil. (See appendix Table B.3.) How much additional revenue would be required to amortize—that is, repay in equal annual installments—the UFLs (plus interest) over 30 years? Appendix Table B.4 presents the annual payment per student required to amortize the UFLs at 8 percent interest. The median payment is $60 per student; per pupil payments range from a low of $2 in New Hampshire to $231 in New York.

In those states where UFLs are not being amortized on a 30-year basis, if services are to be retained at current levels, school expenditures must be increased to amortize the UFLs. Appendix Table B.4 also lists the percentage increase in current operating expenditures needed to amortize the UFLs over 30 years.[9] In the median state, amortization would require a 4 percent increase in current operating expenditures. Table 3.4 presents the extreme quartiles of systems in terms of the burden of UFLs on future school revenues. Ten states must allocate more than 8 percent of their current operating expenditures to fully amortize outstanding school UFLs.[10] The regional distribution of these states (Fig. 3.2) resembles that for the school employee UFLs per member (Fig. 3.1).

Unfunded pension obligations (pension debt) are only one form of debt incurred by or on behalf of state and local governments. Governmental units regularly issue debt instruments (market debt) to finance construction and other expenditures. Some states incur heavier pension debt, others heavier market debt. Alabama and Arizona, for example, have similar total school debt per student ($1,156 and $1,190, respectively). Yet 82 percent of Alabama's debt is pension debt while 80

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[9]This assumes that no unfunded benefit improvements occur during the amortization period and that actuarial assumptions are accurate. If, as is likely the case, unfunded benefit improvements occur and actuarial assumptions understate liabilities, the true burden on future revenues will be higher.

[10]For states that are currently amortizing their UFLs, these amortization payments are included in current operating expenditures. For these states the figures in Column (3), Table B.4, are understated.

Table 3.4

AMORTIZATION OF SCHOOL EMPLOYEE UFLs AS A PERCENT OF CURRENT SCHOOL OPERATING EXPENDITURES: EXTREME QUARTILES

Upper Quartile	%	Lower Quartile	%
Indiana	13.9	Alaska	0.1
California	12.7	Iowa	0.2
Rhode Island	12.5	New Hampshire	0.2
Louisiana	11.3	South Dakota	0.3
Washington	10.3	Nebraska[a]	0.5
Kentucky	9.4	Arkansas	0.7
New York State	9.2	Kansas	0.8
Montana	8.9	Vermont	1.0
Ohio	8.6	Utah	1.2
West Virginia	8.1	New Jersey	1.3
Alabama	6.6	Arizona	1.4
Georgia	6.6		

[a]Excludes Omaha.

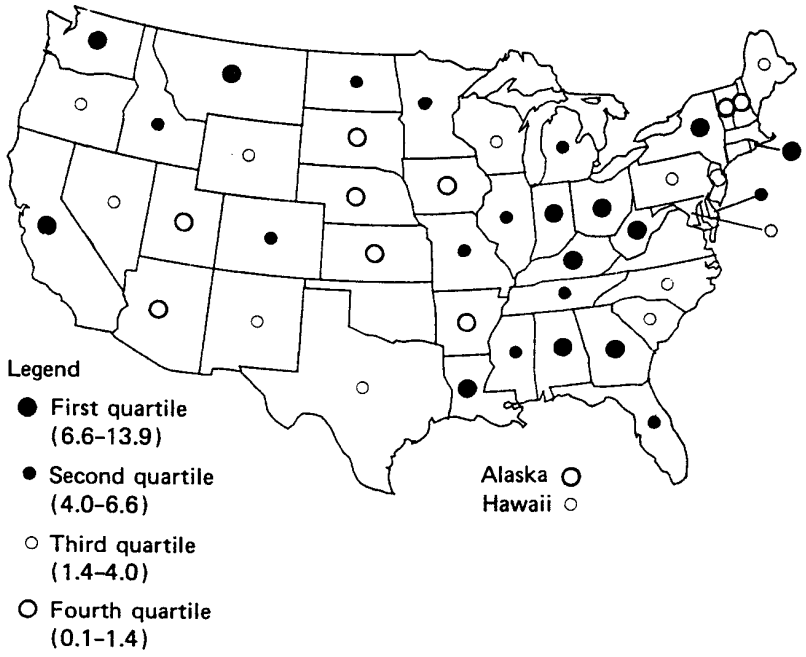


Fig. 3.2—Amortization of school-employee UFLs as a percent of current school operating expenditures, by quartile

percent of Arizona's is market debt. Since both forms of debt burden future revenues, we are interested in the total school debt burden—not pension debt alone. The median state (Oregon) has accumulated $1,362 per pupil in total school debt—pension and market. At the upper extreme are New York ($3,715) and Rhode Island ($3,510). Table 3.5 presents the extreme quartiles for total school debt per pupil. (See appendix Table B.3 for a listing of total school debt per pupil, by state). On the basis of this indicator, the East and West are more evenly divided (Fig. 3.3). (However, the marked difference between the industrial and agricultural North Central States persists.) This implies that the Eastern states borrow more heavily than the Western from their pension funds, rather than in the market. Further research should test the hypothesis that rapidly growing states openly borrow more in the market, while declining and slower growing states "covertly" borrow more pension funds.

As noted above, governmental units may hold different portfolios of pension and market debt. Before examining these portfolios, we also note some special features of public pension debt that distinguish it from market debt.

1. Pension debt is a promise to pay an uncertain amount; market debt is a promise to pay a stated amount.
2. Pension debt bears interest at a much higher rate than market debt. The interest on pension debt is what could have been obtained by investing in government or corporate securities.[11] The interest on market debt is determined by the market rate on tax-free state and local government obligations. The former, being taxable to the general investment community (although not to TRSs), is always higher than the latter.
3. Pension debt can be used for any lawful governmental purpose; market debt is principally limited (although not always in practice) to capital account expenditures.
4. Pension debt is incurred passively by not contributing the full current-period normal cost of pension obligations (or interest on UFLs); market debt must be actively placed with one or more creditors.
5. Interest on market debt must be paid directly out of annual budgets; interest on pension debt may be postponed repeatedly, although generally not indefinitely.

[11]This is not strictly true, however. The opportunity cost of pension debt may differ from the market rate of return forgone, for several reasons, including community time preference.

Table 3.5

SCHOOL DISTRICT DEBT PER STUDENT: EXTREME QUARTILES

Upper Quartile	Debt per Student ($)	Lower Quartile	Debt per Student ($)
New York	3,715	South Dakota	321
Rhode Island	3,510	Iowa	628
Washington	2,990	Arkansas	741
California	2,857	South Carolina	752
Louisiana	2,637	New Hampshire	757
Alaska	2,559	North Carolina	762
Montana	2,501	New Mexico	780
Indiana	2,429	Kansas	802
Illinois	2,395	Nebraska[a]	832
Minnesota	2,396	Utah	891
Michigan	2,288	Vermont	900

[a]Excludes Omaha UFLs.

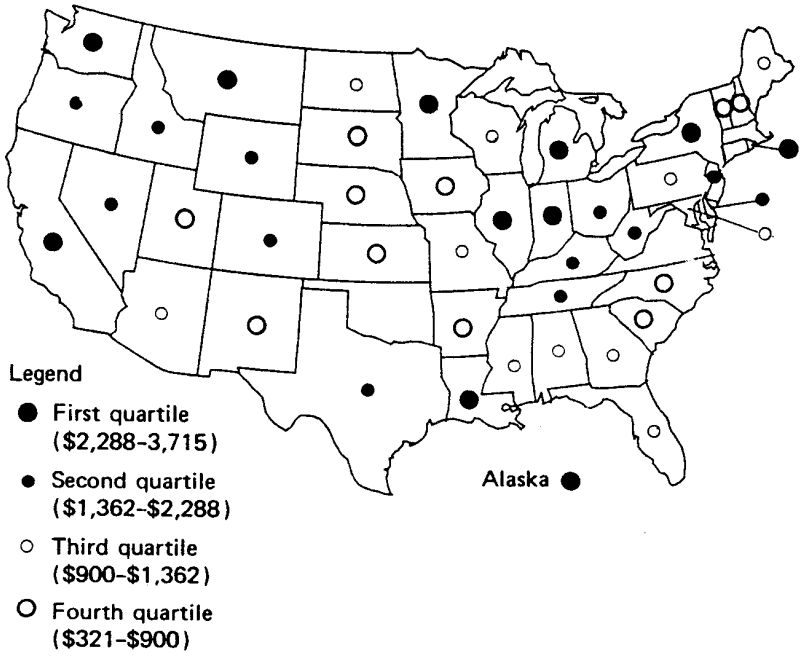


Fig. 3.3—Total school debt per student

6. Market debt is voluntary. From the point of view of many local governments, pension debt in state-level retirement systems is largely involuntary. The state sets contribution levels—not the local governments. If the state chooses a contribution level inadequate to fund pension obligations, pension debt results. Even local school districts that prefer not to borrow must accrue pension debt.

The school debt portfolios of governmental units, by state, are quite variable. A few states borrow almost exclusively in the market. (For example, 97 percent of New Hampshire's school debt is market debt.) Several others do so very little. The median portfolio mix is 48 percent market debt, 52 percent pension debt.

Figure 3.4 presents the school debt portfolio mixes by state (adjusted per pupil). The line OX represents an equally balanced portfolio; AA and BB represent total borrowing of $1,000 and $2,000 per student, respectively. As total debt increases, the proportion of pension debt increases markedly. This raises an interesting question about the borrowing behavior of governmental units.[12] Why borrow increasingly from a source that is more expensive than market debt? While we provide no answers, we offer the following hypotheses: First, market debt may require voter approval—which appears increasingly difficult to obtain; second, beyond some level, additional market debt adversely affects the government's credit rating, which is both politically and financially undesirable; third, market debt may be unsuitable for financing current account expenditures; and fourth, interest on market debt must be paid out of succeeding years' budgets, while interest on pension debt may be easily deferred in the short run. In sum, market debt may be financially less expensive, but pension debt may be politically less expensive.

ABILITY-TO-PAY INDICATORS

A large debt does not necessarily mean that a state has problems; the state may have adequate capacity to handle the debt. The states whose future promises to contribute to TRSs are suspect are the ones that lack that capacity. As a crude indicator of which states deserve further scrutiny, we use the proportion of the market value of property

[12]Because pension debt may be involuntarily accumulated, our talking about "borrowing behavior" may be an artifice for many school districts. We assume, for want of a better model, that the contribution levels (hence pension debt) set by the state reflect, inter alia, the debt preferences of the median school district. Research on the politics of pension funding and public-sector debt-portfolio decisions can enlighten us about the merits of this assumption.

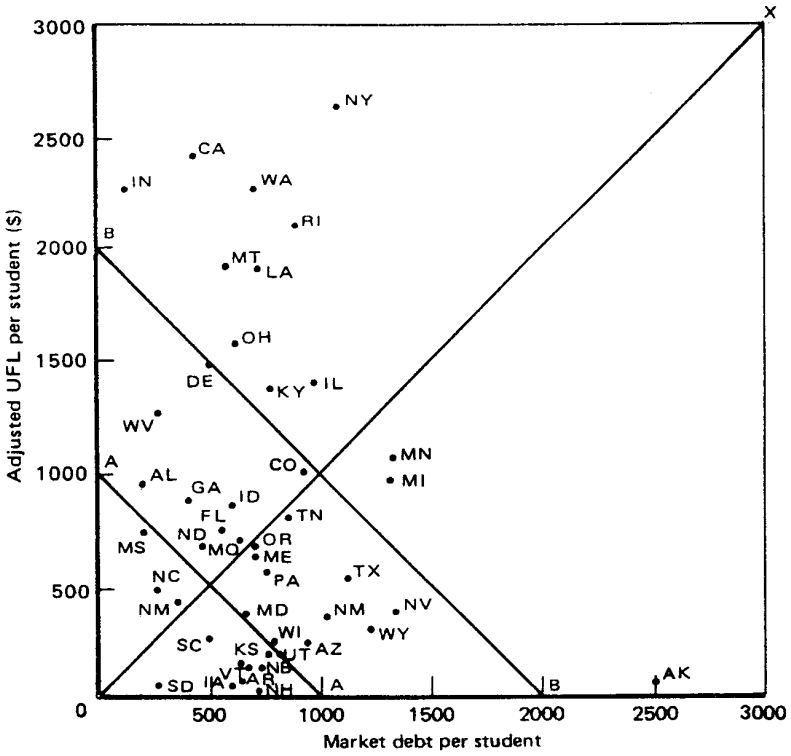


Fig. 3.4—Pension and market school-debt portfolio mixes, by state

(a proxy for the tax base) that is burdened by pension and market debt (what we loosely refer to as state "debt-equity" ratios). Appendix Table B.5 presents this ratio for total school debt, by state. The median state has "mortgaged" 2.8 percent of its property as school debt; several states have mortgaged more than twice that amount. Table 3.6 presents the extreme quartiles. Future school revenues in the Eastern states (and especially the industrial North Central states, New York, and Rhode Island) are more heavily burdened than in the Western states (Fig. 3.5).

We also consider a more comprehensive indicator of the ability of state and local governments to pay future pension promises. In the medium to long run, noneducational governmental services compete with education for limited state and local revenues. Consequently, we are interested in the proportion of the tax base that is burdened by all state and local debt—pension and market. As a proxy for total debt, we

Table 3.6

SCHOOL DEBT-EQUITY RATIOS: EXTREME QUARTILES

Upper Quartile	Ratio	Lower Quartile	Ratio
New York	.085	South Dakota	.005
Louisiana	.074	Iowa	.008
Rhode Island	.061	Nebraska[a]	.011
Michigan	.055	Kansas	.012
Kentucky	.054	New Hampshire	.013
Indiana	.053	Arkansas	.016
West Virginia	.047	North Dakota	.016
California	.045	Vermont	.016
Montana	.045	Wisconsin	.017
Washington	.045	Florida	.017
Ohio	.041		

[a]Excludes Omaha.

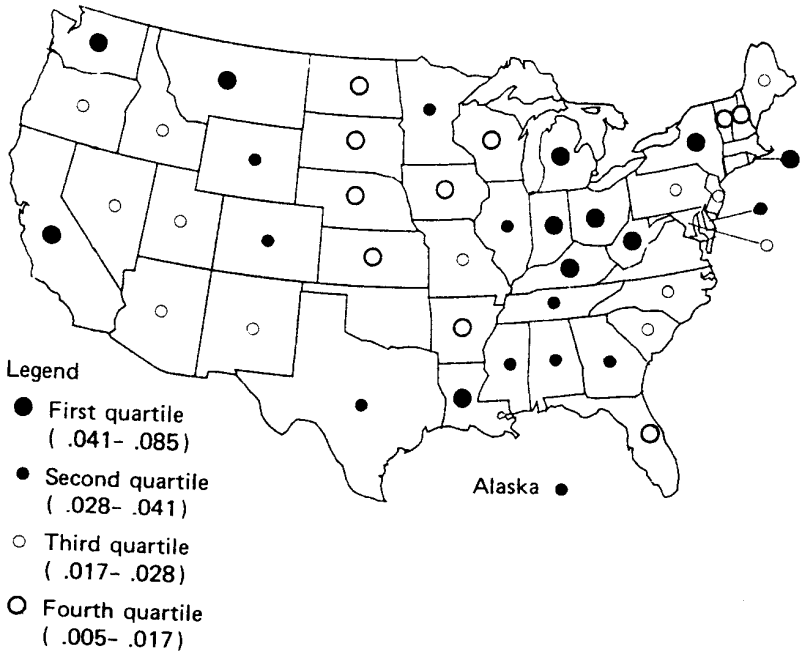


Fig. 3.5—School debt-equity ratio

use the sum of total state and local market debt and school pension debt. (See Fig. 3.6.) This measure understates the total burden on the tax base because it excludes pension debt for public employees not employed by school districts (data we did not collect). Appendix Table B.5 presents the values for this indicator, by state. The median state has "mortgaged" 10 percent of its property to the state and local sector. Table 3.7 presents the extreme quartiles. The Eastern states appear to have burdened more of their future revenues than their Western counterparts. Two states appear to have encumbered far more of their tax bases than the others: Alaska (32 percent) and New York (35 percent). However, there are crucial differences between them. Alaska is growing rapidly; it is borrowing to build for the future. New York is not growing very rapidly; one suspects it is borrowing to pay for the past.

Eighteen high-debt states appear in the upper quartile by either ability-to-pay indicator (see Fig. 3.7). Most are in the industrial North Central and Northeast regions. We cannot conclude that these states'

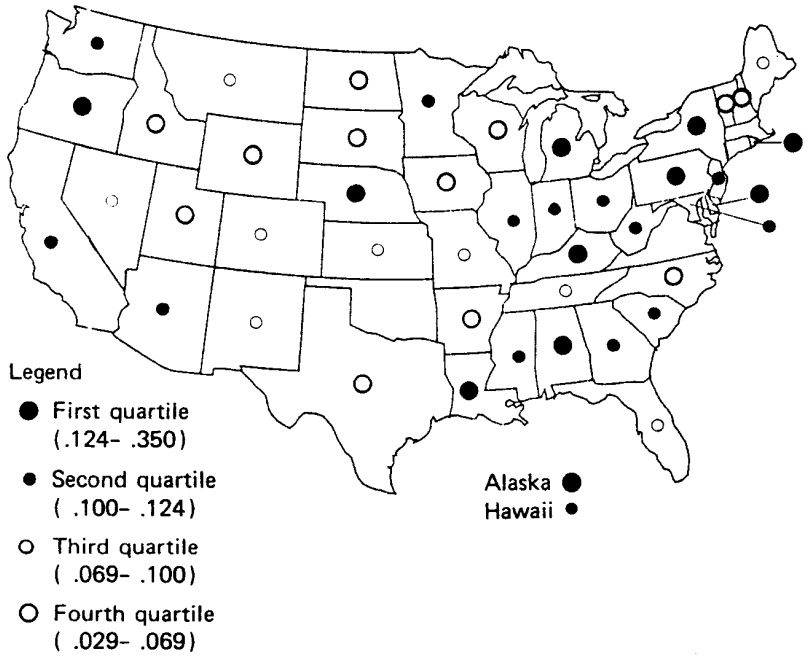


Fig. 3.6—Total state and local debt-equity ratios

Table 3.7

TOTAL STATE AND LOCAL DEBT-EQUITY RATIOS: EXTREME QUARTILES

Upper Quartile	Ratio	Lower Quartile	Ratio
New York	.350	Iowa	.029
Alaska	.320	South Dakota	.034
Louisiana	.223	Idaho	.040
Delaware	.182	Wisconsin	.042
Kentucky	.175	North Carolina	.046
Alabama	.174	Wyoming	.047
Rhode Island	.163	Utah	.049
Pennsylvania	.162	North Dakota	.052
Oregon	.133	Vermont	.053
Nebraska[a]	.132	Arkansas	.058
Maryland	.129	New Hampshire	.067
Michigan	.124	Texas	.069

[a]Excludes Omaha UFLs.

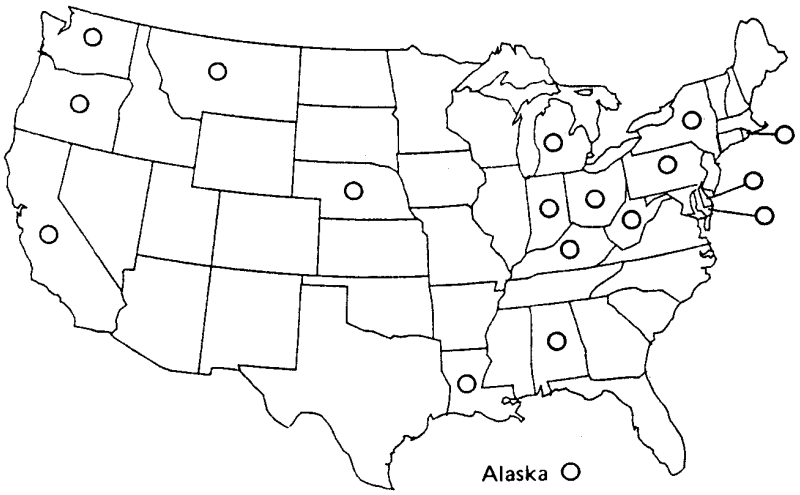


Fig. 3.7—The 18 high-debt-burdened states

TRSs are in trouble; however, we believe that if any systems are in trouble, they are likely to be among these states, which therefore deserve further attention. In the following discussion of what future trends mean for the financial condition of TRSs, we focus on these 18 states. For the purposes of this discussion, we call them "high debt burdened" states.

THE IMPLICATIONS OF FUTURE TRENDS

A number of political, economic, and demographic trends may make the debt positions of these and other states better or worse than they appear in Tables 3.6 and 3.7. These trends include declining enrollments, inflation, fiscal limitation, and interregional population migration.

Declining Enrollments

Aggregate elementary and secondary enrollments began to decline in 1970 and are expected to continue to decline into the 1980s. The decline is estimated to be 14 percent from 1970 to 1980, and 16.3 percent from 1970 to 1985 (Fishlow, 1978). Associated with declining enrollments is a reduction in the number of instructional staff. This adjustment lags the decline in enrollment. From 1968 to 1975, instructional staff in U.S. public schools increased 14.4 percent; since 1975, instructional staff levels have turned down only very slightly.

Declining enrollments may affect each element of the assessment equation (Eq. (2)). Having fewer students means having to spend less on education. At the same time, it means declining support for school revenue measures and reduced state aid. The net effect is unclear; however, we know that state aid declines proportionately with enrollments, while staffing reductions lag. As a result, declining enrollments may reduce revenues more than they reduce expenditures, tightening the pressure on future local revenues.[13]

In some states, declining enrollment may result in the unanticipated accrual of additional UFLs. These states' TRSs use what is called an "aggregate costing method" in computing and funding their benefit obligations. Aggregate costing methods require an assumption about the rate of growth of system membership. For the roughly 25 percent of the TRSs that use aggregate costing methods, if the current assump-

[13]Odden, Augenblick, and Vincent (1976) concur.

tion does not reflect the effects of the now-certain enrollment decline where applicable, the realized experience of the system will lead to actuarial losses. These losses are additions to unfunded liabilities which must then be amortized, with interest.

In sum, declining enrollments are likely to raise UFLs for some states and reduce the ability of all affected states to meet future pension obligations. Appendix Table B.6 (col. 3) presents enrollment changes by state. Virtually all of the 18 high-debt-burdened states have experienced declining enrollments. Of these, 10 have experienced enrollment declines greater than the national average from 1970-1978. Table 3.8 lists the above- and below-average states.

Inflation

The rising cost of living exerts upward pressure on benefits in two ways. First, automatic and ad hoc post-retirement adjustments for current retirees are legislative responses to inflation and often depend upon changes in the consumer price index (CPI). Second, inflation leads to pressure for higher teacher salaries. Higher salaries mean higher salary bases for the determination of benefits. For example, a teacher with a 25-year career will have a 60 percent higher salary base if the annual rate of salary growth has been 5 percent than if it has been 3 percent. Higher benefits add to current and future pension costs and,

Table 3.8

HIGH-DEBT STATES AND PERCENT ENROLLMENT CHANGES RELATIVE TO NATIONAL AVERAGE, 1970-78

Smaller than Average Change	% Change	Larger than Average Change	% Change
Alaska	11.3	Delaware	-16.5
Alabama	-6.5	Rhode Island	-14.9
Washington	-6.2	Ohio	-13.0
Montana	-6.2	Pennsylvania	-12.7
Kentucky	-3.3	California	-12.1
Louisiana	-1.7	Maryland	-11.4
Oregon	-1.3	New York	-10.0
West Virginia	-1.0	Nebraska	-9.4
		Michigan	-9.3
		Indiana	-8.2

unless fully funded, lead to larger UFLs. Unanticipated levels of inflation may result in UFLs greater than those presently estimated; at the same time, however, it increases the rate of return on TRSs' portfolios, thereby reducing UFLs. The net effect on UFLs is unclear.

While we cannot directly measure the vulnerability of systems to inflationary pressure, it is likely to be greater in systems that provide for automatic post-retirement adjustments. Column (4) of appendix Table B.6 lists the automatic post-retirement cost-of-living adjustment for each state TRS. Less than half of the high-debt states provide such adjustments: Ohio, Oregon, Rhode Island, Washington, California, Louisiana, and Maryland.

Yet inflation may be the saving grace for most TRSs that would otherwise experience financial difficulties. As long as inflation in nominal tax bases exceeds post-retirement adjustments in benefits, unanticipated inflation will improve the ability of TRSs to meet their future pension obligations. Most systems have low caps on these adjustments (2 to 4 percent); only Maryland fully compensates retirees for the effects of inflation.

Growth and Decline

Few states have a static tax base after adjusting for inflation. Those that are growing rapidly can accumulate high debt-equity ratios with little cause for concern, because growth greatly improves their future debt position. Alaska, for example, has a total debt-equity ratio of .32—second only to New York—but paced the nation in real personal income growth from 1970 to 1977, with an average annual rate of 10.9 percent. By contrast, New York had the highest total debt-equity ratio (.35), although its real personal income barely grew at all during the same period (0.8 percent per year). States with high total debt-equity ratios and school debt-equity ratios, and with slow-growing real revenue-raising capacity, are more likely to have trouble meeting future commitments than rapidly growing states. Among the high-debt states, nearly 40 percent are in the lower quartile of states in real personal income growth; nearly two-thirds are below the median state. Only two (Alaska and Oregon) appear to be high-growth, high-debt states, while the growth rates of five others are above the median. Table 3.9 lists the 18 high-debt states and their school and total debt-equity ratios in order of annual growth rates in real personal income. It focuses our attention on the first 7 to 11 systems on the list, which experienced less than average growth.

Table 3.9

HIGH-DEBT STATES AND THEIR SCHOOL AND TOTAL DEBT-EQUITY RATIOS, IN ORDER OF ANNUAL GROWTH RATES IN REAL PERSONAL INCOME, 1970-77

State	Annual Growth Rate in Real Personal Income, 1970-77	Debt-Equity Ratio: School Debt/ Market Value of Property	Debt-Equity Ratio: Total Debt/ Market Value of Property
Lowest quartile of all states			
New York	0.8	.085	.350
Rhode Island	1.7	.061	.163
Delaware	2.5	.033	.182
Ohio	2.5	.041	.100
Pennsylvania	2.5	.026	.162
Maryland	2.9	.019	.129
Indiana	3.3	.053	.104
Second quartile			
Montana	3.5	.045	.087
Michigan	3.5	.055	.124
Nebraska	3.5	.011	.132
California	3.7	.045	.101
Third quartile			
Washington	4.1	.045	.118
Alabama	4.5	.040	.174
Kentucky	4.5	.054	.175
Louisiana	4.8	.074	.223
West Virginia	4.8	.047	.101
Highest quartile of all states			
Oregon	5.2	.022	.133
Alaska	10.9	.031	.320

Fiscal Limitation

Even where the tax bases of the underlying jurisdictions are sufficient to support future retirement costs, statutory or constitutional restrictions on revenue-raising may limit the ability of these jurisdictions to meet their obligations. An increasing number of states and localities are subject to fiscal limitation on expenditures or revenue-raising. Binding constraints may affect the integrity of benefits or service levels; the alternative is to remove the fiscal limitation. Column

(6) of appendix Table B.6 lists systems whose underlying jurisdictions are subject to fiscal limitation at either the state or local level or both. Of our upper quartile states, half are subject to some form of local fiscal limitation: Alaska, California, Indiana, Michigan, Montana, Nebraska, Oregon, Rhode Island, and Washington. Two of them (Michigan and Oregon) are subject to both state and local fiscal limitations. Interestingly, only Rhode Island is a particularly slow-growing state. With that single exception, fiscal limitation does not appear to be a dominant constraint on the long-run ability of governments to meet future TRS promises.

Summary

To summarize, we have identified 18 states as "high-debt burdened" states; they are in the upper quartile of states in terms of either their school or total debt-equity ratios, or both. Nearly 40 percent of them are growing slower than the national average; more than half have experienced enrollment declines greater than the national average; nearly half make automatic annual cost-of-living adjustments in benefits (typically 2 to 4 percent)—yet inflation of their tax bases will improve their financial condition; and exactly half have state and/or local fiscal limitations on their revenue-raising capacity. In 6 of these 18 states, three or more adverse trends have converged to cloud their fiscal futures. As indicated in Table 3.10, these are California, Indiana, Michigan, Nebraska, Ohio, and Rhode Island. Although New York has neither post-retirement cost-of-living adjustments nor fiscal limitation, its debt-equity ratio is so large (.35 versus a median of .10) and its growth rate so low (0.8 versus a median of 4.0), that it especially deserves further scrutiny. These indicators are measures of *relative* financial health. Because we cannot determine the absolute financial condition of the average TRS, we cannot say that those that are below average are in financial trouble; but if any are in financial trouble, they are likely to be TRSs in these 18 states.

While we have identified systems that have most encumbered their future revenues with unfunded pension obligations and other debt, this falls far short of supplying the information that pension policymakers need for planning decisions. This information—which systems are likely to be in trouble, by how much, and when—cannot be determined without substantial new data and analysis that will greatly improve the ability to forecast benefits, state and local fiscal capacity, and other demands on government revenues.

Table 3.10

IMPLICATIONS OF FUTURE TRENDS FOR STATES WITH HIGH DEBT-EQUITY RATIOS

State	Total Debt-Equity Ratio	Enrollment Decline	TRS Has Automatic Cost-of-Living Adjustment	Fiscal Limitation	Growth in Real Personal Income, 1970-77
Alabama	.174	+	Yes	No	+
Alaska	.320	+	No	Yes	+
California	.101	-	Yes	Yes	-
Delaware	.182	-	No	No	-
Indiana	.104	-	No	Yes	-
Kentucky	.175	+	No	No	+
Louisiana	.223	+	Yes	No	+
Maryland	.129	-	Yes	No	-
Michigan	.124	-	No	Yes	-
Montana	.087	+	No	Yes	-
Nebraska	.132	-	No	Yes	-
New York	.350	-	No	No	-
Ohio	.100	-	Yes	No	-
Oregon	.133	+	Yes	Yes	+
Pennsylvania	.162	-	No	No	-
Rhode Island	.163	-	Yes	Yes	-
Washington	.118	+	Yes	Yes	+
West Virginia	.101	+	No	No	+

NOTE: +(-) = greater (less) than national average.

Appendix A

THE TEACHER RETIREMENT SYSTEM REPORTS

Our sample of TRS reports was collected with the cooperation of TRS officials. It yields a fair representation of what the systems are like.

We began the data collection in late February 1978, by sending letters to the system directors who were listed in the National Education Association (1976) report on TRSs. The letter requested three types of information: benefit and membership eligibility data, annual reports containing financial data on the system, and actuarial valuations describing the financial condition of the system. Follow-up letters were sent to systems that failed to respond. A final request was made by telephone in May and June 1978. Calls were also made to systems that were not listed in the National Education Association report and therefore had not received letters. We also requested financial and actuarial data from systems that had sent only benefit information. No further inquiries were made except when specific questions arose regarding individual systems.

The information came in the form of benefit pamphlets, annual reports, and actuarial valuations. From some systems we also received copies of state statutes, computer printouts, or interoffice memoranda. The degree of detail varied considerably between systems.

Appendix B

FINANCIAL STATISTICS

Table B.1

MEASURES OF TEACHER RETIREMENT SYSTEM FINANCIAL CONDITION

System	(1) Unfunded Liability ($ million)	(2) Unfunded Liability Per Active Member ($)	Year
	State Systems		
Alabama	739.1	8,559	1976
Alaska	3.5	497	1977
Arizona	293.5	2,558	1977
Arkansas	37.2	1,181	1976
California	9894.7	35,682	1977
Colorado	420.0	8,908	1977
Delaware	391.7	16,253	1976
Florida	2890.0	8,253	1977
Georgia	890.1	11,312	1978
Hawaii	239.1	5,283	1976
Idaho	392.2	10,442	1977
Illinois	1642.0	15,908	1977
Indiana	1818.4	27,575	1978
Iowa	61.0	403	1977
Kansas	178.3	1,659	1977
Kentucky	799.3	16,554	1976
Louisiana	1208.4	19,900	1977
Maine	235.1	6,898	1977
Maryland	334.0	4,475	1976
Michigan	2374.0	11,304	1975
Minnesota	640.6	10,015	1977
Mississippi	1038.0	9,065	1978
Missouri	518.5	8,964	1976
Montana	320.7	20,786	1977
Nebraska	20.8	1,023	1977
Nevada	192.5	4,526	1976
New Hampshire	3.6	307	1975
New Jersey	414.9	3,776	1975
New Mexico	165.1	4,383	1976
New York	5691.0	25,497	1974
North Carolina	1039.8	5,777	1977
North Dakota	76.1	7,764	1976
Ohio	2947.0	20,211	1978
Oregon	798.0	7,524	1977
Pennsylvania	2280.0	9,135	1975

Table B.1—continued

System	(1) Unfunded Liability ($ million)	(2) Unfunded Liability Per Active Member ($)	Year
Rhode Island	336.7	30,216	1977
South Carolina	402.8	2,778	1977
South Dakota	12.8	442	1978
Tennessee	1220.1	9,451	1977
Texas	1782.2	5,800	1976
Utah	79.6	2,280	1977
Vermont	13.2	1,995	1975
Washington	1168.0	27,434	1976
West Virginia	598.0	13,404	1975
Wisconsin	244.1	2,391	1978
Wyoming	98.4	3,489	1978
	Local Systems		
Chicago	853.9	25,782	1977
Denver	156.7	22,727	1978
Des Moines	2.0	1,592	1978
Detroit	497.7	18,067	1977
Duluth	6.8	5,634	1977
Fulton County, Ga.	33.5	9,424	1976
Kansas City, Mo.	46.1	7,908	1977
Knoxville	51.4	10,384	1978
Milwaukee	62.7	9,700	1978
Minneapolis	103.9	27,100	1976
New York City	4258.0	55,299	1974
Portland, Ore.	29.0	11,684	1976
St. Louis	42.5	5,882	1978
St. Paul	108.2	38,369	1978

NOTE: Connecticut, Massachusetts, Oklahoma, Virginia, Boston, Washington, D.C., and Omaha did not provide data.

SOURCE: Retirement System Reports; see App. A.

Table B.2

ESTIMATED SCHOOL EMPLOYEE
UNFUNDED LIABILITIES

State	Unfunded Liability ($ million)	Unfunded Liability Per Member ($)
Alabama	739.1	8,559
Alaska	4.0	497
Arizona	133.3	2,558
Arkansas	45.4	1,181
California	12,935.0	35,682
Colorado	575.4	10,677
Delaware	183.7	16,253
Florida	1235.5	8,253
Georgia	967.4	9,674
Hawaii	74.0	5,283
Idaho	173.3	10,442
Illinois	3469.0	18,306
Indiana	2636.2	27,575
Iowa	23.8	411
Kansas	77.8	1,659
Kentucky	960.1	16,554
Louisiana	1590.0	19,900
Maine	153.8	6,898
Maryland	354.9	4,475
Michigan	2150.6	12,089
Minnesota	945.8	11,942
Mississippi	386.2	9,065
Missouri	734.0	8,555
Montana	345.0	20,786
Nebraska	31.4	1,023
Nevada	52.9	4,526
New Hampshire	4.6	307
New Jersey	532.4	3,776
New Mexico	114.8	4,383
New York	9540.3	33,126
North Carolina	616.4	5,777
North Dakota	90.8	7,764
Ohio	3712.8	20,211
Oregon	355.9	7,620
Pennsylvania	1748.4	9,135
Rhode Island	450.2	30,216
South Carolina	157.5	2,778
South Dakota	6.3	442
Tennessee	713.3	9,486
Texas	1555.6	5,800
Utah	54.9	2,280
Vermont	19.2	1,995
Washington	1775.0	27,434
West Virginia	512.0	13,404
Wisconsin	228.4	2,830
Wyoming	33.5	3,489

Table B.3

Pension and Market School Debt Per Pupil

State	Estimated School Employees UFL Per Student ($)	Market Debt Per Student ($)	Total School Debt Per Student ($)	Estimated UFLs / Total Debt
Alabama	953	203	1156	.82
Alaska	47	2512	2559	.02
Arizona	233	957	1190	.20
Arkansas	98	643	741	.13
California	2418	439	2857	.85
Colorado	1006	941	1947	.52
Delaware	1470	504	1974	.74
Florida	720	563	1283	.56
Georgia	885	415	1300	.68
Hawaii	423	NA	NA	NA
Idaho	854	601	1455	.59
Illinois	1407	988	2395	.59
Indiana	2284	145	2429	.94
Iowa	38	590	628	.06
Kansas	159	643	802	.20
Kentucky	1387	777	2164	.64
Louisiana	1907	730	2637	.72
Maine	632	712	1344	.47
Maryland	379	686	1065	.36
Michigan	975	1313	2288	.43
Minnesota	1074	1322	2396	.45
Mississippi	727	240	967	.75
Missouri	729	629	1358	.54
Montana	1917	584	2501	.77
Nebraska	96	736	832	.12
Nevada	377	1364	1741	.22
New Hampshire	25	732	757	.03
New Jersey	355	1047	1403	.25
New Mexico	413	367	780	.53
New York	2627	1088	3715	.71
North Carolina	481	281	762	.63
North Dakota	684	484	1168	.58
Ohio	1547	632	2179	.71
Oregon	652	710	1362	.48
Pennsylvania	763	544	1307	.58
Rhode Island	2605	905	3510	.74
South Carolina	253	499	752	.34
South Dakota	41	280	321	.13
Tennessee	809	859	1668	.48
Texas	516	1122	1638	.32
Utah	178	713	891	.20
Vermont	177	723	900	.20
Washington	2285	705	2990	.76
West Virginia	1268	292	1560	.81
Wisconsin	220	778	998	.22
Wyoming	331	1238	1569	.21

Table B.4

AMORTIZATION OF ESTIMATED SCHOOL EMPLOYEE UNFUNDED LIABILITIES

State	Amortization Payment per Pupil[a] ($)	Current Operating Expenditure per Pupil[a] ($)	Amortization as % of Current Operating Expenditure Per Pupil
Alabama	84	1281	6.6
Alaska	4	3341	0.1
Arizona	21	1436	1.4
Arkansas	9	1193	0.7
California	213	1674	12.7
Colorado	89	1649	5.4
Delaware	130	2138	6.1
Florida	63	1549	4.1
Georgia	78	1189	6.6
Hawaii	37	1963	1.9
Idaho	75	1206	6.2
Illinois	124	2058	6.0
Indiana	201	1449	13.9
Iowa	3	2002	0.2
Kansas	14	1682	0.8
Kentucky	122	1294	9.4
Louisiana	168	1481	11.3
Maine	56	1522	3.7
Maryland	33	2100	1.6
Michigan	86	1975	4.3
Minnesota	95	1962	4.8
Mississippi	64	1220	5.2
Missouri	64	1425	4.5
Montana	169	1906	8.9
Nebraska[b]	8	1526	0.5
Nevada	33	1526	2.2
New Hampshire	2	1366	0.2
New Jersey	31	2333	1.3
New Mexico	36	1476	2.5
New York	231	2527	9.2
North Carolina	42	1343	3.2
North Dakota	60	1518	4.0
Ohio	136	1581	8.6
Oregon	57	1929	3.0
Pennsylvania	67	2079	3.2
Rhode Island	229	1840	12.5
South Carolina	22	1340	1.7
South Dakota	36	1385	0.3
Tennessee	71	1209	5.9
Texas	45	1352	3.4
Utah	16	1363	1.2
Vermont	16	1550	1.0
Washington	201	1951	10.3
West Virginia	112	1374	8.1
Wisconsin	19	NA	NA
Wyoming	29	2007	1.5

[a]At 8% interest over 30 years.

[b]Excludes Omaha.

Table B.5

DEBT-EQUITY RATIO BY STATE[a]

State	School	State and Local	State	School	State and Local
Alabama	.040	.174	Montana	.045	.087
Alaska	.031	.320	Nebraska	.011	.132
Arizona	.026	.113	Nevada	.027	.086
Arkansas	.016	.058	New Hampshire	.013	.067
California	.045	.101	New Jersey	.024	.107
Colorado	.032	.079	New Mexico	.019	.084
Delaware	.033	.182	New York	.085	.350
Florida	.017	.070	North Carolina	.019	.046
Georgia	.028	.102	North Dakota	.016	.052
Hawaii	NA	.119	Ohio	.041	.100
Idaho	.025	.040	Oregon	.022	.133
Illinois	.040	.104	Pennsylvania	.026	.162
Indiana	.053	.104	Rhode Island	.063	.163
Iowa	.008	.029	South Carolina	.019	.100
Kansas	.012	.075	South Dakota	.005	.034
Kentucky	.054	.175	Tennessee	.037	.082
Louisiana	.074	.223	Texas	.040	.069
Maine	.025	.092	Utah	.021	.049
Maryland	.019	.129	Vermont	.016	.053
Michigan	.055	.124	Washington	.045	.118
Minnesota	.040	.115	West Virginia	.047	.101
Mississippi	.028	.123	Wisconsin	.017	.042
Missouri	.027	.074	Wyoming	.028	.047

[a]Total debt divided by market value of property.

Table B.6

Unfunded Liabilities and Trends Affecting Teacher Retirement Systems

State	Estimated School UFL Per Active Member ($)	% Change in Enrollment, 1970-78	Automatic Post-Retirement Adjustment	Annual Growth in Real Personal Income, 1970-77	Fiscal Limitation (State or Local)
Alabama	8559	-6.5	no	4.5	no
Alaska	497	11.3	4% limit	10.9	local
Arizona	2558	27.3	N/A	6.1	both
Arkansas	1181	-1.3	1.5%	5.4	no
California	35682	-12.1	2%	3.7	local
Colorado	10677	1.8	3%	5.4	both
Delaware	16253	-16.5	N/A	2.5	no
Florida	8253	6.9	N/A	5.6	local
Georgia	9674	-1.0	1-1/2% semi-annually	4.0	no
Hawaii	5283	-6.1	2.5%	3.4	both
Idaho	10442	11.5	5% limit	4.9	local
Illinois	18306	-10.6	2%	2.1	no
Indiana	27575	-8.2	no	3.3	local
Iowa	411	-13.8	no	3.5	local
Kansas	1659	-14.5	no	3.8	local
Kentucky	16554	-3.3	1%	4.5	no
Louisiana	19900	-1.7	3% limit	4.8	no
Maine	6898	-2.9	CPI	3.3	no
Maryland	4475	-11.4	CPI	2.9	no
Michigan	12089	-9.3	no	3.5	both
Minnesota	11942	-12.6	no	3.5	local
Mississippi	9065	-8.1	no	4.8	no

Missouri	8555	-13.5	2% limit	2.9	no
Montana	20786	-6.2	no	3.5	local
Nebraska	1023	-9.4	no	3.5	local
Nevada	4526	14.1	2%	6.0	no
New Hampshire	307	10.1	no	3.8	no
New Jersey	3776	-9.2	50% CPI change	1.9	both
New Mexico	4383	-0.7	no	5.7	no
New York	33126	-10.0	no	0.8	no
North Carolina	5777	-1.2	4% limit	4.1	no
North Dakota	7764	-17.0	no	4.7	no
Ohio	20211	-13.0	2%	2.5	no
Oregon	7620	-1.3	2%	5.2	both
Pennsylvania	9135	-12.7	no	2.5	no
Rhode Island	30216	-14.9	3%	1.7	local
South Carolina	2778	-2.0	4%	4.8	no
South Dakota	442	-16.9	2%	3.8	both
Tennessee	9486	-3.2	3% limit	4.4	state
Texas	5800	1.1	no	5.5	both
Utah	2280	6.6	4% limit	5.3	local
Vermont	1995	-1.0	5% limit	2.5	no
Washington	27434	-6.2	3% limit	4.1	local
West Virginia	13404	-1.0	no	4.8	no
Wisconsin	2830	-10.9	no	3.6	local
Wyoming	3489	-8.0	N/A	7.8	no

NOTE: N/A = not available.

SOURCES: U.S. Department of Commerce, Bureau of the Census, *Statistical Abstract of the United States*, 1978, Tables 11, 12, 20, 724, 725; National Education Association, Research Division, *Estimates of School Statistics, 1970-71*, 1970, Tables 6, 8, and *Estimates of School Statistics, 1978-79*, 1978, Tables 2, 6, 7; S. Abramowitz and S. Rosenfeld, *Declining Enrollments: The Challenge of the Coming Decade*, NIE, 1978, Table 61.

Appendix C

SUMMARY OF RESEARCH SUGGESTIONS

This report has suggested fourteen topics on which further research would be valuable; we collect them here in outline form. All but the last two are cited on pp. 12, 13, and 14.

Improvements in Actuarial Assumptions

Time-series estimates of salary determinants.

Effects of inflation on salaries, turnover rates, and retirement decisions.

Testing the symmetry of salary determinants, turnover rates, and retirement decisions in growth and decline.

Revenue-Raising Capacity

Time-series estimates of the exogenous determinants of the tax base.

Estimates of the tax base elasticity of the tax rate—residential, commercial, and industrial.

Understanding intergovernmental revenue-raising interactions.

The effects of inflation on the tax base.

Further work on the capitalization of tax rates.

State and Local Expenditures

Time-series estimates of expenditure determinants.

The effects of inflation on expenditures—especially compared with revenues.

Understanding intergovernmental expenditure interactions.

Testing the symmetry of expenditure determinants in growth and decline.

State and Local Borrowing (see p. 27)

Understanding why governments borrow what they do.

Understanding their debt portfolio choices (e.g., pension debt versus market debt).

BIBLIOGRAPHY

Abramowitz, S., and S. Rosenfeld, *Declining Enrollments: The Challenge of the Coming Decade,* U.S. Department of Health, Education, and Welfare, National Institute of Education, Washington, D.C., March 1978.

Advisory Commission on Intergovernmental Relations, *Taxation,* Washington, D.C., 1963.

Barro, Stephen, *The Urban Impacts of Federal Policies:* Vol. 3, *Fiscal Conditions,* The Rand Corporation, R-2114-KF/HEW, April 1978.

Commission on Pensions, City of New York, *Report on the Pension Funds of the City of New York,* New York, 1916.

Fishlow, Harriet, "Demography and Changing Enrollments," in S. Abramowitz and S. Rosenfeld (eds.), *Declining Enrollments: The Challenge of the Coming Decade,* U.S. Department of Health, Education, and Welfare, National Institute of Education, Washington, D.C., March 1978.

Friedman, Joseph, *Housing Location and the Supply of Local Public Services,* The Rand Corporation, P-5421, April 1975.

Greenough, William C., and Francis P. King, *Pension Plans and Public Policy,* Columbia University Press, New York, 1976.

Gurwitz, Aaron, "The Measurement of Fiscal Capacity," The Rand Corporation (unpublished paper), 1977.

Harvard Law Review, "Public Employee Pensions in Times of Fiscal Distress," March 1977.

Inman, Robert, "Optimal Fiscal Reform of Metropolitan Schools," *American Economic Review,* March 1978.

Kentucky Legislative Research Commission, *An Analysis of Retirement and Benefit Plans for Kentucky State Employees,* Research Report No. 128, October 1975.

Levin, Sharon G., "Suburban-Central City Property Tax Differentials and the Location of Industry: Some Evidence," *Land Economics,* Vol. 50, No. 4, November 1974.

Mayo, Stephen K., "An Econometric Model of Residential Location," Ph.D. dissertation, Harvard University, 1971.

McGill, D. M., *Fundamentals of Private Pensions,* Richard D. Irwin, Inc., Homewood, Ill., 1977.

National Education Association, *Estimates of School Statistics, 1970-71,* Research Division, Washington, D.C., 1970.

——, *1978-1979,* Washington, D.C., 1978.

National Education Association, *Teacher Retirement Systems,* Washington, D.C., 1976.

Oates, Wallace E., "The Effects of Property Taxes and Local Public Spending on Property Values: An Empirical Study of Tax Capitalization and the Tiebout Hypothesis," *Journal of Political Economy,* Vol. 77, November/December 1969, pp. 957-971.

Odden, Allan, John Augenblick, and Phillip E. Vincent, *School Finance Reform in the States, 1976-1977,* Education Commission of the States, Denver, Colorado, December 1976.

Office of Fiscal Affairs, New Jersey State Legislature, *New Jersey's Contributing Public Employee Pension Programs,* March 1976.

Pease, Sara R., *The Characteristics of Teacher Retirement Systems,* The Rand Corporation, N-1519-NIE, November 1980.

Smith, R. Stafford, "Property Tax Capitalization in San Francisco," *National Tax Journal,* Vol. 23, June 1970, pp. 177-193.

Thompson, Wilbur R., and John N. Mattila, *An Econometric Model of Post-War State Industrial Development,* Wayne State University Press, Detroit, Michigan, 1959.

Tilove, Robert, *Public Employee Pension Funds,* A Twentieth Century Fund Report, Columbia University Press, New York, 1976.

Trowbridge, C. L., and C. E. Farr, *The Theory and Practice of Pension Funding,* Richard D. Irwin, Inc., Homewood, Illinois, 1976.

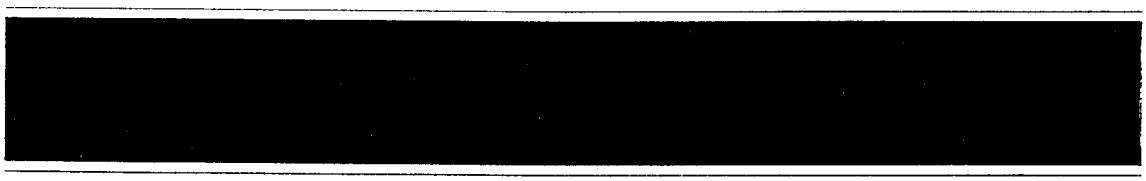
U.S. Department of Commerce, Bureau of the Census, *Employee Retirement Systems of State and Local Governments,* Vol. 6, No. 1, Washington, D.C., September 1978.

——, *Statistical Abstract of the United States,* 1978.

U.S. House of Representatives, Committee on Education and Labor, *Pension Task Force Report on Public Employee Retirement Systems,* 95th Cong., 2d sess., Washington, D.C., March 15, 1978.

Vaughan, R. J., *The Urban Impacts of Federal Policies:* Vol. 2, *Economic Development,* The Rand Corporation, R-2028-KF/RC, June 1977.

Vaughan, R. J., and M. E. Vogel, *The Urban Impacts of Federal Policies:* Vol. 4, *Population and Residential Location,* The Rand Corporation, R-2205-KF/HEW, May 1979.

Victor, Richard B., *The Effects of Unionism on the Wage and Employment Levels of Police and Firefighters,* The Rand Corporation, P-5924, August 1977.

RAND/R-2517-NIE