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ABSTRACT

A synthesis of research findings addressing effects of population and economic changes on education supply and demand in rural communities also presents policy implications, to help with local decision making. Principal research findings listed include: lack of a statistical relationship between per pupil expenditures and achievement on standardized tests; teachers' salaries are determinants of school quality as measured by achievement tests; lack of evidence of economies of size for school districts, except small rural districts; and a consistent relationship exists among income, community wealth, school size and school expenditure levels. Principal implications for policy and future research are also stated: school decision makers must consider school system structure to determine the most effective means of meeting short- and long-run educational objectives when allocating funds, and research is needed to help school administrators minimize costs when faced with excess capacity and reduced enrollments. Also recommended are expenditure analysis to identify local factors that community leaders can modify to deliver education at least cost, research on relationships between local economic growth and local education, and consideration of local, private, social, and spillover benefits of education when determining total returns to education. An annotated bibliography describes 121 research reports published between 1960 and 1983. Research projects (25) of the Southern Rural Development Center are listed. (MH)

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Education in a Changing Environment

Impact of Population and Economic Change on the Demand and Cost of Public Education in Rural America

By Brady J. Deaton
and Kevin T. McNamara

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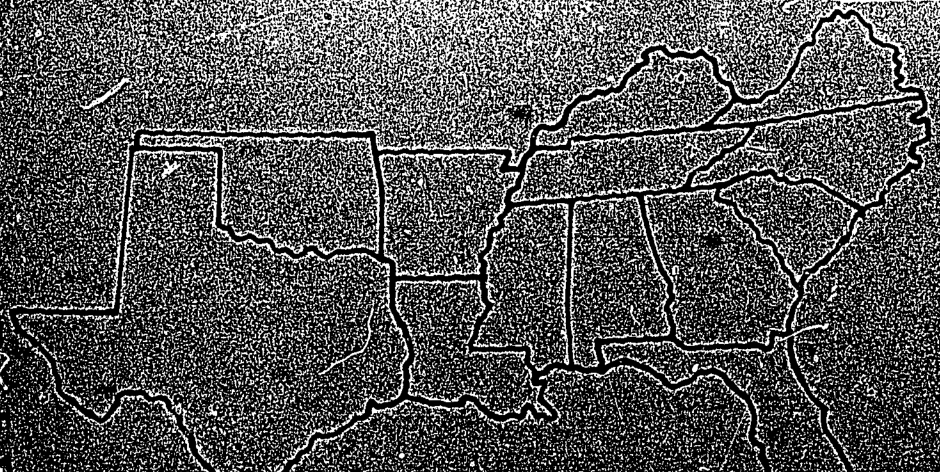

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EDUCATION IN A CHANGING RURAL ENVIRONMENT

THE IMPACT OF POPULATION AND ECONOMIC CHANGE ON THE DEMAND FOR AND COSTS OF PUBLIC EDUCATION IN RURAL AMERICA

A SYNTHESIS OF RESEARCH FINDINGS AND AN IDENTIFICATION OF IMPORTANT POLICY ISSUES

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PREFACE

This synthesis has attempted to identify research findings that address the effects of population and economic changes on the supply and demand for education in rural communities.

Research findings are presented and their possible policy implications are identified. In this way, we hope that the synthesis will both provide researchers with an understanding of the research issues and help school policy makers and community leaders perceive implications of the research for practical decision making at the local level.

We want to thank our colleague Dr. Thomas G. Johnson for proof reading the entire manuscript and acknowledge the substantial contribution of Dr. Bernal Green, Economic Development Division, Economic Research Service, USDA. Dr. Green read an earlier draft manuscript and made a number of useful conceptual and structural suggestions. We want to give him credit for suggesting the use of figures in the text while not burdening him with any responsibility for errors of interpretation. We also wish to thank E. Jane Luzar and Marcia M. McNamara for editing the synthesis and bibliography. Finally, we want to thank Diane Journell for typing the manuscript.

CONTENTS

Preface iii
List of Figures vii

Part One

THE IMPACT OF POPULATION AND ECONOMIC CHANGE ON THE DEMAND FOR AND COSTS OF PUBLIC EDUCATION IN RURAL AMERICA

A SYNTHESIS OF RESEARCH FINDINGS AND AN IDENTIFICATION OF IMPORTANT POLICY ISSUES

I. OVERVIEW. 1

II. THEORETICAL AND POLICY PERSPECTIVES ON EDUCATION SUPPLY. 8

III. EMPIRICAL FINDINGS ON THE SUPPLY OF EDUCATION 14
  The Contribution of Teachers. 15
  Economies of Size 18

IV. THEORETICAL AND POLICY PERSPECTIVES ON EDUCATION DEMAND. 21

V. EMPIRICAL FINDINGS ON THE DEMAND FOR EDUCATION. . . . 23
  Expenditure Analysis Studies. 24
  Education as an Investment. 25
    An Economic Growth Perspective. 26
    Social and Private Returns to Education . . . 31

VI. CONCLUSIONS FOR RESEARCH AND POLICY 38

Part Two

A SELECTED BIBLIOGRAPHY

I. ANNOTATED BIBLIOGRAPHY. 41

II. RESEARCH PROJECTS OF THE SRDC 79

III. SRDC BOARD OF DIRECTORS 83

LIST OF FIGURES

Figure 1: COMMUNITY HUMAN CAPITAL SUPPLY AND DEMAND 3
Figure 2: SCHOLASTIC APTITUDE TEST MEANS SCORES, 1951-81. . 5
Figure 3: HUMAN CAPITAL ACCUMULATION PROCESS. 10

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EDUCATION IN A CHANGING RURAL ENVIRONMENT

The Impact of Population and Economic Change on the Demand for and Costs of Public Education in Rural America

A SYNTHESIS OF RESEARCH FINDINGS AND AN IDENTIFICATION OF IMPORTANT POLICY ISSUES

OVERVIEW

The shifting settlement patterns of the U.S. population create unique pressures on the public sectors of local jurisdictions. Economic opportunities and population have shifted toward the South and West over the past decade and a half. Small towns and rural areas have received relatively greater numbers of families reflecting preferences for rural and small town life. This population movement stimulates demand for local public services in receiving areas and forces adjustments to the relatively lower population levels in sending areas. Growing populations must be served by police, fire, water, sewage, libraries, medical facilities and, most importantly, educational services. To the extent that the new population has higher income levels and different tastes and preferences, the mix of local public services demanded may be significantly different over relatively short time periods. Changes in the demographics of the population toward, for example, smaller family size and a general aging of the population, compound shifts in the mix of local services demanded by citizens of each area.

Public schools are significantly affected by sudden increases or decreases of school age children as their parents respond to changing job opportunities. The ability of the local school jurisdiction to adjust to these pressures while maintaining quality educational programs depends on their cost structure, tax base, quality of administration and teachers, volunteer support of the school program, and parental concern for their childrens' future. Community supply and demand for human capital provides a framework to understanding how these relationships affect education.

Human capital supply and demand both result from local people's needs (Figure 1). On the supply side, community leaders, parents and others make local human capital investments decisions, primarily through funding of the public education system, to ensure that individuals reared in the community obtain the skills needed to attain a socially acceptable quality of life. The broader social goal for an educated society also bears on human capital investment and is seen through minimum state and federal standards, or mandates for public education. These local and mandated investments are made through primary and secondary schooling, vocational training and higher education. Community demand for human capital is derived from households for household production needs and from local businesses and industries to meet labor requirements. These demands create the composite local demand for education as well as for other goods and services.

At the interface of the supply of, and demand for, human capital are markets (both formal and informal) that determine local human capital equilibrium. The formal human capital supply-demand

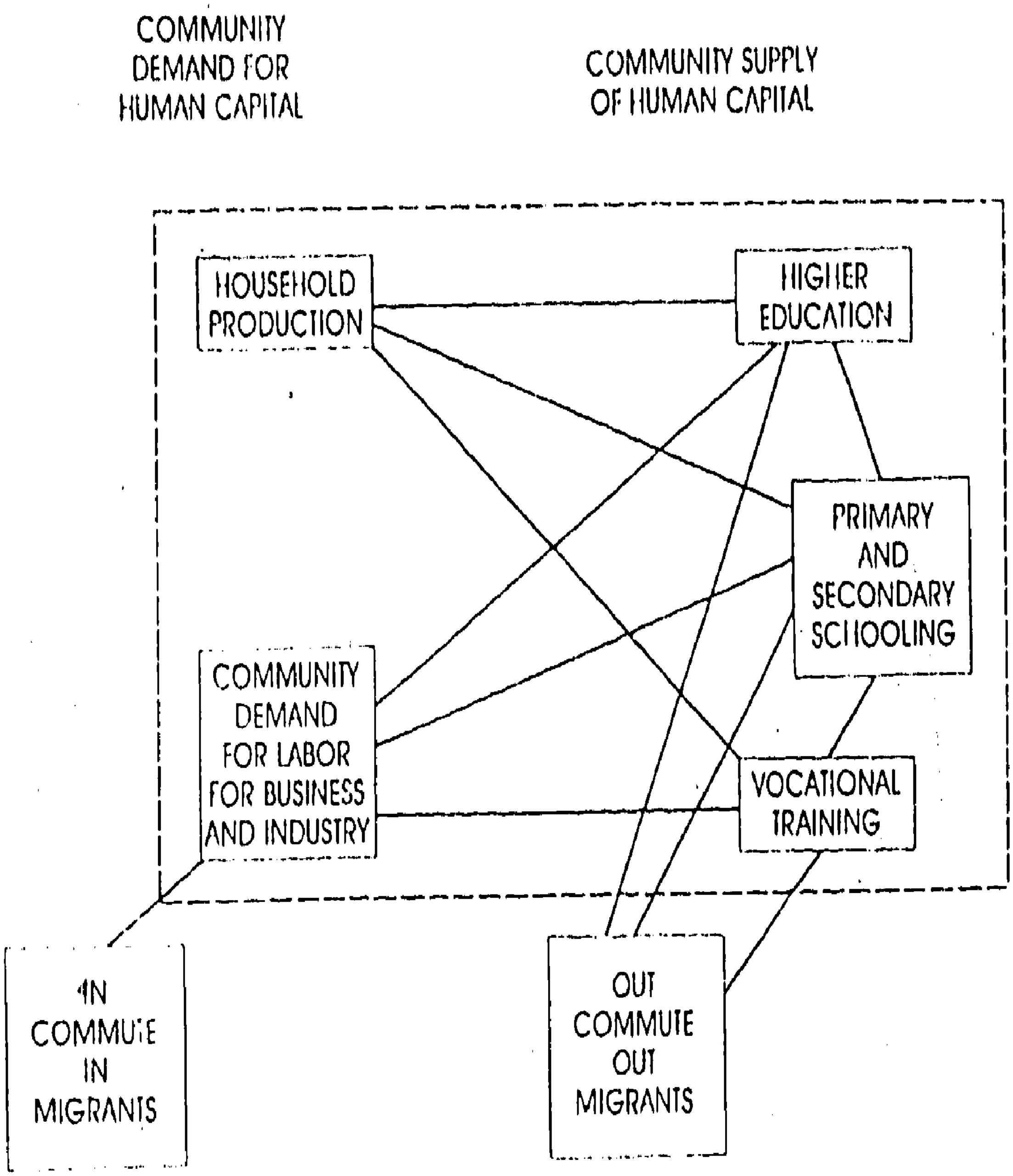

COMMUNITY DEMAND FOR HUMAN CAPITAL
COMMUNITY SUPPLY OF HUMAN CAPITAL
HOUSEHOLD PRODUCTION
HIGHER EDUCATION
PRIMARY AND SECONDARY SCHOOLING
COMMUNITY DEMAND FOR LABOR FOR BUSINESS AND INDUSTRY
VOCATIONAL TRAINING
IN COMMUTE IN MIGRANTS
OUT COMMUTE OUT MIGRANTS

Figure 1: Community Human Capital Supply and Demand

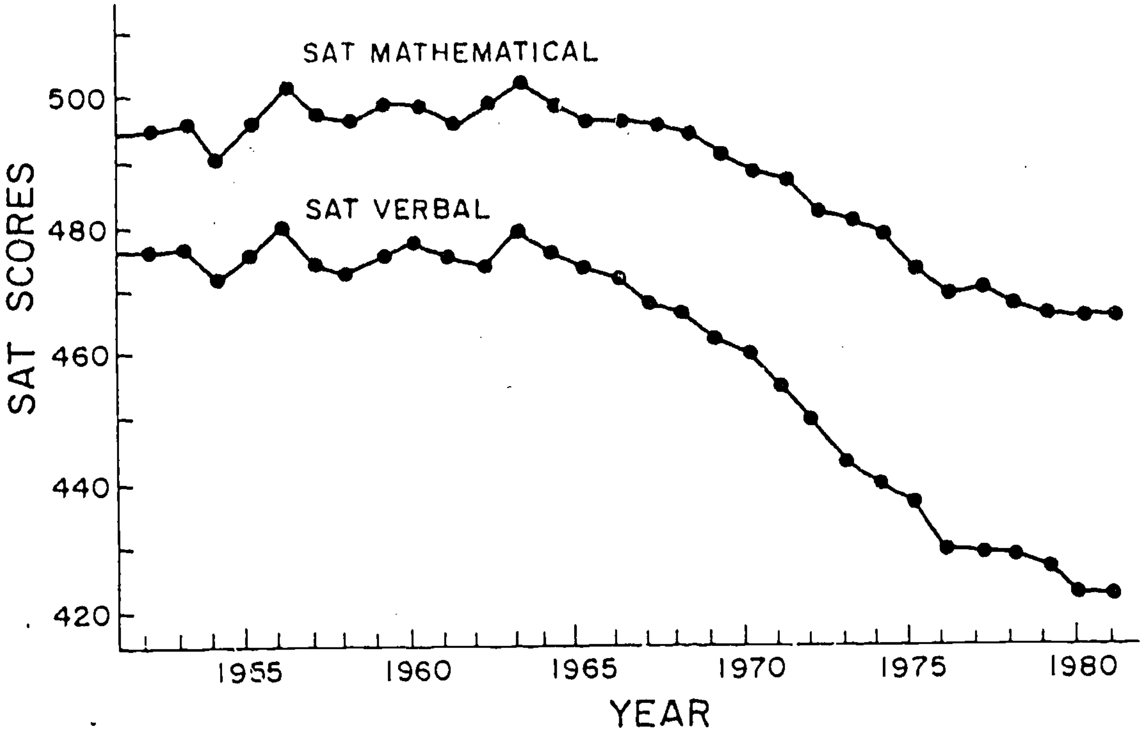
equilibrium level is established at some price level, or level of wages, for various skill levels. Changes in the demand for specific occupations will adjust the price level (wage rate) and attract or discourage further investments in those skill areas. Interaction between labor users and skill trainers also provides informal adjustments to this equilibrium.

The local human capital market is linked with markets outside of the community through external labor supply and demand relationships that establish in or out commuting and/or migration patterns.

The purpose of this synthesis is to identify important findings from a wide body of primarily economic literature. We have attempted to identify concepts and relationships that have important implications for future research and for decision makers who seek to gain a greater understanding of the relationships between population and economic growth and the related demand for and costs of public primary and secondary education in rural America.

Our focus on primary and secondary education stems from two basic concerns. *First,* the major component of local government spending for most jurisdictions in the U.S. is primary and secondary education. Therefore, annual political decisions about budget allocations tend to focus public concern on the local school system. The concern about education has increased in recent years as a pattern of falling scores on various achievement tests has developed (figure 2).

Figure 2: Mean SAT Mathematical and Verbal Scores, 1951-1981



Source: Andrew Oldenquist. "The Decline of American Education in the '60s and '70s." American Education. May 1983.

*A Nation at Risk**, a report recently completed by the National Commission on Excellence has thrust the issue of quality education to the forefront of public policy discussion. Public debates on schooling are based on various levels of private understandings about the ability of local spending to influence the quality of education. These issues are inherently economic, but the ability of economic research to provide clear- cut answers to the most important questions remains quite unclear. No less an observer than Mark Blaug has recognized the difficulties inherent in any attempt to define the nature and scope of the economics of education (p. vii). Recognizing this, the range and diversity of literature cited and apparent conflicting results should come as no surprise to the reader. *Second,* local decisions about the level of funding for public primary and secondary education provide the foundation for this nation's investment in its human capital stock. The quality and level of U.S. economic growth to a very large degree lies with the public choices made by the thousands of local school districts across the country. Perhaps of greater significance is the likelihood that the major social problems of poverty and political alienation, and ultimately the quality of citizenship achieved, depends fundamentally on the nature of our public school system.

This synthesi consequently, is undertaken in hopes of providing insight into some of these relationships. We have attempted to identify the theoretical underpinnings of our approach and have drawn inferences from empirical findings which, in many cases, go well beyond the scope and intent of the original research. By doing so, we hope to stimulate needed research that will help clarify points of conflict, fill missing gaps of knowledge and ultimately provide more accurate information on which private and public schooling decisions can be made. At a minimum, we want to glean from the findings those relationships which may be of value to the local decision makers and extension service educators who must make daily decisions on educational matters with or without the research to guide them.

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*The Gardner Report. *A Nation at Risk*. National Commission on Education, 1983.

THEORETICAL AND POLICY PERSPECTIVE ON EDUCATION SUPPLY

Our synthesis of research on the effects of population and economic change on public education will be undertaken within an appropriate theoretical framework which draws on the classical economic concepts of the supply and demand of education services.

Interpreting the supply of educational services requires a conceptual construct that links the output of education with the input factors that produce the output. Educational output has both a quality and quantity dimension, and it is important to recognize that a number of considerations enter into any determination of educational output. No single measure is sufficiently comprehensive to capture the desired educational output for which society strives to achieve. Common output measures include:

- the proportion of youth who complete a given year of education,
- the levels of achievement measured by standardized test scores,
- the ability and desire to take additional training and to pursue college education,
- the ability to exercise responsible citizenship,
- the ability to adjust to changing social and economic demands, and
- the ability to be financially successful in professional careers after school.

A variety of approaches have been undertaken by researchers to develop appropriate measures for many of these concepts, though the most common measure of educational output has been some type of standardized test scores. Ostrom has called our attention to the need for using multiple indicators of public service outputs. While some research adopts several models with different measures of output (Burkhead, Katzman, Perl), most economic studies of education have not used multiple indicators in spite of the apparent potential contribution this could make. As fiscal stress is felt increasingly by local public officials, such issues take on greater significance. Resource allocation can be efficiently achieved only when outputs and inputs are clearly defined and externality effects recognized.

In order to resolve the conflicts in these reported findings, a complete conceptual model would be required in which the following characteristics were controlled statistically:

- Background of students and their families,
- Socioeconomic characteristics of the communities in the study,
- The expenditure mix in the school budget, particularly controlling for transportation costs and other non-academic overhead costs,
- The level and source of school funding.

The human capital accumulation process is outlined in Figure 3. The figure illustrates the unique nature of the human capital production process. Unlike the generalized production system which has one production, or growing period with controllable inputs, human capital

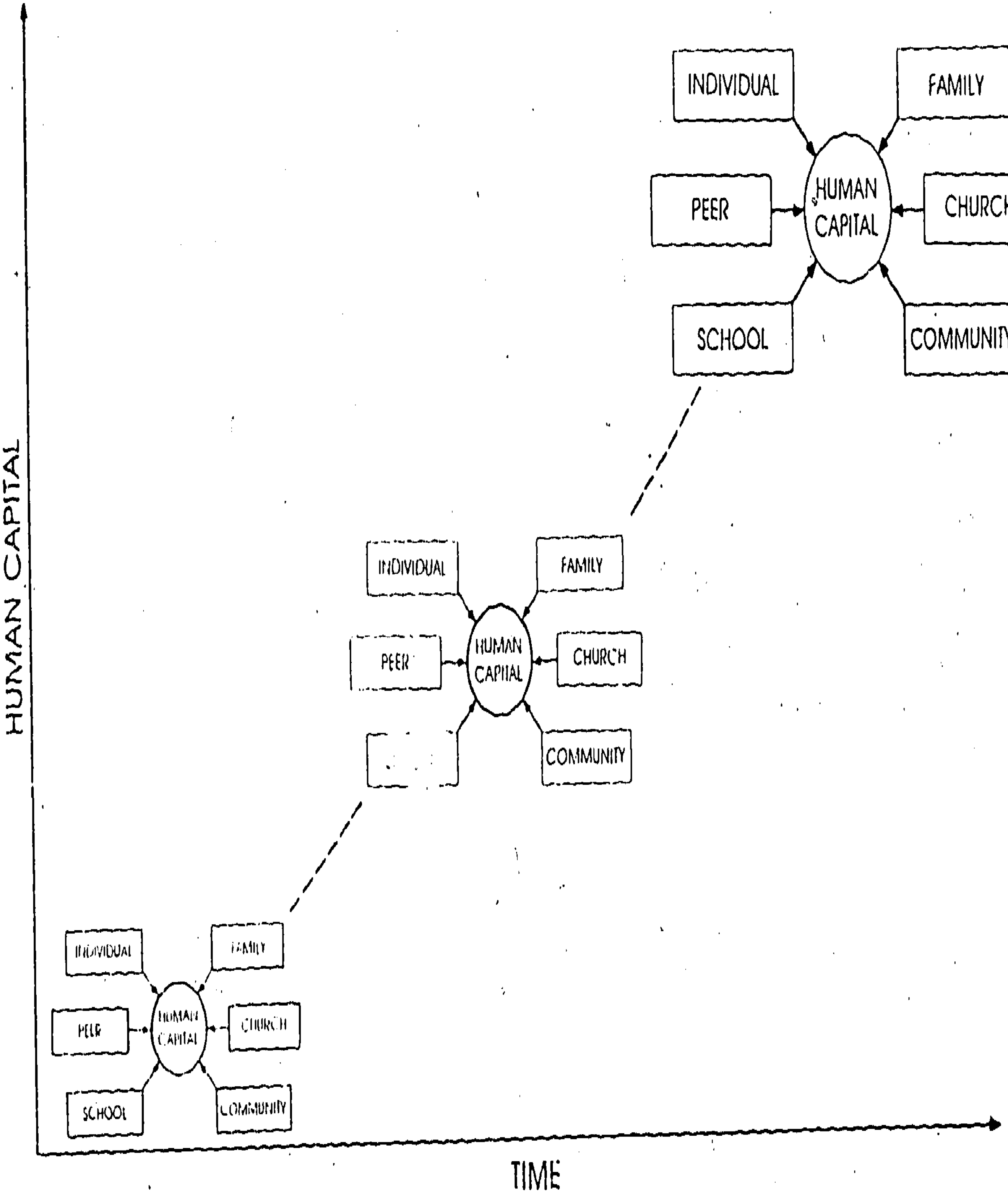
HUMAN CAPITAL
INDIVIDUAL
FAMILY
PEER
HUMAN CAPITAL
CHURCH
SCHOOL
COMMUNITY
INDIVIDUAL
FAMILY
PEER
HUMAN CAPITAL
CHURCH
COMMUNITY
INDIVIDUAL
FAMILY
PEER
HUMAN CAPITAL
CHURCH
SCHOOL
COMMUNITY
TIME

Figure 3: Human Capital Accumulation Process

development through primary and secondary schooling is a continuous process that occurs over 12 unique production periods. During each of these periods inputs from six broad categories interact to produce human capital. These catagories of influence or production inputs are individual, family, peer, church, community, and school. Prior schooling also greatly influences the effects of the inputs on human capital development. The myriad factors affecting education and the dynamic nature of human capital production inputs over the total schooling period raise questions about modeling the production of education and about the interpretation of results from generalized production models.

At first glance, input factors appear to be more easily identifiable than output, but upon further exploration they are just as difficult to operationalize in a research context. That is, direct input factors such as school buildings, teachers, buses, books, and administrators can be counted rather easily. The quality of each of these becomes more difficult to measure, though the quality may be more important than quantity as a determinant of the ultimate desired output. Prices can be attached to such factors as buses, books and teachers which, when multiplied by their respective quantities and divided by the number of pupils, provide per pupil cost estimates for various levels of output. Therefore, the supply of educational services can be analyzed from either a production function or cost of production basis.

A critical set of inputs which must be considered includes the type of pupils in the school. Cultural and socioeconomic backgrounds are important determinants of students' ability to benefit from other inputs. Important influences on the quality of pupils are usually associated with the educational background of the parents, number of siblings, and the time and effort devoted by parents to pre-school training and to activities that complement the formal schooling activities. Associated with this is the willingness of parents to be active volunteers in the school, assisting with art, music, and other learning activities. Clearly, the genetic and nutritional backgrounds of children may vary markedly and will also influence the quality of pupils and their ability to respond to the influence of other inputs.

In addition to direct input factors, three other sets of conditions must be considered in analyzing the supply of educational services. These include: a) service conditions, b) states of technology, and c) institutional arrangements. The ability to utilize direct inputs to achieve desired output levels will vary as one or more of these three factors vary. Therefore, we have to be alert to a wide variety of influences that may distort rather straightforward statistical analyses of input-output relationships. Population growth and changing economic conditions may impinge differentially on these factors.

Service conditions refer to the socioeconomic environment within which the school system operates. The use of volunteers in the school, the organization of the political decision-making units, the availability of extracurricular and non-school learning activities, and the competition with private schools may all reflect factors worthy of consideration. For instance, changes are currently occuring with the use of volunteer and paid teaching aids as assistants to the classroom teacher resulting in improved student performance without substantial cost increases.

Technological changes may be of less significance to the production of education than to some other public services. Baumol has emphasized the dependence of education on labor inputs and the implications this holds for the rising costs of producing educational services.* Recent developments in microcomputers and their application to education might, however, significantly alter the teacher/pupil ratio in education. So while education may still be what Baumol calls constant productivity industry, it is shifting to a new plateau of labor/capital ratio. This could result in a significant reduction in the future allocation of labor resources to education with simultaneous, substantial increases in productivity.

Institutional arrangements refer to the rules of law and tradition that undergird the public school system. Three examples of significant changes in institutional arrangements that affected public education are: (1) the judicial decision reached in Brown vs the Board of Education in 1954 which ended the legitimacy of racially segregated public schools, (2) the consolidation of public schools which shifted the nature of traditional links between the schools and their clientele communities, and (3) more recent judicially inspired changes in state and local financing of education stemming from the *Serrano* decision which held that the educational quality available to students should not depend on the property wealth of local school jurisdictions.

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* Baumol, William J. "Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crisis," *American Economic Review*, LVII, No. 3 (1967) pp. 415-426.

Each of the above factors has played an important role in determining the production of educational services in small towns and rural areas. Deaton has emphasized the importance of philosophical underpinnings and of society's conception of justice in determining the relative role played by national, state, and local jurisdictions. His analysis suggests a continued, if not growing, significant involvement of federal government in both regulating and financing public education. Hence, our assessments of research findings attempts to relate these issues to factors associated with changing levels of population and economic growth.

EMPIRICAL FINDINGS ON THE SUPPLY OF EDUCATION

Our objective in this section is to draw attention to research findings that identify specific factors that lend themselves to being changed by local decisions about the educational process. Specifically, the importance to quality education of teachers' salaries and their educational background, including formal and informal training, will be addressed. Also, the contributions of other inputs such as classroom space and formal and informal teaching support will be identified. Most importantly, the relationship between levels of spending and local revenue sources and changes in each of these factors will be scrutinized. Finally, implications for, and findings on, the economies of scale in primary and secondary education will be discussed.

The Contributions of Teachers

The finding that per pupil expenditures is strongly associated with measures of student achievement lacks policy specificity (Levin in Johns, *et al.* 1970). On the one hand, research such as that of Ribich and Murphy has often failed to control for other variables that are likely to be jointly determining both the expenditure level and the students' abilities. Specifically, the influence of property wealth and family income should be included as control variables. Even after correcting for the influence of these factors, it is helpful to know whether the allocation of funds within the school budget makes a significant impact on student achievement. On this score, a sprinkling of evidence has emerged.

Several studies have found teachers' salaries significantly related to achievement. Bowles and Levin (1968) found both teachers' salaries and school facility measures significantly related to achievement. They engaged in a running discourse with Coleman over the severity of multicollinearity among school, teacher, and student background variables (Coleman, 1968). Clearly, being able to separate the intervening influence of each of these factors is a prerequisite to sound findings in this area.

Gustmann and Pilot found that higher expenditures are generally translated into higher teachers' salaries and are jointly associated with enrollment as a percent of population. Raymond's study of West Virginia schools was a great deal more specific. Using measures of several school inputs, he sought to determine variations in quality as measured by achievement test scores and freshman grade point averages. His results revealed that the teachers' salaries variable was the only significant determinant of school quality.

Supporting this general view were studies by Levin (1970), Perl (1973), Stinson and Krahmer (1969) and Welch (1966). Each of these provided a more in-depth assessment of the issue. Levin's study led him to conclude that the recruitment and retention of teachers with higher verbal scores is a cost effective approach to raising students' achievement scores.

Stinson and Krahmer set out to test the hypothesis that per pupil expenditures were related to educational quality. They found that instructional outlay per teacher, operating cost less transporation cost, and total cost less transportation outlays were all significantly correlated with achievement. Welch (1966) found staff-student ratios significantly related to productivity estimates. Stinson and Krahmer reported no statistically significant relationship between achievement scores and per pupil expenditures. Welch (1966) reported that quality of schooling as measured by per pupil expenditures was an important contribution to the returns to schooling.

Policy Implications

Research has shown that the quality of education at the local level can be improved by local decisions to increase teachers' salaries and to upgrade the quality of school facilities. There is, however, little evidence concerning the reasonable time frame required to realize increases in educational quality from these investments. Local policies that devote more resources to instructional outlays, lower student-teacher ratios, and non-transportation expenses are the mostly likely to result in higher student achievement scores. Local policy makers must realize that increasing the salaries of existing teachers would provide short run incentives for existing staff to stay, thereby delaying the school systems objective of recruiting and then retaining more qualified teachers. Other expenditure decisions aimed at improving educational quality will also require some lag period before their impacts are realized. Consideration of the school system's attributes, such as age of staff, condition of facilities, and teacher/pupil ratios, will help decision makers select the appropriate investments to consider when formulating plans to reallocate resources to improve the quality of education.

Economies of Size

Our concern here is to explore whether increasing or decreasing school size due to population growth or decline will affect the quality of schooling. Both energy-based boom towns in the West and smaller, more stable communities in the South and West have experienced rapid economic and population growth over the past decade and a half. What prognosis does this hold for quality education?

Levin has pointed out that economies of size studies can be divided into those that address school district size and those directed to individual schools. Clearly, it is the latter which hold concern for our purposes. In any event, Levin concludes that studies of the former have found no evidence of economies of size for the range of districts under consideration. Kiesling's (1967) study of New York State supports this view. He feels, however, that economies of size may exist in small rural school districts (Levin, p. 192 in Johns, *et al.*). This issue has not been resolved by other research.

Potential diseconomies of size were revealed by Kiesling's findings of a negative association between school size and average test scores for high school students over size ranges from below 200 to almost 4000. (Kiesling's results are reported by Levin in Johns, *et al.*)

Holland and Bartelle's report of economies of size was not based on achievement scores as output measures. Neither was Osburn's analysis of per pupil expenditures and school system size. These results must be discounted on this particular issue when compared with Kieslings. The contrasts in these approaches should serve as a warning against drawing premature findings on the economies of size issue.

Levin's assessment of the studies by Burkhead and associates supported the view that there is "no significant statistical association between school enrollments and several measures of educational outcome once differences in students' backgrounds and school resources were accounted for" (p. 193). While diseconomies are potential dampers, "no study has found that such units yield economies of size, and several inquiries have obtained the opposite results" (Levin, p. 194). Levin further observes that no rigorous studies have been made of elementary school size, "and the major source of size inefficiencies have not been delineated in adequate detail."

The case studies of the western boom towns completed by Ross and Green represent a seminal contribution to economic analysis of the response of communities to rapid population increases. Their work illustrates the insight that can be gained from alternative social science disciplines. Their social change perspective revealed the complex and dynamic interactions that occur among power groups, the inertia associated with traditional sources of community power, and the unlimited potential of local community action when undertaken by concerned citizens. That is, local citizens can make a substantial contribution to the improved quality of public education. Commitment and leadership are vital ingredients of the local supply of education service.

Policy Implications

In this assessment lies, perhaps, the most optimistic conclusion gleaned from the research synthesis. The basic issue confronting the public school system is how to generate greater efficiency. How can higher educational output be achieved with relatively less financial input? School systems confronted with sharp changes in population must take great care to avoid undue inefficiency which leads to higher per pupil costs of education.

Rather than dealing with the consolidation issue of the 1950's and 1960's, school systems are now more likely to be faced with minimizing educational costs when excess capacity is pervasive, an issue with which research has not dealt. The least-cost method of shrinking the school system while quality is expanded must be explored as we move into a decade when many school systems are and will be facing this issue.

THEORETICAL AND POLICY PERSPECTIVES ON EDUCATION DEMAND

The demand for educational services can be formally analyzed in economic terms under a variety of alternative assumptions about the relationships between individuals and the unit of local government. Fox has identified two principal bodies of thought that explain how voter preference is translated into actual production of education services (pp. 3-4). The first approach, the median voter model, assumes that people will move from one community to another seeking an appropriate level and mix of public services (the Tiebout hypothesis).* Continuous formal and informal interaction between citizens and decision makers leads toward an optimal level of output.

The dominant party model is the second body of thought. Here, groups that win elections set service and expenditure levels in such a way that they maintain themselves in power from one election to the next.** These two approaches result in different interpretations of the supply and demand of education.

For either approach, the demand for public education can be viewed as a function of factors such as service conditions, population levels, prices of education and other goods, property wealth, intergo-

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*Tiebout, C. M. "Pure Theory of Local Expenditures." *Journal of Political Economy* 64(3): 416-424, 1956.

**Buchanan, James M., and Gordon Tullock. *The Calculus of Consent*. University of Michigan Press, 1962.

vernmental grants, and income. Important variables to note here include prices of education and of other goods and levels of income. The former incorporates consideration of relative prices between public and private schools, whereas the latter recognizes that the quality and quantity of education vary with levels of income of individuals and income levels across school districts. The implications for public policy of each of these factors may be quite significant.

A revolution in both the demand for quality education and the means of providing it has occured in the post WWII period. Communities are faced with federal and state mandates reflecting broader societal demands for more uniform access to quality education. Unfortunately, state and federal financing may not be adequate to insure that mandated needs are met. Conflict over the objectives of primary and secondary education are endemic, and the bureauratic apparatus may be an inadequate means of achieving reasonable agreement on the outcomes.

Mandates have led to exceptionally high costs for busing, special education and extra-cirucular activities without resolving what level of government should bear the responsibility for the financial burden being imposed. Local policy makers must be able to maintain sight of local educational objectives as well as mandated social objectives while considering the allocation of local financal resources to the educational system in order to insure that the desired quality of education is obtained. Research approaches to this area of inquiry must encompass this broader framework in order to obtain useful information for informed public discussion.

EMPIRICAL FINDINGS ON THE DEMAND FOR EDUCATION

The demand for education is derived from the social welfare objectives of society. This demand is collectively expressed through various political units and by individuals according to the utility (both direct and indirect) they expect to receive from education. At the national level, education is viewed as a means of developing good citizens who are politically responsible and in whom particular values can be inculcated in the educational process. In strictly economic terms, education provides skills and abilities that contribute to national economic growth and which enable individuals to be responsive to changing macro economic forces. This may entail such phenomena as spatial resettlement and occupational adjustments to structural changes in the economy. These adjustments have been important factors shaping the history, culture and economy of the U.S. Both the population turnaround and the technological change being experienced by the U.S. are unique in some aspects but simply reflect a continuing pattern of change that will surely reveal new facets in future decades.

Expenditure Analysis Studies

A number of studies of the demand for public primary and secondary education (Conlisk, Garns, Hirsch) have used expenditure analysis to estimate factors that influence local expenditure levels for education. Income, community wealth (property value), and size of school variables are the factors that consistently explain educational funding levels.

While these expenditure analyses are generally referred to as demand studies, caution must be used in interpreting the results. Hirsch* points out that these expenditure equations have embedded within them both a cost function and a demand function. Further difficulties arise with this type of study because actual quantity and quality of output are not recognized, nor is the nature of local service conditions. Expenditures are the product of units of output and the per unit cost of education. Focusing on expenditures masks the behavioral and technical relationships underlying the concepts of educational output and the costs of production. The need to develop meaningful educational output measures to use in both demand estimation and cost analysis has become apparent, but the research response appears to be less than desirable.

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* Hirsch, Werner Z., "Output and Costs of Local Government." Presented Paper, National Conference on Non-Metropolitan Community Services Research, Ohio State University, Columbus, Ohio, January 1977.

Hickrod points out another shortcoming of the expenditure analysis studies in that, while they identify factors that influence funding levels, they do not provide educational policy makers with information about factors they can influence to impact education funding levels.

Administrators of individual school systems are familar with the general quality and quantity of educational output the system is producing and have some idea of how incremental increases in funding could be allocated to various school inputs to improve the quality and/or quantity of this educational output. Their interest in expenditure analysis studies therefore relates to issues that influence variation in expenditure levels, not in demand for education or cost of production issues. In this context, expenditure analyses could be quite useful for the local administrator or political decision maker.

Education as an Investment

The seminal contributions in this area stem from the works of Becker and Schultz. Their findings strongly support the view that education plays a key role in the economic development of any society and represents an attractive investment from an individual perspective. Each of these perspectives will be considered briefly.

An Economic Growth Perspective. Schultz' 1961 contribution marked a significant departure from contemporary economic thought at that time and firmly established the view of education as an investment in human capital. He asserted that education is an important means of enlarging the range of individual choice and enhancing personal and social welfare (p. 2). These principal assertions were generalized and placed in a global perspective in his Nobel lecture of December 10, 1979.

Schultz (1961) was struck by two puzzling observations: (1) A long period of decline in the capital-income ratio in the U.S., and (2) the increased income growth of the U.S. "at a much higher rate than the combined amount of land, man-hours worked, and the stock of reproducible capital used to produce the income" (p. 6). Given the evidence of growing real earnings of workers and the rapid post-war recovery of Europe and Japan, he concluded that the answer which unifies these observations lies in the investments in human capital which were not accounted for in most economic analyses.

Schultz evaluated the rapid rate of increase in educational investments in the U.S., including income foregone while in school, and came to two important conclusions: (1) a high income elasticity of demand exists for education if it is regarded as pure consumption, and (2) investments in education account for between 30 to above 50 percent of increased national income in the U.S. Denison's (1962) analysis further supported these views.

Each of these conclusions holds important implications for state and local economic growth. On the one hand, rising per capita incomes will result in a greater demand being placed on local school districts. The population turnaround has resulted in higher income individuals moving into small towns and rural areas. The resulting pressures on the school system for higher quality education should not be surprising.

On the other hand, local investments in education may be an important factor influencing local economic growth. In viewing the local jurisdiction as a decision unit that seeks to maximize local returns on investment, some important implications follow. Clearly, individuals who leave the jurisdiction to find jobs elsewhere may benefit themselves and society at large but do not directly generate revenue flows within the jurisdiction. Holtmann (1966) hypothesized that communities will not produce education if it cannot be reimbursed for its costs. Holland and Tweeten (1973) developed a school funding model based on these premises and concluded that compensation for such spillovers would result in greater dollar transfers than under other approaches based on "ability to pay" or "equality of opportunity".

The appeal of this concept to jurisdictions that are major exporters of educated human capital leads to related policy questions of how local growth can be stimulated. Capturing the benefits of local investments may require that new economic opportunities be generated or attracted. Local policies that move in this direction require that a careful assessment be made of the expected returns to local investments in education versus the return to other public service investments.

An important research question which emerges is the relationship between education and local economic growth. Economic growth may stimulate the demand for increased educational quality if per capita incomes increase, or if new migrants into the community have preference structures that place a higher value on education than the level preferred by long term residents. Conflict may arise between new residents demanding higher education and long term residents content with the status quo. This conflict may be offset to some degree if higher per capita property wealth is associated with new residents who will then pay for a greater than average share of school expenses. In many cases, however, a lag exists between immediate demands for education at the same or higher levels and the building of new homes and their assessments for tax purposes. It becomes obvious that wealth per capita, lags in assessment and taxing procedures, and the size of families of new migrants into the community all play key roles in creating new demands for public educational services.

The evidence for determining whether education is an important factor that stimulates local economic growth, however, is sparse and inconclusive. Following Schultz's lead, the argument favoring such a relationship seems rather obvious. Higher quality educational services provide more skilled manpower, higher amenity values, and greater infrastructural and social adjustment potential for the community.

Given the pervasiveness of educational externalities and the greater mobility of more highly educated laborers, however, it is not clear that the benefits can be captured at the local level (Becker, Hines, Welch). The return on educational investment is more certain to be captured as the level of jurisdiction being considered moves from the local to the state and national levels. Recognizing this relationship leads to important policy implications about who should bear the burden for public education.

Industrial location studies have included either stock or flow measures of human capital as a determinant of employment change or of industrial location.* The major objective of these studies was not, however, to establish the relationship between local educational investments and local economic growth and their methods of analysis were inadequate to address this important relationship.

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*Dorf, R.J. and Emerson, M. "Determinants of Manufacturing Plant Location for Nonmetropolitan Communities in the West North Central Region of the U.S." *Journal of Regional Science* 18: 109-120, 1978.

Leuck, D.J. "An Econometric Model of Manufacturing Growth in Rural Employment in Rural Tennessee Counties From 1962 to 1976." *Southern Journal of Agriculture Economics* 11: 63-67, 1979.

Smith, Eldon D., Deaton, Brady J., and Kelch, David R. "Location Determinants of Manufacturing Industry in Rural Areas." *Southern Journal of Agriculture Economics* 10: 23-32, 1978.

Smith, Eldon D., and Klindt, Thomas H. *Industrial Location and Growth in Submetro Tennessee and Kentucky Communities.* Southern Cooperative Series Bulletin 258, June, 1981.

Sulaiman, Jamaludin, and Husak, Leroy J. The Impact of Industrial Sites on Industrial Employment Growth: A Case Study of Appalacian Ohio." *The American Industrial Development Council Journal,* 15: 7-22, 1980.

Per pupil school expenditures accurately reflect school output only under severe restrictions which generally cannot be expected to hold. At a minimum, economies of size would have to be absent, the quality of teachers and other school inputs have to be homogeneous, and other service and institutional arrangements must be essentially invariant. Clearly, future research on the influence of local education on local economic growth should be based on standardized achievement scores at a minimum. Multiple indicators of schooling output would be preferable and would provide local and state decision makers with more accurate measurements of the relationships between educational output and local economic growth. The theoretical perspective of Ostrom should be valuable for researchers in this area.

Policy Implications

That a vital society requires a dynamic educational system seems beyond question. Research on national economic growth and development has firmly established these causal relationships. On the other hand, the dependency of state and local economic growth on the educational system of the jurisdiction is less well understood. Population mobility has frustrated attempts to measure these relationships. While substantial conceptual research will be required to guide research to measure the significance of the relationship between local economic growth and local education, some industrial location studies do indicate *a relationship between education and economic growth*. Also, a sampling of the empirical data suggests that this is well understood by leaders of business and industry. That a quality economic environment depends on quality education is, therefore, a compelling argument.*

Social and Private Returns to Education. The concern of economists with returns to education is consistent with the classical notion that the relative returns to alternative investments helps allocate the economy's resources among competing uses (Gisser). The U.S. and most other major industrial nations have constrained the allocation process by establishing minimum ages for required school attendance or minimum levels of years of schooling required of all youth.

Given such requirements, the questions remain concerning what level of inputs can be justified given some socially acceptable rate of return (a supply side question), and what quantity and quality of schooling should be obtained to insure a competitive position in the job market (a demand side perspective). In both cases, the rate of return or the benefit-cost ratio becomes an important question.

None of the above denies the fact that school regulations and programs are designed to achieve multiple outputs that go well beyond their narrow economic contribution. Nevertheless, the economic aspects of this societal function is intertwined with a host of other variables. Identifying and measuring the relative importance of various determinants of labor market behavior become a fundamental concern at the macro-economic level and may sharply alter local economic and schooling decisions. Such questions as the following emerge from these considerations and build on Welch's 1975 contribution:

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*Smith, Eldon D., Brady J. Deaton, and David R. Kelch. "Location Determinants of Manufacturing Industry in Rural Areas." *Southern Journal of Agricultural Economics* 10:23-32, 1978.

- Within a given market area, what range and level of skills influence future earnings?
- What is the role of primary and secondary public education in developing these skills?
- Does schooling play a role in the distribution of important skills among individuals?
- What factors determine variations in the level of remuneration for given skills among market areas?

Answers to these questions will provide insight into perplexing issues of income distribution, equality of economic opportunity, and the importance of quality education (Schultz, 1972). Unfortunately, most economic approaches to analyzing these issues have been seriously deficient. Welch's review (1975) found most research superficial in that important contributing variables such as family background, ability, and quality of schooling were often omitted. Studies by Ben-Porath and Haley were identified as exceptions. Also, the measures used in the research of school quality and skills gained are conceptually weak or are often excluded from the analysis. Skills gained from education, for example, were most often measured by the number of years of schooling completed rather than some conceptually based measure of marketable skills gained in the education process.

However, even after adjusting for ability and family background, Welch found no study that showed a zero net return to schooling (p. 65). Adjustments for ability and family background reduced earnings estimates by 7-17%. Clearly, however, both ability and family background may be bound up in the quality of school program provided, creating additional measurement difficulties.

Measures of ability depend on the socioeconomic, particularly the nutritional, background of the family and, depending on how and when they are measured, may also be strongly influenced by pre-school training and early years of the formal schooling experience. In addition, the socio-economic status of the family determines the extent of their involvement in school volunteer and PTA program activities which represent, in many jurisdictions at least, substantial inputs into school quality. Some programs (e.g. art and music) depend exclusively on volunteer inputs (Ben-Porath; Borus, Brennon and Rosen; Brown; Carnoy and Marenbach).

Studies by Gisser; Morgenstern; Ben-Porath; Brown; Miller; Carnoy and Marenbach; and Hines, Tweeten, and Redfern showed substantial rates of return to primary and secondary schooling. Hines, Tweeten and Redfern's study concluded that: (1) private returns justify private schooling investments for all race-sex groups at all schooling levels, and (2) social returns from schooling were 11.8 percent and represented 18 percent of average annual income growth of the U.S. from 1958 to 1960. These results are consistent with findings by Lassiter, Labowitz (1974) and most other studies cited above with some differences due to geographic and demographic specificity of estimating techniques.

The results of other studies are more sobering. Morgan and David's (1963) regression analysis with 14 independent variables showed only a 4-5% return in earnings. Niemi (1974) used 1970 Census data to calculate private internal returns to investments for whites, hispanics, and blacks in Texas and California. He concluded that internal rates of return to education have declined but that ethnic and racial differences are insignificant when compared to earlier studies. Raymond and Sesnowity criticized the methods employed by Niemi and found no decline in returns when they reestimated the returns from the same data.

More specific evidence on race-earnings differentials point to a critical role for education. Link and Ratledge reported that per pupil expenditures, a proxy for quality education, was a significant factor explaining earnings differences for both white and black males in 1967. A subsequent report by Link, Ratledge and Lewis based on the National Longitudinal Survey of the Labor Force supported Welch's hypothesis that improved quality of black education is responsible for black income gains.

Luyjites' study of Appalachian youth in the late 1960's reported that greater investments in education raised student expectations and induced more outmigration. Outmigration is generally associated with higher wage earnings which would be reflected in greater returns to educational investments even after adjusting for costs of moving including foregone earnings. These higher monetary returns appear to overestimate the welfare gains associated with the move, at least for the Appalachian migration stream, because some of the higher wage can be viewed as a psychic cost or as a compensation for the disamenities of urban life*.

The relationship between primary and secondary education and other approaches to obtaining basic skills has not been widely addressed. Yet, the issue is important in a broader view of institutional approaches to basic education. Borus, Brennan and Rosen found that male participants in Indiana's Neighborhood Youth Corps program made high earnings gains. The private gains and social returns for females were low and negative respectively. Also, high school dropouts received earnings gains in direct relationship to their length of time in the NYC program. Obviously, the institutional constraints on choice make this a problematic area of analysis since enrolees in Neighborhood Youth Corps on the one hand, and Upward Bound on the other, represent selective clientele. The interaction between such educational program and general public education deserves attention.

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* For more discussion and measurement of these differences see Deaton, Brady J., Larry C. Morgan, and Kurt R. Anschel. "The Influence of Psychic Costs on Rural-Urban Migration," *American Journal of Agricultural Economics* 64(2): 177-187, 1982.

As evaluated in terms of earnings gain, these results imply some range of direct substitution between the skills derived from public primary and secondary education and those received from non-formal schooling. Supporting this notion are the findings from Corazzini's analysis of post-high school vocational education. His benefit-cost analysis of high school level and post-high school level vocational education revealed that students who studied those skills in post-high school training that were available in high school have made poor investments. Rather than repeat this skill training, Corazzini recommended that semi-professional training would most likely lead to higher earnings gains.

Schultz' (1972, NBER) summary [illegible] the rates of return reveal the highest rates to elementary education [illegible] and higher), followed by high school (25%) and higher education ([illegible]). The measures show greater instability for nonwhites in all regions of the U.S. and are somewhat depressed below the levels for whites. He emphasized Welch's findings that the rate of return on improved educational quality in rural farm areas of the U.S. is approximately 27 percent, and the return on expenditures for teachers' salaries as the means of improving the quality of schooling ranged between 23 and 26 percent.

In concluding this section, it seems important to emphasize that investments in education reap benefits differentially among specific skills gained and over time in the economy as the derived demand for educational products varies. Differentials stemming from the derived demand of the general economy will vary by economic sub-regions and will stimulate some mobility of capital as well as labor. Consequently, research results must be interpreted with wisdom and a degree of caution. Basically, a dynamic, general equilibrium view of the economy must be the maintained perspective for interpreting these results, recognizing that most research is not based on the conceptual constructs emanating from such a view. Whereas these limitations constrain the state of the arts for the economics discipline, they do not constrain our use of general equilibrium constructs in the interpretation of the results.

Policy Implications

Economic decisions regarding the desirable level of investment in formal schooling will be viewed from three perspectives. The first is the private returns that can be earned by individuals and their families. An intergenerational perspective is most useful in this regard. The second is the public and private sector returns that can be captured by the respective jurisdictions. Counties and states will invest relatively more in education as their ability to internalize the returns increases. And, the third is the spillover benefits can be captured only by higher levels of political jurisdictions. The broader societal gains will result in public action to increase investment in education and to preserve the desirable social outcome.

CONCLUSIONS FOR RESEARCH AND POLICY

Our society is now caught up in a fundamental re-examination of basic education. Social and economic change will almost surely stimulate a new wave of research on the economics of education. Past research revealed that rural areas have lagged behind urban communities in educational investments. Consequently, rural areas have suffered from lower levels of public service development, lower rates of economic growth, lower quality health, legal and political institutions, and a lower ability to respond to rapid social change.

Fortunately, there are enough exceptions to these generalizations to illustrate the significant benefits that can be reaped from a sound program of investing in people. The future of rural America lies in the hands of local leadership across the country. The response of local leadership in providing public education will almost certainly determine the future quality of life for both rural and urban communities.

Available research findings, in spite of methodological difficulties and sometimes conflicting results, point to human capital investments as the fundamental tool for alleviating poverty, promoting citizenship, and altering those institutional structures that threaten to erode the quality of life. The response to this implicit challenge lies with the public school system. Citizens must determine what level of life opportunities will be supported through education and on what terms it will be offered.

This synthesis has revealed the following specific findings for research and policy:

Principal Research Findings

- There is no statistical relationship between per pupil expenditures and achievement as measured by standardized achievement test scores;
- Teachers' salaries are significant determinants of school quality as measured by achievement test results;
- There is no evidence of economies of size for school districts, except for small rural districts;
- Income, community wealth and school size consistently explain school expenditure levels;
- Investment in education accounts for between 30 to 35 percent of increased national income in the U.S.;
- Evidence of education stimulating local economic growth is inconclusive;
- Education is a significant factor explaining earnings differences among blacks and whites;
- The social returns to education have been estimated to exceed 10 percent;
- The private returns to education justify the investments in it;
- Returns to different educational levels have been estimated as

  Elementary school-35 percent,

  Secondary school-25 percent,

  Higher education-15 percent.

Principal Implications for Policy and Future Research

- School decision makers must consider the structure of their school system when allocating funds to specific expenditure items to determine the most effective means of meeting short- and long-run educational objectives;
- There has been no research undertaken that will guide school administrators seeking to minimize costs when faced with excess capacity, a situation that will confront an increasing number of school leaders as the effects of smaller family size continue to reduce school enrollments;

- Expenditure analysis is needed to identify specific local factors that community leaders can modify to deliver local education at least cost;

- The relationship between education investment and national economic growth has been established, but additional research is needed to determine the significance of the relationship between local economic growth and local education;

- Policy makers must consider the local, private, social and spillover benefits to education to determine the total returns to education.

ANNOTATED BIBLIOGRAPHY

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Akin, John S., and Douglas J. Youngday. "The Efficiency of Local School Finance." *Review of Economics and Statistics* 58(2): 255-258, 1976.

The study uses the median voter decision model and the assumption that households vote for public education expenditures on the basis of perceived benefits and burdens to obtain estimates of expenditures for school districts in New York. The authors estimated the price elasticity of demand for education to be .189. They conclude that a state matching and program could be established on the basis of their results which would lead to an approximately efficient provision of education in every school district.

2
Barlow, Robin. "Efficiency Aspects of Local School Finance." *Journal of Political Economy* 78(5): 1028-40, 1970.

This investigation addresses the question of whether a particular level of spending associated with a property tax is allocatively efficient. Using a median voter model the author concludes that personal property tax funding would produce an inefficiently low level of output. Production of an efficient level of output when including business property tax is dependent on the percent of total property represented by business property.

3
Becker, Gary S. *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education.* Published by National Bureau of Economic Research, distributed by Columbia University Press, New York, 1975.

This seminal contribution provides the theoretical framework for economic analyses of human capital. Empirical findings are presented on the effects on earnings of alternative types of learning and on the rates of return to high school and college educations. The trends over time for private rates of return have been steady increases. Social rates of return estimates can not be made until the external effects of education are measured more appropriately. Becker concludes that research on human capital will be a significant part of analyzing such issues as economic development, income distribution, and labor turnover.

4
Becker, Gary S., and Barry R. Chiswick. "Education and the Distribution of Earnings." *American Economic Review* 56(2): 358-369. May 1966.

This paper develops a theory of the distribution of earnings that relies fundamentally on the basic general economic theory of maximizing behavior, where each person invests in the appropriate amount of human capital to maximize his or her economic behavior. The distribution of earnings is then determined by the distribution of investments and their rates of return.

5
Ben-Porath, Yoram. "The Production of Human Capital and Lifecycle Earnings." *Journal of Political Economy* 75(4): 352-65, 1967.

This study illustrates how a human capital production function can be used in the determination of the optimal path for human capital investment. The author analyzes implications for an individual's allocation of time and demonstrates how lifecycle earnings are affected by purchased inputs, time, the services of human capital, and costs.

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Bieker, Richard F., and Kurt R. Anschel. "Estimating Educational Production Functions for Rural High Schools: Some Findings." *American Journal of Agricultural Economics* 55(3): 515-519, 1973.

This study estimates a production function of the educational process using 1967-68 and 1968-69 data for the 11th grade students from five rural school districts. Students are the basic unit of observation and curriculum is the basic educative unit using academic, vocational and general classifications. Achievement is used as an output measure with four school inputs, one ability and one family characteristic. The results indicate that separate and different functions are required to evaluate the relationships between inputs and outputs for each curriculum.

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Blaug, Mark. *An Introduction to the Economics of Education.* London: The Penguin Press, 1970.

This book is a textbook that considers the economics of education. It includes sections on human capital formation, public and private returns to education, education and economic growth, and education and labor requirements.

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Boisvert, Richard N., and Harry P. Mapp, Jr. "A Benefit-Burden Analysis of Public School Financing: The Impact on Rural and Urban Taxpayers." *American Journal of Agricultural Economics* 56(4): 578-585, 1974.

The author applies cost-benefit analysis to the evaluation of school financing alternatives presented by the Fleischmann Commission, a commission charged with making recommendations on quality, cost and financing of public education in New York State. The study used 1970-71 New York state data.

Results indicate that equalizing per pupil expenditures through a statewide property tax would transfer benefits to high income suburban areas while equalization through a state income tax would benefit low income rural areas.

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Borus, Michael E., John P. Brennan, and Sidney Rosen. "A Benefit-Cost Analysis of the Neighborhood Youth Corps." *Journal of Human Resources* 5(2): 139-59, 1970.

The paper analyzes the benefits and costs of the Neighborhood Youth Corps program in Indiana using average per hour participant cost and regression analyses of participants' demographic characteristics regressed on 1967 earnings.

The study concludes that there are high earnings gains for males due to participation in the program and low gains for females. High school dropouts benefit more from the program than do high school graduates and the longer participants remain in the program, the greater the increase in post-program earnings.

10
Bowles, Samuel, and Harry M. Levin. "The Determinants of Scholastic Achievement -- An Appraisal of Some Recent Results." *Journal of Human Resources* 3(1): 3-24, 1968.

The study assesses data and statistical analysis used in the Coleman Report and finds that many of the report's finding are in error because of poor measurement of school resources, inadequate control for social background, and inappropriate statistical techniques. The authors report that teacher verbal scores and teacher experience have significant influences on achievement.

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Bowles, Samuel, and Harry M. Levin. "More on Multicollinearity and the Effectiveness of Schools." *Journal of Human Resources* 3(3): 393-400, 1968.

The article discusses multicollinearity in the Coleman Report data and uses a zero-order correlation matrix to show there is a substantial degree of it. Also the authors develop new estimates of the effectiveness of school inputs on achievement by eliminating variables that had insignificant coefficients in earlier estimates. They find that teachers' salaries and school facility measures are significantly related to achievement.

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Brown, Charles. "A Model of Optimal Human Capital Accumulation and the Wages of Young High School Graduates." *Journal of Political Economy* 84(2): 299-316, 1976.

The author estimates parameters of Ben-Povath's optimal accumulation of human capital model using a discrete-time version of the model. The analysis reveals that the discount rate and elasticity of investment costs estimates are implausible, so the model does not provide optimal earnings profile.

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Burkhead, Jesse. *Input and Output in Large City High Schools.* Syracuse, New York: Syracuse University Press, 1967.

Burkhead discusses the economics of education, develops a model for education as a production process, and then uses the model to estimate input-output relationships for Chicago public high schools, Atlanta public high schools and small community high schools.

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Cain, Glen G., and Harold W. Watts. "Problems in Making Inferences from the Coleman Report." *American Sociological Review* 35(2): 228-242, 1970.

This examination discusses perceived serious methodological shortcomings of the Coleman Report. They argue that the Report specifies an inadequate theoretical model against which to interpret statistical results and provides weak justification for the use of variables in the regression model.

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Carnoy, Martin, and Marenbach Dieter. "The Return to Schooling in the United States, 1939-1969." *Journal of Human Resources* 10(3): 313-30, 1975.

The authors estimate rates of return for investment in schooling for each of four census years (1939-69) fo white males, white females, non-white males, and non-white females using a standard discount formula. Their results suggest that the demand for college education has increased at greater rates than for secondary and primary education.

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Carroll, Stephen J. "School District Expenditures Behavior.' *Journal of Human Resources* 11(3): 317-27, 1976.

The study investigates how schools allocate budgets for many categories of school inputs: teachers, other professional educators, non-professional personnel, non-personnel instructional resources, administration, attendance and health services, transportation, plant operation and maintenance.

The author develops a utility maximizing function where input quantities are used in a preference function. This is done because 1) there is no reason to assume output maximizing behavior as in business, 2) insufficient knowledge of producion functions in education.

The results from the additive-logarithmic utility function indicate expenditures for teacher inputs are much smaller at margins in the discretionary budget (50-60%) than in the general budget (70-75%). The opposite is true for other educational inputs.

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Clune, William H, III. "Law and Economics in Hobson V. Hansen: An Introductory Note." *Journal of Human Resources* 7(3): 275-282, 1972.

The author provides a carefully reasoned case against the use of imprecise economic findings in court cases. For example, he argues that the question of whether or not economies of scale exist in public education should not be decided in court. Rather, such issues should be firmly resolved by economists and sufficiently understood to be applied confidently for a given situation. In the absence of well established economic relationships, justice will most likely be served by court decisions reached on the basis of presumed relationships. This article introduces the discussions by Michelson and by O'Neill, *et. al*.

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Cohn, Elchanan. "Economies of Scale In Iowa High School Operations." *Journal of Human Resources* 3(4): 422-434, 1968.

Cohn estimates an education production function and a per pupil cost curve using 1963 Iowa High School data. The production function uses the difference between a class's achievement measured in the 12th grade and 10th grade as an output measure. Median teachers' salary and number of teacher assignments were significant educational input factors. The cost function used per pupil school costs as the dependent variable. The positive, significant coefficient on average daily attendance squared indicates the long-run average cost curve is U-shaped, so that economies of scale do exist for Iowa high schools.

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Cohn, Elchanan, and John Riew. "Cost Functions in Public Schools." *Journal of Human Resources* 9(3): 408-414, 1974.

The authors offer an answer to Michelson's Criticisms of Riew's and Cohn's Wisconsin and Iowa studies which estimated economies of scale on individual school rather than school district basis.

They say that economy of scale estimates for Wisconsin and Iowa schools diverge over 100% due to differences in samples used. Also, technological, institutional and environomental differences can account for cost differences.

The authors argue that theoretical estimates are not in error for salary variables because nonsalary costs must be considered.

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Coleman, James S., et al. *Equality of Educational Opportunity.* U.S. Department of Health, Education, and Welfare, U.S. Government Printing Office, Washington, D.C., 1966.

The report provides a comprehensive review of regional and racial differences of educational resource distribution in the U.S. The report includes a study of school and home environment influences on student achievement.

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Coleman, James S. "Equity of Educational Opportunity: Reply to Bowles and Levin." *Journal of Human Resources* 3(1): 236-246, 1968.

Coleman discusses data deficiencies Bowles and Levin pointed out in Coleman Report data and disagrees with Bowles and Levin about their severity. Also, the author discusses statistical procedures and argues that multicollinearity among school, teacher, and student background variables is not serious.

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Collins, Judith and Marvin Johnson. "Fiscal Equity and School Aid Formulas: The Wisconsin and Minnesota Experiences." *North Central Journal of Agricultural Economics* 2(2): 159-166, 1980.

This paper analyzes the attempts of two states, Wisconsin and Minnesota, to achieve fiscal equity in school finance. Minnesota uses a foundation approach designed to provide every pupil with some minimum level of educational spending. The power equalizing approach of Wisconsin seeks to provide equal taxing power to every school district. The authors found that both systems improved absolute equity in per pupil spending among school districts. This does not imply that wealth neutrality is achieved. In fact, the Minnesota system has led to more wealth neutrality while the Wisconsin approach more closely approximates effective taxing power equity. Foundation formulas result in a larger state share of educational costs and less local district autonomy as compared to the guaranteed tax base approach used by Wisconsin.

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Conlisk, John. "Determinants of School Enrollment and School Performance." *Journal of Human Resources* 4(2): 140-57, 1969.

The article analyzes 1960 Census data on school enrollment and school performance using demographic variables to explain variations. Regression analysis provides good predictions about schooling decisions in terms of R^2s. Variables with significant coefficients are beyond the child's control and, therefore, difficult to use making inferences about enrollment and performance improvement.

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Corazzini, Arthur J. "When Should Vocational Education Begin?" *Journal of Human Resources* 2(1): 41-50, 1967.

Corazzini presents a benefit-cost analysis of high school level and post-high school vocational education from the parents' perspective. Results indicate that students who study skills in post-high training that are available in high school vocational programs have made a poor investment. Returns improve if students take semi-professional training.

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Deaton, Brady, J. "New Institutional Arrangements for Supplying Local Public Services Under New Federalism with Special Reference to Education." *American Journal of Agricultural Economics* 65(5), 1983.

The major emphasis of this paper is to stress the need for employing a broader conceptual framework for interpreting the local supply response of community provision of educational services. The paper draws on the induced innovation work of Vernon Ruttan and relates it to the philosophical premises of John Rawls. The author concludes that the strength of our national commitment to equality of educational opportunity will not reduce the public commitment to publicly provided education.

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Denison, E.F. "Education, Economic Growth and Gaps in Information." *Journal of Political Economy* 70(5 part 2) 124-128, 1962.

This article analyzes past sources of growth, probable future growth rates and potential for altering future growth rates and assesses the through various actions. Estimates sources of growth of total national income and of real national income per person employed.

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Denzau, Arthur T. "An Empirical Survey of Studies on Public School Spending." *National Tax Journal* 28(2): 241-249, 1975.

The author suggests a theoretical paradigm as the basis for empirical work on public school spending and also re-estimates versions of thirteen prior public school spending models using a single data base. The results support a model with nine significant positive determinants of spending and five significant negative determinants.

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Edwards, Linda N. "The Economies of School Decisions: Teenage Enrollment Rates." *Journal of Human Resources* 10(2): 155-73, 1975.

Edwards uses 1960 Census data in a household production model to explain teenage schooling decisions. Regression analysis is used with income, adult education, attainment, unemployment, ruralness, and proportion black regressed on enrollment rate.

The model explains three-fourths's of state variations in enrollment rates for white children, but not for non-whites. Also, total per pupil expenditures are found to be an important determinant of teenage schooling decisions.

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Fein, Rashi. "Brookings Institution Conference on Vocational Education: Introduction." *Journal of Human Resources* 3(Supplement): 1-140, 1968.

Introduction to Brookings Conference by Rashi Fein. This edition includes papers: 1) Morgan V. Lewis. "Implications of Two Views of Vocational Guidance." pp. 17-31. (a) Discusses implications of alternative views of vocational guidance and (b) individual achievement of potential maximization. 2) Gerald G. Somers. "The Response of Vocational Education to Labor Market Changes." pp. 36-58. Evaluates relationship of vocational education to labor market in terms of enrollment job placement, cost-benefit, and disadvantaged needs. 3) Michael K. Taussig. "An Economic Analysis of Vocational Education in New York City High Schools." pp 59-87. Presents cost-benefit analysis of vocational education in urban public high school. 4) Arthur J. Corazzini. "The Decision to Invest in Vocational Education: An Analysis of Costs and Benefits." pp. 88-120. Analysis of economic benefits of vocational education to individual graduate and community as compared to economic costs of maintaining the school. 5) Jacob J. Kaufman. "Occupational Training Needs for Youth." pp. 121-140.

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Feldstein, Martin S. "Wealth Neutrality and Local Choice in Public Education." *American Economic Review* 65(1): 75-80, 1975.

This article considers the problem of financing local public education in a manner that neutralizes local wealth difference effects while maintaining local perogatives. The analysis shows wealth neutrality can be achieved with matching grants that cause the net price of education to vary with wealth in an appropriate direction.

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Folkman, W. S. "Rural Problem Areas Need Better Education." *Agricultural Economic Research* 13: 122-130, 1961.

Folkman presents and discusses data on generalized problem areas delineated in a Department of Agricultural's Human Resource Report(1955) on rural education.

32
Fox, William F., *Relationships Between Size of Schools and School Districts and the Cost of Education*. U.S. Dept. of Agriculture, Economics, Statistics, and Cooperatives Service, Technical Bulletin No. 1621, 1980.

The author assesses the theoretical, methodological, and empirical basis of more than 30 studies designed to measure size-economies of public elementary and secondary education. Economies of scale appear to be evident in both elementary and secondary education and in school district administration. In all cases, however, the degree of economies varies with many factors other than size. The author argues that future research should follow a theoretical framework based on behavioral relationships underlying the supply and demand of education services.

33
Fratoe, Frank A. *Rural Education and Rural Labor Force in the Seventies*. U.S. Dept. of Agriculture, Economics, Statistics and Cooperative Service, Rural Development Research Report No. 5, Washington, D.C., October, 1978.

This report provides a thorough discussion and statistical comparison of educational measures for metropolitan and nonmetropolitan areas by major census regions of the U.S. The data reveal that public education in rural areas lags behind central metropolitan and suburban areas on a number of important indicators of schooling such as average school years completed, and standardized test scores. Resources to support rural public schools are also more limited than in urban areas.

34
Garms, Walter I. "A Benefit-Cost Analysis of the Upward Bound Program." *Journal of Human Resources* 6(2): 206-19, 1971.

This study analyzes the private and social benefits and costs of the Upward Bound program for white males, white females, non-white males and non-white females. Results show private benefits positive for all groups at 5 to 10% rate. Study uses older siblings of program participants as control group and found a higher rate of control group going on to college. Garms suggests the Upward Bound program might be a device to identify those who will go on to college rather than a program to get unlikely students to college.

35
Garms, Walter I., and March C. Smith. "Educational Need and Its Application to State School Finance." *Journal of Human Resources* 5(3): 304-17, 1970.

Garms reports results of experiment using school personnel(secretaries) to gather socioeconomic data on students that would be predictive of educational achievement. Socioeconomic variables collected explain 75% of the variance in the school system using regression analysis. The authors develop a formula for adding a need variable to state school aid formula based on socioeconomic factors and suggest it as a basis for allocating state funds to equalize educational opportunity.

36
Gilford, Dorothy; Glenn L. Nelson; and Linda Ingram, Eds. *Rural America in Passage: Statistics for Policy*. National Academy Press, Washington, D.C., 1981.

This book provides a detailed assessment of the current quality and availability of data for rural development policy. Chapter 8 (pp. 99-110) is devoted to data needs for rural education. The chapter focuses on changing educational needs associated with demographic changes. The debate on the effects of school consolidation on "rural development" is reviewed. The authors recommend that all school district data be coded as to rural-urban location in order to facilitate comparisons of available resources.

37
Gisser, Micha. "On Benefit-Cost Analysis of Investment in Schooling in Rural Farm Areas." *American Journal of Agricultural Economics* 50(3): 621-629, 1968.

The article estimates economic productivity effects of schooling on farm hands. It concludes that agricultural production is favorably affected by schooling, whether schooling is a vehicle for advancing technological sophistication or a factor of production.

38
Gustmann, Alan L. "On Estimating the Rate of Return to Education." *Journal of Applied Economics* 5(2): 89-99, 1973.

The study provides an analysis of variations of personal preference of consumption over time as a factor influencing individual education decisions under assumptions of perfectly operating capital markets and inoperative capital market.

39
Gustmann, Alan J., and George Pidot, Jr. "Interaction Between Educational Spending and Student Enrollment." *Journal of Human Resources* 8(1): 3-23, 1973.

The authors use two-stage least squares to jointly estimate public school per pupil expenditures and school enrollment per capita as functions of 16 exogenous variables.

Expenditures per student are found to be positively related to costs of production measured by teacher salaries and revenue availability, and negatively related to enrollment rate and competing demands for revenues. Enrollment as percent of population is found to be positively related to expenditures per pupil, proportion of population school age and proportion of non-Catholics.

40

Haley, William J. "Estimation of the Earnings Profile from Optimal Human Capital Accumulation." *Econometrica* 44(6): 1223-1238, 1976.

Haley develops an income maximizing life cycle human capital accumulation model with simultaneous estimation of parameters, and provides an empirical test of the model using U.S. Census current population reports for 1956, 1958, 1961, 1963, 1964 and 1966 data.

41

Hambor, John C., Llad Phillips, and Harold C. Votey. "Comments on High School and Their Contribution to Performance." *Journal of Human Resources* 8(2): 260-263, 1973.

The authors argue that Tuckman model is incorrectly specified, and as a consequence, its major explanatory variable is incorrectly interpreted. The study discusses errors in specification and interpretation.

42

Ham r, John C., Llad Phillips, and Harold L. Votey, Jr. "Optimal Community Education Attainment: A Simultaneous Equation Approach." *The Review of Economics and Statistics* 55(1): 98-103, 1972.

This study uses a simultaneous equations approach to account for supply and demand of community education. Cross-sectional data for 42 states during the 1964-66 period was used. Results indicate that school inputs, pupil inputs and community characteristics all have significant impacts on educational attainment as measured by percent of draftees failing a preinduction mental exam, illiteracy rate, median school years completed for people over 34, and graduate retention rate.

43
Hansen, W. Lee, Editor. *Education, Income, and Human Capital Studies in Income and Wealth*, Vol. 35, Conference on Research in Income and Wealth. New York: Columbus University Press, 320, 1970.

This publication presents seven papers presented at Conference on Education and Income held November 15-16, 1968, sponsored by Wisconsin University's Department of Economics and the Conference on Research in Income and Wealth. The articles are: Samuel Bowles. "Toward an Educational Production Function"; Zvi Griliches. "Notes on the Role of Education in Production Functions and Growth Accounting"; Yoram Ben-Porath. "The Production of Human Capital Over Time"; Barry R. Chiswick. "An Interregional Analysis of Schooling and the Skewness of Income"; Peter B. Kenen. "Skills, Human Capital, and Comparative Advantage"; Anthony Scott. "The Brain Drain - Is a Human Capital Approach Justified?"; T. W. Schultz. "The Reckoning of Education as Human Capital."

44
Hansen, W. Lee. "Total and Private Returns to Investment in Schooling." *Journal of Political Economy* 71(2): 128-140, 1963.

Hansen estimates internal rates of return to both total and private resource costs for various schooling amounts from elementary through college. The author compares rates of return to investments in schooling to present value of lifetime income approach(Houthakker) and value of lifetime income (Miller).

45
Hanushek, Eric A. *Education and Race.* Lexington, Massachusetts: Lexington Books, 1972.

Hanushek develops a conceptual model of the educational process. He then discusses single system, or individual student analysis, and multi-school system analysis of education production. The multisystem anlysis considers racial differences. The book concludes with a discussion of resource allocation and education distribution policy implications.

46
Hanushek, Eric A. "Teacher Characteristics and Gains in Student Achievement: Estimation Using Micro Data." *American Economic Review* 61(2): 280-288, 1971.

Hanushek develops an education production model using 1968-1969 data for third grade students from a large California school system to estimate the relationship between variables which can be controlled by public policy and educational output. The results indicate that teaching experience and graduate education do not contribute to student achievement score gains and that teachers do not account for differences in Mexican-American students' achievement.

47
Hickrod, G. Alan. "Local Demand for Education - A Critique of School Finance and Economics Research Circa 1959-1969." *Review of Educational Research* 41(1): 35-49, 1971.

This paper reviews research on educational demand conducted through the 1960's. Hickrod classifies the studies in three general areas: cross-sectional expenditure determinant studies; time-series expenditure determinant studies; and, studies with a variable other than expenditures as the demand determinant.

The general results from the studies are that wealth or size measures tend to have the most explanitory power, while factors which communities could influence tended to be insignificant. The implication Hickrod draws from this is that research results provide little assistance to educational policy makers and, in the future, research should be directed at factors communities can influence to provide policy makers with insights into increasing or decreasing demand for education.

Hickrod also suggests seven areas for further research. These include the use of interactive terms for multiplicative relationships, the development of curvilinear and longitudinal models, and the use of larger samples to obtain co-subjects for each independent variable.

48
Hiller, John, and Robert C. Tollison. "An Economic Model of Performance Contracting in Education." *Journal of Public Finance* 29(1): 36-48, 1974.

The authors consider incentive contracting for supply of educational goods and services that is based on output rather than costs. They conclude that this incentive system would result in the most efficient supplier being selected to provide contracted services.

49
Hines, Fred. "Propensities to Invest in Schooling in the South and Non-South." *American Journal of Agricultural Economics* 51(5): 1561-1564, 1969.

Hines uses multiple regression analysis and cross-sectional data from 48 states to evaluate differences that exist between per pupil public school expenditures in South and non-South regions. He concludes that the difference is explained largely by the relative ability to finance schooling, as measured by per capita income.

50
Hines, Fred, Luther Tweeten, and Martin Redfern. "Social and Private Rates of Return to Investment in Schooling, by Race-Sex Groups and Regions" *Journal of Human Resources* 5(3): 318-40, 1970.

The study computes social and private rates of return for investment in schooling for white males, white females, non-white males and non-white females, using a sample from the 1960 Census of Population.

The findings indicate that private returns justify private schooling investment for all race-sex groups at all schooling levels. The social returns from schooling investment was 11.8 percent. Social benefits from schooling represented 18 percent of average annual income growth from 1958 to 1960.

51
Hirsch, Werner Z. "Determinants of Public Education Expenditures." *National Tax Journal* 13(1): 29-40, 1960.

The author suggests a framework to identify, measure and rank determinants of public primary and secondary education expenditures where per pupil expenditures are a function of local political, social and economic characteristics. The model is tested on a St. Louis City-County with data from the early 950's to show that locality's ability to pay is the most significant determinant of per pupil expenditure.

52
Hirsch, Werner Z. "Income Elasticity of Public Education." *International Economic Review* 2(3): 330-339, 1961.

Hirsch uses time series and cross section data to analyze income elasticity of public primary and secondary education. The resulting elasticity is less than one.

53
Hirsch, Werner Z. and Morton J. Marcus. "Intercommunity Spillover and the Provision of Public Education." *Kyklos* 22(4): 641-660, 1969.

The article develops a conceptual model to analyze inter-community spillovers of education and their implications for local expenditures and investments. The authors apply the model to a case study of Clayton, Missouri to provide numerical counterparts for theoretical analysis.

54
Holland, David W., and John L. Bartelle. "School Consolidation in Sparsely Populated Rural Areas: A Separable Programming Approach." *American Journal of Agricultural Economics* 57(4): 567-575, 1975.

This study considers the relationship between internal school economies and transportation cost with regard to rural school consolidation using a linear programming model.

It concludes that while public schooling does seem to be characterized by size economies, consolidation cannot be counted on to provide cost savings for sparsely populated areas. This study shows both long and short run cost savings were 1.3% of school and transportation budget, with no value placed on child's commuting time.

55
Holland, David W., and Luther G. Tweeten. "Human Capital Migration: Implications for Common School Finance." *Land Economics* 49(3): 278-84, 1973.

The authors develop a school funding model that takes into consideration geographic spillover of educational benefits from public education. The results indicate that spillover compensation in many areas involves greater dollar changes than under "ability to pay" or "equality of opportunity" models.

56
Holtmann, A. G. "A Note on Public Education and Spillovers Through Migration." *Journal of Political Economy* 74(5): 524-25, 1966.

Holtmann applies Becker's model showing that a profit maximizing firm will not incur on-the-job training costs for competitive communities. Results show that a net benefit maximizing community will not produce education it cannot be reimbursed for.

57
Holtmann, A. G., "Linear Programming and the Value of an Input to a Local Public School System." *Public Finance* 23: 429-4, 1968.

This paper develops a model that views schools as profit maximizing institutions and focuses on the value of education and value of school system inputs in the short run using the present value of expected future income and expected completion of a given school year as a profit measure. Applied to Detroit school system, the model shows value of an additional unit of input in terms of increase in present value of expected income.

58
Hu, Sheng Cheng. "Education and Economic Growth." *Review of Economic Studies* 43(3): 569-618, 1976.

Hu develops a life cycle growth model in which individuals devote a fraction of their time to education for a period of time and then work full time after completing the schooling period to maximize utility. He uses a function which is dependent on education and time consumption preference.

59
Johns, Roe L.; Irving J. Goffman; Ken Alexander; and Dewey H. Stollar, eds. *Economic Factors Affecting the Financing of Education*. National Educational Finance Project, Gainsville, Florida, 1970.

The publication presents a collection of eleven papers on financing education. Papers are: "Factors

Affecting Future Demand for Education" by Kenneth E. Boulding; "The Human Capital Approach to Education" by Theodore W. Schultz; "The Social and Economic Externalities of Education by J. Ronnie Davis; "Education and Economic Growth" by Charles S. Benson. "Economic Analysis of Institutional Alternatives for Providing Education(Public, Private Sector)" by Henry M. Levin. "The Effect of Different Levels of Expenditures on Educational Output" by Thomas I. Rebich. "The Effect of Educational Spending on Poverty Reduction" by Harvey E. Brayer. "Federal, State and Local Responsibility for Financing Education" by James M. Buchanan. "Taxpayer Constraints on Financing Education" by John F. Due; "Alternative Tax Sources for Education" by John F. Due; "Analysis in a PPB setting." by Selma Mushkin and William Poelock.

60
Johnson, George E. "The Demand for Labor by Educational Category." *Southern Economic Journal* 37: 190-204, 1970.

Johnson develops a model to explain the structure of labor demand by educational category and combines it with an aggregate model of individual educational choice to determine equilibrium distributions of educational attainment and the structure of rates of return to education. The model is then applied to demand for college graduates.

61
Johnson, George E., and Frank P. Stafford. "Social Returns to Quantity and Quality of Schooling." *Journal of Human Resources* 8(4): 139-55, 1973.

The authors use per pupil expenditure per unit of time as approximation for school quality and quantity to develop a model to estimate marginal social rates of return for both quality and quantity of schooling. The authors conclude that earnings potential is influenced by quality of schooling as measured by per pupil expenditure, that the marginal effect of equality of school quality on earnings diminishes, and that the marginal rate of return to school quality is considerably higher than that for years of schooling.

62

Johnson, Marvin B., and Judith N. Collins. "Fiscal Equity and the Wisconsin School Finance Reform: Non-negative Aid Constaints." *Land Economics* 55(3): 334-349, 1979.

This article is a case study of Wisconsin's experience with school finance schemes designed to minimize the influence of local property wealth on the fiscal choices of school districts in the 1969-70 period. The authors concluded that the district power equalization scheme in Wisconsin resulted in state government providing 40 percent of school costs. Whereas improvements in absolute spending equity were achieved, property wealth is still directly related to district spending.

63

Jordan, K. Forbis; and Kern Alexander, eds. *Futures in School Finance: Working Toward a Common Goal.* Proceedings of the 17th National Conference on School Finance, Phi Delta Kappa, Inc., Bloomington, Indiana, 1974.

The 19 conference papers presented in this book are: "Toward a Common Goal" by John Ottina; "The End of the Rainbow: The Future Prospects for Federal Aid to Elementary and Secondary Education" by Robert D. Reischauer; "An Organizational View of Educational Finance" by David Selden; "Priorities in the Allocation of State Funds" by Maurice Criz; "The ACIR Study of State Revenue Potential" by Will S. Myer; "Determinants of Local School Taxes - Some Overlooked Factors" by John H. Bowman; "Income Redistribution and the Public Schools" by Kern ALexander and Thomas Melcher; "Income Distribution Effects of Public Education Expenditures: Common Schooling and Higher Education" by David W. Holland: "The Cost of Delivering Equivalent Educational Services" by Roe L. Johns; "Financing Equality of Educational Opportunity - A reassessment" by William P. McLure; "Educational Needs and Program Costs" by K. Forbes Jordan; "The Courts and School Finance: A Reexamination" by Richard S. Vacca; "The Courts and Special Education" by Ernest E. Singletary; "Factors to Consider in Planning Special Education Financing" by Philip R. Jones and William R. Wilkerson; "Equality of Educational Opportunity Versus Local Autonomy - The Dilemma Facing North American Education - The Ontario Experience" by E. Brock Rideout; "Revised Handbook II" by Allan R. Lichlenberger; "What Happened to PPBS?" by John M. Rajcic; "'Futures' and State

School Finance Programs" by Richard H. Rossmiller; "Futures in Education: Some Financial Implications" by Harold G. Shane; and, "School Finance Research Studies".

64
Kaiser, Harry M., and Glenn L. Nelson. "Inequality and Minnesota School Finance." *Minnesota Agricultural Economist*, No. 625, February 1981.

This technical report examines the effect on school finance of two alternative supplemental local tax levels which are available to Minnesota's 437 school districts with 1979-80 data. These levels can be used to supplement the levies of equalized funding achieved under the basic maintenance levy. The authors found that local jurisdictions with low property wealth have adopted discretionary levies which assure them of more state aid per dollar of local revenue. Wealthier districts have adopted referendum levies which guarantee more revenue per student from a given mill rate. The authors propose an alternative system that would equalize revenue potential with respect to wealth and still preserve local options to increase their levies. The report provides an example of administrative responses to court imposed attempts to equalize the quality of education on the basis of state wealth rather than variations in local property wealth.

65
Katzman, Martin T. "Distribution and Production in a Big City Elementary School System." *Yale Economic Essays* 8(1): 201-256, 1968.

This is a case study of the distribution of benefits of a big city elementary school system to different socioeconomic groups. The study uses regression analyis of production to estimate effectiveness of school purchased inputs on six measures of student performance.

66
Katzman, Martin T. *The Political Economy of Urban Schools.* Cambridge, Massachusetts: Harvard University Press, 1971.

Katzman develops the school production function model and reviews previous education production studies. He then presents his analysis of the Boston elementary school system, in which he uses performance measure for school holding power, cognitive development and academic achievement. The book includes a discussion of the consequences of restructuring city schools.

67
Kiesling, Herbert J. "Measuring a Local Government Service: A Study of School Districts in New York State." *Review of Economics and Statistics* 49(3): 356-367, 1967.

Kiesling uses regression analysis to measure the effectiveness of various school inputs on output as measured by achievement test scores. The study uses breadwinner's occupation as a proxy for students' socioeconomic background. Data is from the New York Quality Measurement Project of the late 1950's. The results find per pupil expenditure to have a weak relationship to achievement. Also, no economies of scale are evident in school district performance.

68
King, Richard A., and G. Bryan Wall. "Estimation of Cost-Quality- Quantity Relationships." *National Conference on Nonmetropolitan Community Services Research,* Committee on Agriculture, Nutrition, and Forestry, U.S. Senate, July 12, 1977, pp. 321-341.

This paper addresses the issue of how a community evaluates alternative community service delivery systems. A method of estimating cost functions based on economic-engineering techniques is presented and applied to a case study of the delivery of physical education services and facilities. The authors suggest that sharing gymnasium facilities with the community at large may be a means of reducing the incentives for consolidation of smaller sized schools.

69
Lassiter, Roy L., Jr. "The Association of Income and Education for Males by Region, Race and Age." *Southern Economic Journal* 32: 15-22, 1965.

This study uses 1960 Census data in regression and correlation analysis of the statistical relationship between income and years of schooling for South and non-South areas of the United States by race and age. The results indicate a positive relationship between income and education by region and race and that the amount of variation of income explained by education increases and then decreases with age.

70
Labowitz, Arleen. "Education and Home Production." *American Economic Review* 64(2): 243-50, 1974.

The study evaluates the effects of a woman's educational attainment on the allocation of her time as an input into home production function. The results of regression analysis indicate better-educated women have shorter intervals between births and devote considerable time to child care, representing a substantial investment in human capital.

71
Labowitz, Arleen. "Home Investments in Children." *Journal of Political Economy* 82(2, Part II): 111-131, 1974.

Labowitz offers a discussion of home investment in children and the effects on IQ, level of schooling obtained, and human capital stock. She concludes that home investments do increase human capital stock; educational achievement is dependent on parents' education and family size; and men's earnings are strongly related to schooling.

72
Levin, Henry M. "A Cost-Effectiveness Analysis of Teacher Selection." *Journal of Human Resources* 5(1): 24-33, 1970.

The article reports the results of a cost-effectiveness analysis of teacher selection that relates teacher characteristics to school output as measured by student achievement scores. Cross-sectional data for 1965-66 from the Survey of Equal Opportunity were used. The study suggests recruitment and retention of teachers with higher verbal scores is a cost effective method of raising students' achievement scores.

73
Levin, Henry M. "Measuring Efficiency in Educational Production." *Public Finance Quarterly* 2(1): 3-23, 1974.

Levin illustrates problems that arise in understanding public service production due to misspecification of output by reviewing the usual approach of estimating the production function of public education for primary and secondary schooling.

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74
Levin, Melvin R., and Alan Shank, eds. *Educational Investment in an Urban Society. Columbia University*, New York: Teachers' College Press, 1970.

This book is divided into six parts with contributions by 18 authors.

Part I. Human Capital and Education: Papers by Theodore W. Schultz, "Investment in Human Capital"; Gary S. Becker, "The Concept of Human Capital"; Burton A. Weisbrod. "Investing in Human Capital". Part II. Educational Expenditures and Worker Productivity, Papers by Jerry Muier. "Social and Economic Factors in Spending for Education"; Charles Benson. "The Contribution of Education to Economic Production"; Theodore W. Schultz. "Capital Formation by Education"; John Vaizey. "The Returns to Education." Part III. Benefits and Costs of Education. Papers by Burton A. Weisbrod. "The Nature of Educational Benefits and Their Spill-Overs"; Jack Wiseman. "Cost-Benefit Analysis in Education". Part IV. PPBS, Papers by Aaron Wildavsky. "The Political Economy of Efficiency: Cost-Benefit Analysis, Systems Analysis and Program Budgeting"; Melvin R. Levin. " Yardsticks for Government: The Role of PPBS"; Aaron Wildavsky. "Rescuing Policy Analysis from PPBS"; Werner Z. Hirsch. "Education in the Program Budget." Part V. Social Educators, Papers by U.S. HBW, "Toward a Social Report"; Wilbur J. Cohen. "Education and Learning". Part VI. Cost-Benefit in Action: Sar A. Levitan and Garth L. Mangum. "Federal Training and Work Programs in the Sixties"; Jacob J. Kaufman, et. al. "Vocational Versus Academic Education in Secondary Schools".

75
Link, Charles R. and Edward C. Ratledge. "Black-White Differences in Returns to Schooling.' *Review of Economics and Statistics* 57(3): 346-350, 1975.

The authors consider the influence of quantity and quality of education on black and white males in 1967. The study uses per pupil expenditures in the district where respondent attended high school as a proxy for quality of education in an earnings function and find it to be significant for both races.

76
Link, Charles R., Edward C. Ratledge, and Kenneth A. Lewis. "Black-White Differences in Returns to Schooling." *American Economic Review* 66(1): 221-223, 1976.

This regression analysis with an earnings model uses data from the National Longitudinal Survey of the Labor Force. Results support Welch's hypothesis that improved quality of black education is responsible for blacks' income gains.

77
Luytjes, Jan B. "Appalachian Brain Drain: Notes on the Impact of Increased Educational Funds in Lagging Areas." *Growth and Change* 2(1): 38-41, 1971.

Luytjes discusses the impacts of federal and state subsidization of education which is done independent of problems relating to overall economic development of lagging regions. Analysis of 23 poor Kentucky counties shows increases in out-migration of youth as a greater investment in education raises the level of students' expectations beyond what they can realize in the local economy.

78
Malt, Shlomo. "The Effect of Demographic Change on Public Education Expenditures." *Review of Social Economy* 26: 118-129, 1968.

Malt estimates the public school expenditure effects of demographic changes. His model inflates 1940 and 1950 populations to 1960 so each contains the same number of people in the 18-64 age grouping, but with their own distinctive age composition.

79
Martin, Lee R. "Research Needed on the Contribution of Human, Social, and Community Capital to Economic Growth." *Journal of Farm Economics* 45(1): 73-94, 1963.

In addressing the need for a better understanding of the structural aspects of economic change, the author provides a stimulating assessment of the role of education in economic growth. He presents a conceptual framework that includes human, social, and community capital as unconventional inputs whose combined contribution to output increases in the U.S. is nearly double that of conventional inputs. The functional interrelationships among those, and with technological change, are identified. The concluding discussion on research problems remains a challenging agenda for rural development researchers.

80
Masters, Stanley H. "The Effect of Family Income on Children's Education: Some Findings on Inequality of Opportunity." *Journal of Human Resources* 4(3): 158-175, 1969.

The article analyzes the relationship of children's education to family income and parents' educational level using 1960 Census data. The author develops regression analyses for determinants of education and also for determinants of Negroes' education. Children from families of low income or low education were found to be 20 times less likely to complete high school than children of families in which both parents have completed high school.

81
McMahan, Walter W. "An Economic Analysis of Major Determinants of Expenditures on Public Education." *Review of Economics and Statistics* 52(31): 242-338, 1970.

The author uses simultaneous equations to determine the major factors influencing the level of current expenditure for public primary and secondary education.

82
Michaelson, Stephan. "Equal School Resource Allocation." *Journal of Human Resources* 7(3): 283-306, 1972.

Michaelson looks at resource allocation aspects of educational policy in light of the "equal protection" issue of education. He discusses economy of scale studies and educational production function estimates (Cohn's and Riew's) and concludes that educational production functions are best seen as school administration behavioral models and not as the "optimal" input-output relationship. The author is an educator and questions application of economic studies to educational questions about allocation of school resources.

83
Miller, H.P. "Annual and Lifetime Income In Relation to Education. 1939-1959." *American Economic Review* 50(5): 963-96, 1960.

The study examines income returns to college education for 1939-1959 in relative terms showing that relative returns have not declined despite increased demand.

84
Moor, R. Carl. "The Economic Efficiency of Mixed Financing of Education." *Public Finance* 1(4): 399-408, 1973.

Moor compares the economic efficiency of two spatial models, a nationalized system and a mixed financing system, as alternative methods of supporting public primary and secondary education. He concludes that the mixed financing system is not superior from the standpoint of economic efficiency when the spatial model is considered. The nationalized system is equal quantity of education of homogeneous quality offered to all students at designated attendance centers. The mixed system is when households may utilize either public or private schools, with community providing a voucher equal in value to cost of public education to households utilizing private services.

85
Morgenstern, Richard D. "Direct and Indirect Effects on Earnings of Schooling and Socio-Economic Background." *Review of Economics and Statistics* 55(2): 225-233, 1975.

The author re-examines relationships among income, socioeconomic background, years of schooling and quality of school inputs. He concludes that school quality has a small direct effect on blacks' wage rate, but none on whites', school quality has strong indirect effects on years of schooling attained, socioeconomic background has a direct effect on earnings and an indirect effect as it also influences years of schooling, and years of schooling has a strong influence on earnings.

86
Morgan, James, and Martin David. "Education and Income." *Quarterly Journal of Economics* 77(3): 423-437, 1963.

The study estimates returns to education using regression analyses on Survey Research Center data for 1959 with hourly wage as dependent variable against 14 independent variables. Results show 4-6% return in earnings.

87
Nam, Charles B., A. Lewis Rhodes, and Robert E. Herriott. "Schooling Retention by Race, Religion and Socioeconomic Status." *Journal of Human Resources* 3(2): 171-190, 1968.

The authors estimate independent and joint effects of race, socioeconomic level, religion and place of residence on male and female high school dropout probability. Socioeconomic variables are regressed against expected or observed dropout rates. The results suggest that socioeconomic factors, indexed by occupation of parent and by religious group (or public) control of schools, have a strong effect on child's staying in school until graduation.

88
Niemi, Albert W. Jr. "Racial and Ethnic Differences in Returns on Educational investment in California and Texas." *Economic Inquiry* 12(3): 398-402, 1974.

Niemi uses 1970 Census data to calculate private internal returns to investments in education for whites, Mexicans and blacks to determine the degree of variation in returns to education in Texas and California by race and ethnic groups. Using Becker's traditional approach to calculating internal returns, the study concludes that internal rates of return to education have declined and that ethnic and racial differences are insignificant when compared to earlier studies.

89
O'Neill, Dave M., Burton Gray, and Stanley Horowitz. "Educational Equality and Expenditure Equalization Orders." *Journal of Human Resources* 7(3): 307-325, 1972.

This paper analyzes the implications of equalizing teacher expenditures per pupil in the elementary schools with 1971 data from the District of Columbia. The authors concluded that this would not help equalize the quality of education. However, these findings apply principally to a within-school-system allocation of teachers, but holds implications for between-school-system variation in expenditures per pupil. The authors emphasize that market allocation across jurisdictions may produce a correspondence between teacher salaries and quality of teaching skills. This will not occur in a large, centralized bureaucracy where central purchase prices rather than real market price differences reflect the value of resources utilized by the individual units. The empirical analysis section of the article discusses important aspects of output measurement. Their analysis of input-output relationships are inconclusive and conjectural in nature. The article's contribution lies primarily in its suggestion for more refined research and in its warnings about drawing premature relationships that may not exist. They offer the fruitful suggestion that equalization of quality education can be achieved on a more cost-effective basis by ordering the equalization of some specific educational inputs, such as teachers, with characteristics that are highly correlated with output measures.

90
Osburn, Donald D. "Economies of Size Associated with Public High Schools." *Review of Economics and Statistics* 52(1): 113-115, 1970.

The study develops a model to identify the relationship between per pupil expenditures and school system size using regression analysis. Results show most scale economies are realized by size of 1500 students.

91
Pauly, Mark V. "Mixed Public and Private Financing of Education: Efficiency and Feasibility." *American Economic Review* 57(1): 120-130, 1967.

The author develops a rigorous theoretical model to demonstrate that efficiency considerations alone are sufficient for *unequal* (author's emphasis) public support of education among income classes. His argument recognizes the externalities of education which imply family utility functions which depend on the consumption of education by other members of the community. Hence, families with low incomes may have to be subsidized in inverse proportion to their income levels in order to meet the levels of education desired by other members of the community. Such a scheme would require unequal lump-sum public payments for families with different income levels if the community desires that every child attain some fixed minimum level of education.

92
Perl, Lewis J. "Family Background, Secondary School Expenditure and Student Ability." *Journal of Human Resources* 8(2): 156-180, 1973.

Perl uses a sample of high school seniors to estimate production relationships of ability test scores to various educational inputs. The data is from the Project Talent Survey of high school seniors, 1960. The results indicate that starting teacher salary, and percent of teachers with M.A. degree affect school output as measured by student performance on ability tests while certification and teacher experience are not significant. Also, student's peers' characteristics affect output such that either integration or compensatory education would accomplish educational output redistribution. There are important nonlinearities in relationship between educational input and output. The same input components have greater effects on low income students than on high income students.

93
Poston, M. "The Theory of Spillovers and its Connection with Education." *Public Finance* 21(1-2): 184-205, 1966.

Poston discusses externalities and spillovers and geographically externalized benefits, as they relate to provision of education.

94
Raymond, Richard. "Determinants of the quality of Primary and Secondary Education in West Virginia." *Journal of Human Resources* 3(4): 450-470, 1968.

Raymond uses a regression model to determine which school purchased inputs are effective in improving educational quality. Achievement test scores and freshman grade point averages were used as school quality measures. Results indicated only teachers' salaries variable was significantly related to output.

95
Raymond, Richard D. and Michael L. Sesnowitz. "Comments on Racial and Ethnic Differences in Returns on Educational Investment in California and Texas." *Economic Inquiry* 14(4): 604-609, 1976.

The study re-estimates returns to education with data used in a study by Niemi and derives different returns. Whereas Niemi concluded that rate of returns to education had declined and that the difference in returns by race and ethnic group had narrowed, this study concludes returns are similar to findings of earlier studies and have, in fact, not declined. The authors cite problems in methods used as the reason for Niemi's inconsistent findings.

96
Raymond, Richard D., and Michael L. Sesnowitz. "The Returns to Investment in Higher Education." *Journal of Human Resources* 10(2): 139-154, 1975.

The authors use 1970 Census data to generate an age-income distribution by educational categories and computed private and social rates of returns after adjusting income for growth, ability and part-time workers. Computed for 1, 2, 3 and 4 year investments in college.

The study concludes that individual returns to 1, 2, 3 or 4 years of college are positive while the social rates are all less than corresponding individual returns contrary to Hansen and Becker. The study can achieve the same result as Hansen and Becker with lower discount rate.

97
Ribich, Thomas E. and James L. Murphy. "The Economic Returns to Increased Educational Spending." *Journal of Human Resource* 10(1): 56-77, 1975.

The authors use Project Talent data to evaluate the effects of spending more money on public education with primary attention given to the economic success, as measured by income of people who had more expensive education. The results indicate that both low and high status whites benefit in terms of lifetime earnings from more spending for education.

98
Riew, John. "Economies of Scale in High School Operation, (Wisconsin)." *Review of Economics and Statistics* 48(3): 280-287, 1966.

The study uses econometric analysis to determine relationships between per pupil expenditure and school size using 1960-61 data for 109 Wisconsin school districts which had a single high school and met North Central Association accreditation requirements. The author concludes that economies of scale in Wisconsin high schools are very significant.

99
Rosenzweig, Mark R. "Farm-Family Schooling Decisions: Determinants of the Quantity and Quality of Education in Agricultural Populations." *Journal of Human Resources* 12(1): 71-91, 1977.

Rosenzweig develops an intertemporal model of farm family schooling decisions which explicitly considers the role of education in agricultural production.

100
Rosenzweig, Mark R. "The Demand of Farm Families for the Quantity and Quality of Education for Their Children In the U.S." *American Journal of Agricultural Economics* 58(5): 842-847, 1976.

The author develops a model integrating farm family schooling decisions into household production and consumption decisions which considers the production value of education in agriculture while distinguishing between quantity and quality of schooling. OLS is used to estimate the enrollment equation using cross sectional data from the 1960 Census. Results indicate that increases in potential farm productivity reduce farm teenagers' enrollment rates.

101
Ross, Peggy J., and Bernal Green, *Impacts of the Rural Turnaround on Rural Education*. Educational Resources Information Center(ERIC), Las Cruces, New Mexico, March, 1979.

This publication addresses the implications of the population turnaround on rural educational systems from a social change perspective. Case studies of two rapid growth communities were completed by the authors in the late 1970's in states west of the Mississippi. The results revealed that both communities underestimated and underresponded to problems created by rapid growth, but responded in very different ways. The study clearly illustrates the complex social forces at work in rapidly growing communities. The social change theory employed provides an enriching framework within which more traditional economic approaches can be interpreted.

102
Schaafsma, Joseph. "The Consumption and Investment Aspects of the Demand for Education." *Journal of Human Resource* 11(3): 233-242, 1976.

The article develops theoretical analyses of the demand for full-time education in which monetary and non-monetary benefits are explicitly considered. The author shows how an investment theoretic approach to the demand for fulltime education must be modified when non-monetary benefits of education are included.

103
Schultz, Theodore W. "Capital Formation by Education." *Journal of Political Economy* 68(6): 571-583, 1960.

Schultz estimates the value of resources going into education, foregone earnings and resources to provide education, from 1900 through 1956.

104
Schultz, Theodore W. *Human Resources: Policy Issues and Research Opportunities.* Published by National Bureau of Economic Research, distributed by Columbia University Press, New York, 1972.

Schultz discusses the demand and supply considerations for economic research and presents a range of research opportunities on human capital. The book also includ[illegible]ted bibliography.

105
Schultz, Theodore W. "Investment in Human Capital." *American Economic Review* 51(1): 1-17, 1961.

Schultz discusses the relationship of human capital investment to economic growth and the scope of five major human capital investment categories (health services and facilities, on-the-job training, formal education, adult education, and migration). He concludes the article with a discussion of social and policy implications of human capital investment.

106
Schultz, Theodore W. *The Economic Value of Education*. New York: Columbia University Press, 1963.

Schultz discusses the economics of education, costs of education, and the economic value of education. A selected bibliography of articles on cost of education, economic value of education, education supply and demand, education in economic development and general topics are included.

107
Schultz, Theodore W. "The Rates of Return in Allocating Investment Resources to Education." *Journal of Human Resources* 2(3): 293-309, 1967.

The paper reviews recent rates of return analyses to investment in education and evaluates rate of return as a guide to resource allocation for education.

108
Sher, Jonathan, P., ed., *Education in Rural America*. Westview-Press, Boulder, Colorado, 1977.

This collection of writings has become a classic treatise on rural education. In eight comprehensive chapters, the history, assumptions, underlying policies, and reforms that undergird rural education in the U.S. are reviewed. The last two of these chapters are devoted to Sher's ideas for a research and action agenda(Chapter 7) and his proposal for school-based community development corporations(Chapter 8). These proposed institutions are designed to create a link between the local educational system and local entrepreneurially based, economic development in rural communities.

109
Smolensky, Eugene. "Investment in the Education of the Poor: A Pessimistic Report." *American Economic Review* 56(2): 370-378, 1966.

Smolensky analyzes the impact of adding further financial incentives to get the poor to complete high school on the reduction of poverty. He concludes that while the current unemployment rate (1966) is high and provides considerable economic incentives for staying in school, the dropout rate is high. Therefore, government policies to provides economic incentives to keep low income people in school do not offer promise.

110
Stern, David. "Effects of Alternative State Aid Formulas on Distribution of Public School Expenditures in Massachusetts." *Review of Economics and Statistics* 55(1): 91-97, 1972.

The article presents an econometric model to simulate alternate formulas of distribution of state aid and uses it to simulate a model designed to make expenditures per pupil independent of community wealth.

111
Stinson, Thomas F., and Edward F. Krahmer. "Local School Expenditures and Educational Quality: A Correlation Analysis." *American Journal of Agricultural Economics* 51(5): 1553-56, 1969.

This is a report on a test of the assumption that per pupil expenditures have a significant relationship to educational quality. The authors found per teacher instructional cost, operating cost less transportation, and total cost less transportation to have significant correlations to achievement. Per pupil expenditure had no statistically significantly relationship with achievement scores.

112
Stubblebine, William C. "Institutional Elements in the Financing of Education." *Southern Economic Journal* 32(1) pt. 2, 1965.

The author develops a conceptual framework for assessing how people can be expected to respond to opportunities to support education. He argues that determining optimal levels of education is precluded by the absence of a fully develped theory of educational externalities and the rudimentary nature of the data on the relationship between education and economic growth. His rigorous application of public choice theory leads the author to conclude that institutions which permit a mixture of public and private financing are more likely to gain support from the community. In a dynamic world with changing demands for the quantity and quality of schooling, exclusive dependence on the rigid structure of publicly provided education may not meet the needs of society.

113
Tuckman, Howard P. "High School Inputs and Their Contribution to School Performance." *Journal of Human Resources* 6(4): 490-509, 1971.

Tuckman uses the production function approach to examine effects of a change of educational inputs on several measures of output (completion of high school and 4 measures for continuing to further training). He concludes that student output variations can be significantly explained by several school and non-school inputs. The author suggests a need for further studies to determine which school inputs interact best with student body characteristics to provide insight into resource allocation and trade-offs among various preformance measures.

114
Wallace T.D. and L.A. Ihnen. "Full-Time Schooling in Life Cycle Models of Human Capital Accumulation." *Journal of Political Economy* 83(1): 137-155, 1975.

The study develops a solution for the path of human capital acumulation using Ben-Porath's model and develops a solution to show the end of specialification in school period. Also, the study considers Ben-Porath's model under the assumption of borrowing for human capital investment.

115
Welch, Finis. "Education in Production." *Journal of Political Economy* 78(1): 35-59, 1970.

The author examines the role of education in production in terms of improving marginal product of labor and efficiency of non-labor inputs. The model is applied to the agricultural sector.

116
Welch, Finis. "Human Capital Theory: Education, Discrimination, and Life Cycles." *American Economic Review* 65(2): 53-73, 1975.

Welch discusses current knowledge on three human capital topics: wealth distributions and life cycle earnings, sources of income returns to schooling, and race differences in income.

117
Welch, Finis. "Measurement of the Quality of Schooling." *American Economic Review* 56(2): 379-392, 1966.

The author uses regression analysis with cross-sectional data from the 1960 Census of Population on determinants of returns to schooling. Quality of schooling measured by per pupil expenditure, staff-student ratios, staff salary, and average enrollment, are found to be principal contributors to productivity.

118
West, Jerry G., and Donald D. Osburn. "Quality of Schooling in Rural Areas." *Southern Journal of Agricultural Economics* 4(1): 85-87, 1972.

The authors use simple correlation coefficents for selected school inputs with Ohio Psychological Test Scores used as a quality measure to compare urban and rural schools. Results show expenditure variables to be more significant in urban areas while community factors are more important in rural areas.

119
White, Fred C. and Bill R. Miller. "Implications of Public School Finance Reform with Local Control." *American Journal of Agricultural Economics* 58(3): 415-424, 1976.

The authors analyze the implications of poor equalization, a method of public school financing reform, on the Georgia public school system using 1971, 1972 data from the Georgia Department of Education. Supply and demand are estimated with simultaneous equations using cross-sectional school expenditure data which are then applied to identify equilibrium spending levels of school districts after removing inequalities due to tax base differences. The results indicate that under this model an increase in expenditures would occur in low wealth school districts while local support would decrease.

120
White, Fred C. and Luther Tweeten. "Optimal School District Size Emphasizing Rural Areas." *American Journal of Agricultural Economics* 55(1): 45-53, 1972.

T[illegible] study develops long run average cost curves for sc[illegible] ith various student densities to determine optima[illegible] district size. The analysis used data from a 1970 [illegible] homa State Department of Education state-wide survey. The results indicate the optimal size range is between 400-1100 average daily attendance.

121
Zimmer, John M. "Expenditures for Public Elementary and Secondary Education in Counties Classified by the Relative Poverty Status of their Rural Population." *Journal of Farm Economics* 49(5): 1204-08, 1967.

The author discusses quality of education available to children in rural areas classified by poverty status of population, sources of school revenues available, and the role of the Federal Elementary and Secondary Education Act of 1965 in ameliorating problems of relative quality that may exist.

RESEARCH PROJECTS OF
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