

***The Economics of Public Primary and
Secondary Education with Special
Emphasis on Rural People and Rural
Economic Development: An
Annotated Guide to the Literature***

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ABSTRACT

The authors present reviews of 160 published studies which have implications about the relationship between rural education and economic development. The reviewed works included books, chapters in books, journal articles and research bulletins. Most of the studies are drawn from the economics and agricultural economics literatures, with a scattering of work from other social sciences. The reviews were grouped into five areas: (1) demand for and supply of public schooling; (2) estimates of the returns to schooling; (3) externalities and the funding of public schools with emphasis on the interaction of domestic population mobility and school funding; (4) the effects of international migration of well-educated individuals on economic welfare and development; and (5) the relationship between public schooling and the rate of economic development and growth. A short overview introduces the general reader to the primary questions addressed in the bibliography. Each of the five sections is opened with an introduction to the major lines of thought included in the section.

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PROLOGUE

Although the concept of human capital has been an important informal concept in economic thought since Adam Smith wrote The Wealth of Nations more than two hundred years ago, it is a relatively new field of formal economic reasoning and empirical research. The modern inquiry into human capital issues began less than 50 years ago with the seminal works of T.W. Schultz and Gary S. Becker. The literature has burgeoned in the past several decades making it difficult, if not impossible, for students of the subject and other users of research studies to keep up with new developments in human capital theory. There has been an equally formidable application of new and increasingly sophisticated estimation techniques to empirical questions.

The development of this new field has been extremely productive, yielding important insights into the ways individuals invest in themselves and the ways communities behave in funding public schooling. There is every reason to believe the field of human capital investment will continue to be the focus of important new knowledge in the future.

The earnings of labor in the form of wages and residual income of managers account for three-fourths of total income of modern economies. These are economies thought to be rich in physical capital, when in fact their greater wealth is in human capital. An expanded awareness of the importance of human capital may help increase both the intellectual and political attention focused on future investments. Given the size and importance of the education "industry," improvements in the understanding of the educational production function and the social decision process could conceivably pay handsome dividends in the future.

Variation in the quantity of human capital among individuals and the household distribution of working individuals are arguably the two most important determinants of per capita income distribution in the U.S. Concern about the level of unemployment arises primarily because of our collective concern with the income of poorer individuals who have little to offer other than their relatively unskilled labor. This concern for the income of the poorest is an important factor in such diverse areas as the rate of monetary growth, government policy toward interest rates and international trade. Even though there is little empirical evidence to support it, provision of public schooling is widely assumed to reduce the variance in income distribution by increasing the earnings of people who would be poor otherwise.

Human capital is affected by almost every mode of human activity: prenatal behavior of the mother-to-be, quality and availability of health care, nutrition, exercise, the consumption of drugs, alcohol and tobacco, acquisition of attitudes and habits from parents related to learning and intellectual development, explicit acts of investment that occur for all levels and forms of schooling and, most importantly for the work represented here, the funding of public schooling. Surprisingly, reviews of the economics literature related to schooling are extremely rare. This bibliography is a small step in providing a richer guide to the literature.

ORGANIZATION OF THE BIBLIOGRAPHY:

Economics involves the study of the interrelationships of many forces that simultaneously impinge on the prices and quantities of myriad products and services. As a consequence, there is no natural organization that can be demonstrated to be superior to all others. We chose a set of five topics to organize this report that appealed to us as we developed our reading and searching.

Virtually any one of the sections can be read independently of the others without substantial loss. Readers who are interested in a particular author may use the index and ignore the topical organization we chose. A brief preview of the five sections is presented below. In addition each section has an introduction for the reader who wants some overview before looking at the items we have selected from the literature.

It may be useful to the reader to know what motivated us to organize the literature as we did. Because we are practicing economists, we started with an interest in the relationship between human capital and economic activity. Relationships between processes such as human capital creation, school funding and economic development are so complex, however, that appeal to the theory alone cannot produce definitive results. This led us to place major emphasis on empirical analysis and occasionally to exclude theoretical pieces that offered no predictions or applications.

Even though theory has its limitations, it is equally clear some theoretical constructs have very important implications for applied analysis. The history and development of selected lines of thought may influence the questions that are asked as well as the procedures used in empirical analyses. This led us to identify and follow a relatively small number of key concepts that have been applied to policy issues. In the following paragraphs we briefly enumerate our reasons for selecting five topical areas for classifying our reviews.

PREVIEW OF THE FIVE SECTIONS:

The first section of our review used the building blocks of economics: demand and supply. In our case the primary emphasis is on the demand for and supply of a portion of the inputs used to produce human capital: formal classroom instruction. On an even more restricted basis, we review the literature that focuses on public funding of instruction, for the most part neglecting private investment of time and energy. This attention to demand and supply fits our personal interests, but it also provides an orientation for the rest of the bibliography.

The second section is on the estimation of the returns to schooling. Both private individuals and public bodies are interested in the relationship between schooling and economic growth. There would be much less interest in public funding if the monetary returns to schooling were shown to be small. Measuring the returns to schooling is not an easy task, however. Consequently, the literature on returns is extensive, reflecting a long succession of attempts to solve the problems analysts have encountered. To a considerable extent the first two sections are tied together: the first focusing on economic forces at work that determine the level of investment and the second focusing on the results of the expenditure of public funds on schooling.

The third and fourth sections are also closely related. The third section addresses the impact actions of individuals may have on the willingness of their home communities to fund public schooling. If students emigrate and the community views this as a loss of the community's investment, the community may reduce its funding of schooling. On the other hand, if firms move into a community because of its good schools, the contributions of immigrating firms to the economic growth of the community may lead the community to engage in greater public funding. This section focuses on domestic migration and local funding.

The fourth section deals with international migration of well educated individuals, primarily in the decades immediately following World War II. Externalities arising from migration

are the focus here as in the third section. The policy questions are different. In international migration the primary concern has been on the losses migration imposes on the home community. In domestic migration, the concern has been on the low level of education provided by the home community because of expected migration.

The fifth section is focused on the relationship between public school funding and economic growth. A central issue is whether schooling increases the economic growth in the school district or whether it only raises the income potential of the student. To a considerable degree we see the last section as the culmination of the entire review because it brings a policy focus to public school funding, which builds on the demand and supply process.

Within each of the sections, works are arranged alphabetically by the name of the author or senior author. One could argue the articles might be better arranged chronologically because there is a definite path of development that unfolds over time in most subjects. But the alphabet makes it easy for the reader to hunt for an author without resorting to the index. The reader who wants to understand the development of a particular line of thought will either have to reconstruct it using some of the key references we have included, or wait for a technical review of the kind that appears from time to time in professional journals.

USING THE BIBLIOGRAPHY:

As we arranged the reviews of the literature into five categories, it became obvious some items could reasonably fit into two or more of the sections. Presenting a complete review in more than one place would lengthen this publication unduly. The alternative of writing different reviews of a given study for different sections, each emphasizing the points relevant to the particular section, was rejected on the grounds it would require more time and energy than were available. In addition the reader might be misled into thinking a larger number of reviews were presented than is the case. Consequently we decided to cross list the articles that have considerable relevance to more than one section. When an article is cross listed, one review is treated as the full review, while the second, short review refers the reader to the location of the primary review.

COVERAGE:

Time constraints forced us to limit the number of items included in the bibliography. We used several criteria to decide what to include. First, the subjects included in the review had to relate in some way to the concept of human capital formation through public schooling. An article or book that emphasized rural areas or had some direct or potential intellectual tie to rural people was more apt to be included than one that had little application to rural people.

Second, we spent most of our time on the research literature of economics and agricultural economics, although the works of a few sociologists, and a small number of political scientists and educators are included. More studies from these disciplines would have been included if time had allowed. Policy and empirical research generally were chosen for inclusion while some theoretical work was not, particularly if the authors did not link their conclusions to policy or empirical analysis.

Third, we tried to focus on issues that are relevant now or may be relevant in the future. Our review covers most of the important ideas of the last forty years, but items written in the past ten years are more likely to have been included in our review than items that appeared in the 1950s.

We confess to one very important omission: the analysis of the funding "equity" issue of the past 10-15 years. From the late 1970s through the 1980s, courts, legislatures and school boards were concerned with the impact of a small tax base on the level of funding of public schools in some of the poorer school districts. This appeared for a while to be an extremely important issue and continues to be important in some states. We found it impossible, however, to cover this issue effectively and at the same time cover the other main lines of thought. Although a few of the pieces we reviewed address the question of equity and state aid to local districts, we have had to set most of the relevant studies aside, at least for the present time.

Fourth, we consciously attempted to provide reviews of the most prominent items in a given line of thought rather than attempt exhaustive coverage of every possible item. This means, for example, that three of Bhagwati's publications are reviewed in detail and several others are only referenced. In his particular case we tried to select works that represent his point of view and approach. We believe the reader who wants to specialize in an area or the works of a particular author will find at least one or two important references to the specific line of thought in our review.

A number of times we were tempted to provide a substantial number of references to items not reviewed, for example studies cited in the works we reviewed. In the last editing of the manuscript we sharply curtailed citations of studies not reviewed. First, it would have been a fairly time-consuming task to have supplied complete citations to all of the references we came across. Second, a simple listing probably would not have provided a great deal of direction to the reader. If a reader goes to one of the items we have reviewed, she or he is apt to find further, but generally less substantive, items in the line of thought of the work we reviewed. On the occasions we have named a researcher without citation of a particular study, the author is well known and his or her works are readily available.

COMPUTER TEXT FILES:

If a reader prefers to have this review in a WORDPERFECT format, send one or more clean diskettes that can hold up to 400,000 bits of information to the following address and indicate the level of WordPerfect you prefer. We will return the text file at our first opportunity.

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SECTION I

DEMAND FOR AND SUPPLY OF PUBLIC SCHOOL FUNDING

Most annually produced and consumed commodities can be usefully analyzed in terms of demand and supply forces in which the price and quantity of a good are assumed to be determined simultaneously. Demanders are perceived as being analytically distinct from suppliers. Their characteristics and motivations can be analyzed separately, leading to a richer analysis than would be possible if the two classes of economic actors were not separated.

Many of the analyses of schooling do not follow this tradition because in public school funding, demand and supply may be confounded. Frequently the community is seen as both supplier and demander. However, if schooling is assumed to be elastically supplied at a level determined by the cost of inputs, there is some hope of separating supply and demand forces. The prices of locally supplied inputs are incorporated into the analysis to represent the level of cost of schooling. This procedure implicitly assumes that the production function for schooling -- the way goods and services are combined to generate school room services -- is the same in all communities and does not exhibit returns to scale or diminishing returns. Only the level of the cost curve per student shifts in response to the cost of factors. This process allows use of a single estimation equation drawn from a theory that includes two equations.

Once supply factors are accounted for in the analysis, attention can be concentrated on demand factors. The forces that affect the response of demanders to changes in the price (cost) of schooling can be separated from forces that affect the location of the curve. Other things equal, the higher the price of schooling, the lower the amount of schooling per student that would be demanded, as is the case with other goods. On the other hand, income per capita and the tastes of the population in the district will affect the location of the demand curve. This process of reasoning has led analysts to concentrate on the differences in demand characteristics of the residents of school districts to explain differences in levels of funding among districts.

The quantity of schooling demanded per student is often measured by the school-completion rate of residents aged 25 and older. A few of the better studies recognize that migration can affect the observed school completion rates of the residents of a school district. Unfortunately, however, a number of studies have not considered migration and have inadvertently allowed their analyses to be confounded by mobility. For example, many writers have concluded that rural households don't demand schooling in the same quantities as urban households because they observe the median level of schooling of rural residents is lower than that for urban residents. The observed differences in school completion among geographically defined populations probably is more of a response to the kind of labor demanded by employers than a reflection of differences in the demand for schooling by youth and their parents. Longitudinal studies that follow individuals over a period of time would allow the measurement of schooling attainment of youth reared in rural areas. These studies would allow better measurement of the demand for schooling of mobile populations.

A number of interesting analyses of funding by districts have implicitly assumed that funding is determined by the median voter in a well-functioning public decision process. A level of funding that is above (or below) the level preferred by the median voter would not garner 50% of the vote at the polls and would fail. Thus the characteristics of the median voter are of special interest. These have been identified and used to estimate price and income elasticities with data from across districts.

Generally, "price" in the study of educational funding is different from "price" used in connection with conventional goods. To the extent the price of schooling is identified with the property tax, the "tax price" faced by the individual voter, who is also a property holder, becomes the object of concern. This is an unusual and potentially confusing definition of price, since it omits other costs of schooling borne by students and their families.

In addition, estimates of consumer responses to tax price may be misleading because elections may not be determined by the median voter. "Public choice" theory, which has been developed and applied widely over the last couple of decades, emphasizes that the costs and returns from participating in public decisions helps determine who participates, the intensity of their participation and the outcomes of public decision processes. In the presence of private benefits to public actions, the results of median voter studies should be viewed cautiously. It is not yet possible to say whether there has been too little or too much public funding from the few applications of public choice theory to school funding questions we found.

Much of the progress over time in the literature has been in identifying ways to improve the estimates of the tax-price and income elasticities. Within the last decade, surveys of households concerning the level of taxation they would prefer have given rise to a new set of demand studies. Some of these newer studies have used the idea of simultaneous selection of residence and the level of school funding in an attempt to avoid possible biases that have arisen in estimating demand elasticities in earlier analyses. Multiple equation systems have also been used to disentangle the impact of emigration and immigration on local demand for public schooling.

Listing Of Citations

Aver, H.W. and J. Whitman. "The Rural Town as a Producing Unit: An Empirical Analysis and Implications for Rural Development Policy," *Southern Journal of Agricultural Economics*, Dec. 1976, v8(2), pp. 79-87.

A full review of this article may be found in the section on schooling and economic growth. It is relevant to the demand for education by the local community because it relates growth to schooling. The authors treat the town as the producing unit and estimate the impact of various inputs on output in a way similar to that in which production functions have been estimated for firms and producing plants.

Baum, Donald N. "A Simultaneous Equations Model of the Demand for and Production of Local Public Services: The Case of Education," *Public Finance Quarterly*, 1986, v14(2), pp. 157-178.

Baum estimates the price and income elasticities of demand for test scores and expenditures in a two-step process using data from 46 Los Angeles County school districts. An output function that relates test scores to expenditures per student, student characteristics and total enrollment is derived from the production function and the test score function. The district's demand function for educational services is then derived from the individual demand functions and in conjunction with a district's political process.

The estimation model consists of equations representing the test score function and the demand function. The test score output function is estimated by taking the log-log form of the district's median twelfth-grade reading achievement test score as a function of (1) the district's current educational expenditure per student, (2) the percentage of the district's students who are black, (3) the percentage of males over 25 residing in the school district who are college educated and (4) the district's average daily attendance--which measures the number of students served by the school district. The educational demand function, in log-log form, is the district's median twelfth-grade reading achievement test score as a function of (1) the proportion of tax collections expended on schooling, (2) the district's median family income and (3) the proportion of the district's housing units occupied by renters.

The district's demand function does not incorporate the effects of federal and state grants on a district's marginal tax price and real income. The author claims that "inclusion of these grants would not significantly affect the marginal tax price term." (p. 162)

The author demonstrates that earlier estimations of reduced form expenditure functions were, in fact, misspecified and did not estimate the demand elasticities for local public services. He also proves that "an area-wide tax base sharing plan assists the poorest school districts but also benefits middle to upper middle income low property tax base districts and harms lower to middle income high property tax base districts." (p. 157)

The author concludes that "the observed relationships are consistent with the predictions of the model. Test scores are influenced by both the district's expenditure and the conditions of production. The demand for test scores is affected by both the median voter's income and tax

price. Both the estimated price and income demand elasticities are significantly less than unity, but the income elasticity exceeds the price elasticity. These results and the simulation result that a tax base sharing program may generate undesirable redistributions of income may be useful in designing policies at achieving a more equal distribution of educational outcomes." (p. 173)

In particular, Baum believes the results suggest that policies designed to redistribute real income through federal or state grants to local school districts will be more effective than tax base sharing policies, which are designed to affect the marginal tax price of educational outputs.

Bergstrom, Theodore C., Daniel L. Rubinfeld and Perry Shapiro. "Micro-Based Estimates of the Demand Function for Local Public School Expenditures," *Econometrica*, 1982, v50, pp. 1183-1205.

For this study the authors utilized the results of a survey of 2000 households in Michigan in 1978 concerning their preferred level of local public school funding. Gamich and Rubinfeld's report of results from the same survey for the sum of local expenditures, is also reviewed in this bibliography. In this work a single-equation regression model was used to estimate the relationship between the characteristics of members of the household and the preferred level of school funding. Characteristics included race, religious preference, age, educational attainment and employment status of the head of household.

The work contains innovative ways of utilizing qualitative data to generate logit estimates of parameters. These were used to estimate income and tax price coefficients. Their results basically were similar to those found in traditional studies of funding differences among school districts. The advantage of using micro data was the ability to study the impact of individual characteristics on expenditure preferences. One novel finding was that healthy heads of households over 65 supported school funding above the level suggested by otherwise similar households.

The survey data were used by the authors to estimate new income and tax price coefficients in a two-stage regression frame of reference designed to avoid simultaneous determination of residence and school funding preferences (Rubinfeld, et al., 1987; Bergstrom, et al., 1988).

Bergstrom, Theodore C., Judith A. Roberts, Daniel L. Rubinfeld and Perry Shapiro. "A Test for Efficiency in the Supply of Public Education," *Journal of Public Economics*, 1988, v35(3), pp. 289-308.

This article is a companion piece to the work of Rubinfeld, et al., (1987), which is also reviewed in this bibliography. The analysis is based on survey data regarding preferences for public school funding levels. The estimation process involves two stages: residential selection and demand for public funding. The authors state this is the first published example of an effort to estimate the sum of the marginal rates of substitution for a Samuelsonian public good. They test for efficiency of public spending by comparing the sum of the marginal rates of substitution to the marginal cost of public schooling. For a "Tiebout correction," which involves removing both tax and price variables from the school funding profit analysis, they get an estimation of

underspending: marginal cost is only about three-fourths of the level of the sum of the marginal rates of substitution. Not making this correction would have led to an estimate of overspending: a ratio of 1.62 of marginal cost to the sum of marginal rates of substitution.

Blaug, Mark. "An Economic Interpretation of the Private Demand for Education," *Economica*, 1966, v33(130), pp. 166-182.

A graphical representation of the demand for education is presented in this paper. Specifically, Blaug investigates the intergenerational ratchet effect regarding individual demand curves for education with private and social yield calculations.

The author theorizes that "if the supply of education were a function of the 'price' of education as defined, excess demand would cause the price to rise, that is, cause the rate of return to education to fall. But it is doubtful whether the supply of educational services provided by the State depends on the yield of investment in education; even if it were, it would be a function of the social yield and not the private yield." (p. 170)

The private and social yields involve a comparison of the lifetime earnings attributable to a marginal unit of schooling. The private yield compares after-tax earnings with extra education associated with the private costs of education, while the social yield contrasts the same earnings stream before taxes with the total resource costs of education. This required that the calculation of the present value of net returns be a summation over a person's work life of the difference between costs and an earnings differential associated with extra education at the age the costs were incurred or the earnings received.

Results indicate "the demand for a particular type of education, as distinct from the demand for an extra amount of education, is not closely related to the differential economic benefits of one or another vocation. In consequence, the mechanism overcomes a shortage of a particular skill by raising its rate of reward, and so attracting additional people to acquire that skill, works at best indirectly and inadequately for that range of skills requiring higher education." (p. 177)

Brainard, W. C. and F.T. Dolbear. "The Possibility of Oversupply of Local 'Public' Goods: A Critical Note," *Journal of Political Economy*, Feb. 1967, v75, pp. 86-90.

The authors challenge Alan Williams' (1967) conclusion that there could be a more-than-optimal supply of a public good in the presence of emigration (which they call "birds.") They conclude Williams violated a self-chosen constraint that no income transfers should be allowed in the analysis.

Brazer, Harvey E. and Therese A. McCarty. "Interaction Between Demand for Education and for Municipal Services," *National Tax Journal*, 1987, v40(4), pp. 555-566.

The authors' objective is to test the validity of the hypothesis that Municipal Overburden (MO) exerts a negative influence on the demand for education, and briefly to examine some views about education. According to the authors, the 'MO' hypothesis "alleges that, other things equal,

high demand for municipal services reduces the demand for elementary and secondary education." (p. 555)

The model used to determine the expected quantity of education arises from the notion of the "median voter." In this article the "quantity of education supplied in each school district is equal to the median of the quantities demanded, and that the median quantity is demanded by the voter with median income, age, education, property value owned, number of school-age-children, and so forth." (p. 557) In their model, the authors rely on the idea of individual maximum utility, given a person's preference function, budget constraint and prices.

A demand for education equation was developed in log-log form in which demand for education is a function of (1) the tax price for education, (2) the price of other public goods, (3) the budget constraint and (4) selected characteristics of the community. The authors also estimate the demand for municipal non-school services by using variables analogous to those used for public education. This test is in contrast to those studies in which non-school expenses were assumed to be determined without reference to school expenditures--in which municipal services were "inexorably" high.

Estimation results are discussed concerning selection of state and school districts, the demand for education, price, income and aid, community characteristics, and schools and school environment regarding sign and magnitude within each of the three areas under study: Connecticut, New Jersey, Virginia.

In their summary of the variable coefficients, the authors conclude that "demand for elementary and secondary education, as measured by per pupil expenditures, is a function of prices and incomes experienced by median voters and a number of characteristics of the communities in which they live. Results suggest there are some missing variables. One missing variable may be 'MO'." (p. 562)

The authors' analysis offers little or no support for the municipal overburden hypothesis. They find "the demand for education is largely a function of tax price, income, aid and community characteristics unrelated to those so frequently alleged to deter outlays for education." (p. 564) In their estimation equations for the demand for municipal services, variables such as population size and density, rate of unemployment, aged people and aging housing contribute little to the explanation of variance.

Broomhall, David and Thomas G. Johnson. Community and Family Influences on Educational Performance in Appalachian Communities. Southern Rural Development Center, MS, Pub. No. 161, September, 1992.

The authors use measures of attitudes of students and parents in four mountain counties of Virginia and Kentucky. They make imaginative use of data on opinions, attitudes and aspirations to test their hypotheses. The four hypotheses are: (1) parents' attitudes influence students' attitudes (weakly supported by the regression analysis); (2) availability of local employment affects values that youths place on education; (3) young persons willing to move are more likely to have high educational aspirations (weakly supported); and (4) students who place high values on education also achieve more academically.

This article is one of a few that address the demand for schooling. The study also appears in Southern Rural Development Center unnumbered publication: Education, Off-Farm Employment and Rural Economic Development: Perspectives from States in the Southeast, proceedings of a rural development symposium at the 1992 meetings of the Southern Agricultural Economics Association, edited by David L. Debertin.

Brown, Byron W. "Achievement, Costs, and the Demand for Public Education," *Western Economic Journal*, 1972, v10(2), pp. 198-219.

Brown proposes a more general model of school district behavior than has been used in other studies. He attempts to answer three questions at the center of debate: (1) "To what extent can cognitive achievement be identified as one of the goals and desired outputs of schools; (2) What are the behavioral characteristics of school districts in achieving these goals and achievement, or some broader unspecified socialization function?; and (3) To what extent do these characteristics of school districts vary by geographical region and community type (cities, urban, fringe, rural, etc...)." (p. 199)

An empirical analysis is presented that estimates the input and output demand functions as well as the production and cost functions. Two additional functions, total cost and a reduced form function for local revenues, are used for estimation purposes. The advantages of this formulation are also discussed.

When a school district, as both a producer and consumer of education, seeks to allocate its resources in an optimal manner between education and other goods and services, it is subject to two constraints. The first is a production function for education that is a function of size, socioeconomic status, attitudes, etc..., and inputs purchased by the district. The second is a resource constraint involving total community resources, school aid received from the state, and prices of other goods and purchased inputs.

From the regression analysis, Brown notes "the possibility exists the less urbanized school districts in the more remote areas of the state tend to have what we might call a more traditional view about the role of education. Not only might they believe the schools are an important rung in the success ladder, but they also tend to equate the goals of education to our achievement measure. The results in all equations seem to bear this view." (p. 216)

The author concludes "richer, higher class school districts demand more of the measured inputs. The strongest relationships are for class size and teachers with advanced degrees. Taken in conjunction with our earlier results on the unimportance of achievement, this indicates these inputs must be serving some other function for the districts. We are reluctant to suggest that any other objective is the single most important one because we lack the data to verify such a claim. But the separate significant effects of wealth and social-economic status scale (SES), particularly in the urban fringe districts, are consistent with the socialization training goal offered by Gintis." (p. 218)

Brown, Byron W. and Daniel H. Saks. "Spending for Local Public Education: Income Distribution and the Aggregation of Private Demands," *Public Finance Quarterly*, 1983, v11(1), pp. 21-46.

Brown and Saks believe past researchers have often ignored the consequences of the particular institutional arrangements for providing local public education. Typically community choice problems have been ignored by invoking a simple median-voter theorem. They justify their investigation by citing the many problems they believe are associated with the empirical consequences of the voting models in which the median-income voter is assumed to be decisive. Problems they cite include disentanglement of price and income effects, the lack of data on the distribution of wealth of individuals other than the mean and median, the presence of non-monotonicity that leads to misspecification in estimating the demand for education and the suggestion that associating community school expenditure per family with the preferences of the median-income family may bias the results.

Weighted regression estimates are presented that entail (1) estimates of the demand curve, (2) state-equalized value per family measure and (3) characteristics of the performance of the school systems with regard to school funding.

In specifying their equation, the authors suggest that, according to previous articles, tastes for a specific set of test scores may be associated with higher or lower school budgets and thus warrant consideration in estimating production functions for schooling. To avoid this problem, the authors made their demand curve conditional on the parameters of the distribution of achievement scores.

With regard to the desire-for-schooling variable, the authors investigate situations in which some community families have no children, one child, or many children in the school system. Thus, it appears the cost exerted on the community in providing a certain level of schooling per child per se is closely related to the number of children in the school system. The authors suggest handling this complication by one of two possible methods, each of which involves modification of the demand definition. The first modification is made to reflect the fact that it is spending-per-child that is relevant, whereas the second introduces the fraction of families with children in the demand equation to reflect crowding.

From the demand curve estimates, the authors reject the hypothesis that the demand curve is monotonic. The other regression estimates suggest that (1) families will, in general, spend more for each point their school system's mean achievement test score increases, (2) the fraction of families with school age children did not have a statistically significant impact on the level of school funding and (3) "the degree of urbanization of the school district affects the level of local school revenues. The most-urbanized school districts spend the most per family and town and rural districts spend the least." (p. 40)

Finally, the authors conclude their results may have policy implications pertaining to (1) community income distributions in devising equalizing interdistrict school aid plans, (2) community distribution in income in relation to jurisdictions for providing schooling, (3) court-favored district-equalizing state aid plans and (4) equalizing expenditures via aid schemes.

Burnell, Barbara. "Effect of School District Structure on Educational Spending," *Public Choice*, 1991, v68(3), pp. 253-264.

This article develops a theoretical and empirical model of local spending on education that analyzes the effect of institutional structure on educational spending. This is done to determine "whether the theory of bureaucratic behavior is consistent with school district spending decisions by testing the hypothesis that the number of school districts in a county has a negative effect on per pupil expenditures." (p. 253)

The author claims that "proponents of the bureaucracy theory have argued whenever local government competition is decreased through annexation, consolidation or centralization of service provision, the result is inefficient service provision." (p. 254)

Burnell's main hypothesis is the number of school districts in a county has a negative effect on per-pupil expenditures. Her reasoning is that the greater the number of districts in a county, *ceteris paribus*, the more competition should exist between districts, forcing more efficient provision of education.

Conceptually, testing the hypothesis involves estimating a reduced-form equation of average per-pupil expenditure on education for school districts in the county as a function of the number of school districts in the county, costs, quality, abilities and tastes.

The empirical model is logarithmic in form, with average per-pupil expenditure on education for a school district in the county as a function of the number of school districts in the county, size of the county system, average instructional salary, per-pupil property tax base, per-pupil aid for education from state, per-pupil aid for education from federal sources, median level of education of adult population and percent of population under 18 enrolled in public school.

"Empirical results do not support the positive relationship between centralization and spending predicted by the theory. When other factors--quality, cost of provision, and demand considerations--are held constant, it appears a fragmented system implies more competition, which results in greater, not lower, expenditures.

"It may be the case that, in areas where the school district structure does become more centralized, there will be some positive redistributive consequences. That is, centralization may result in more equal access to quality education for all residents of a metropolitan area." (p. 262)

DeYoung, Alan J. "Economic Development and Educational Status in Appalachian Kentucky," *Comparative Education Review*, 1985, v29(1), pp. 47-67.

This study focusses on factors that determine the level of school funding and educational achievement of central Appalachia. Prominent among the alternate explanations of the way the forces affect education is the "internal colony" model, in which the dominance of coal mining and external ownership of a resource are assumed to work against both funding of education and employment of graduates. This approach is sometimes termed a "public choice" model, one in which costs and returns from public decisions for particular members of the community are presumed to influence the decision process.

Empirical analysis includes step-wise multiple regression of expenditure, school quality and educational achievement as dependent variables in 117 Kentucky school districts on independent variables. Generally, both educational expenditures and achievement are lower in

districts in which farming and mining are important. Like most studies of this type, the supply and demand forces are neither identified nor their separate impacts analyzed. The implicit assumption is that funding is more of a manifestation of supply than of demand and supply considerations (costs) dominate educational funding.

Fratoe, Frank A. "Rural Education and the Rural Labor Force in the Seventies," USDA, ERS, Rural Development Research Report No. 5, Washington, DC: USGPO, October 1978.

This is an excellent review of education expenditures and achievement in metropolitan and non-metropolitan counties in 1970. The study distinguishes expenditures by geographic regions and in some instances by race, sex and occupation. The author notes that emigration of educated individuals may affect observed differences in the levels of education between metro and non-metro residents. Thus, observed differences in schooling achievement of persons over 25 may not reflect differences in demand for schooling of persons of school age.

The author concludes that more education by itself "will do little to encourage development of rural/non-metropolitan America. Efforts directed only to the educational institution will not increase either quantity or the quality of work opportunities" (p. 32). He also suggests increased schooling combined with recruitment of jobs might be productive.

Frey, Donald E. "Demand and Supply Elasticities for Private Education: A Rejoinder," *Public Finance Quarterly*, 1991, v19(3), pp. 369-376.

This paper is the third in a series of exchanges between Frey, Felice Martinello and Edwin West. Frey wrote the first article in 1988, which was followed by a comment that appears on pages 347-354 of the same journal as this rejoinder. Martinello and West argued a tuition tax credit would provide substantial net government savings when all levels of government are considered. In the rejoinder reviewed here, Frey argues Martinello and West misunderstood the results of his and their own data and restates he believes demand for private education is inelastic.

A problem with the analysis revolves around Frey's vague measure of the term "very likely." This term was used to refer to those who said they would change schools in lieu of a tuition tax credit when asked the question.

Frey uses a RAND study of Minnesota--which Martinello and West rejected, since it deals with only one state--to support his argument in this rejoinder. Frey asserts the Minnesota study is important and should not be neglected when analyzing the topic proposed by Martinello and West. He further argues that Minnesota already had in effect a long-standing tuition tax credit deduction and therefore one could reasonably draw conclusions from the behavior of Minnesota residents.

Gamich, Edward M. and Daniel L. Rubinfeld. "Micro estimation of public spending demand equations and tests of the Tiebout and median-voter hypothesis," *Journal of Political Economy*, 1982, v90(3), pp. 536-560.

The authors report the analysis of data obtained from a survey of individuals in Michigan assessing their satisfaction with the level of total local governmental spending for education. The procedures and results parallel their own work and the results concerning local public school expenditures reported by Bergstrom, et al., (1982), which is also reviewed in this bibliography. The authors find low income elasticities within areas; they find larger income elasticities between areas. This finding could lead to strong support for median-voter models, even when they are inappropriate because of Tiebout mobility. They note voters in urban districts are more satisfied with the level of total local expenditure than voters in rural areas, districts in which Tiebout sorting would not be expected to be effective.

This work should be read in conjunction with later two-stage estimation work designed to avoid sample selection bias (Bergstrom, et al., 1988, and Rubinfeld, et al., 1987).

Gisser, Micha. "On Benefit-Cost Analysis of Investment in Schooling in Rural Farm Areas," *American Journal of Agricultural Economics*, 1968, v50(3), pp. 621-629.

This article analyzes the effect of additional schooling on economic productivity of human agents working on farms by using a general method to estimate the benefit-cost ratio of investment in schooling and then drawing some important conclusions about the development of farm areas in underdeveloped countries. According to the author, "evidence indicates that raising the level of schooling in rural farm areas will stimulate farm out-migration and this will more than offset the effect of higher productivity on farms, thus increasing farm income significantly." (p. 621)

The author computes the benefit-cost ratio for a farm boy for each additional year in high school and labor productivity estimates from regression analysis. He asserts that "on the average, it does pay for the individual farm worker to acquire more schooling at the high school level. This study shows that more schooling affects favorably the process of agricultural production. It does not tell us whether schooling is a vehicle for a higher degree of technological sophistication or a factor of production per se. The study also suggests comprehensive rural development in underdeveloped countries should strike a balance between investment in human capital and tangible capital." (pp. 628-629)

Greenberg, Elizabeth, Paul L. Swaim, and Ruy A. Teixeira. "Can Rural Workers Compete for the Jobs of the Future?," *Agricultural Outlook Conference '93 Booklet 3*, USDA-ERS, December 2, 1993, pp. 60-71. Washington: USGPO.

The authors note the gap in educational attainment between rural and metropolitan areas is declining and large differences in attainment exist among metro schools and among non-metro schools. In addition, the high school completion rate gap between metro and non-metro schools was wider in 1991 than it had been in 1971. In the first section of the report the authors appear to assume the stock of human capital is a good estimate of the rate of addition to the stock. But unlike other authors, they also analyze the achievement levels of current students.

Their general conclusion is that differences between metro- and non-metro areas are trivial except in the Southern region. The proportion of rural youth enrolled in high school college

preparatory curricula and planning to go to college is smaller than that for metro youth. Thus, there may be differences in the "quality" of rural educational opportunities. The authors conclude there is less opportunity for formal on-the-job training for rural workers, but they provide no measurements of how this may be affected by the industry of employment or other variables.

Hanushek, Eric "The Economics of Schooling: Production and Efficiency in the Public Schools," *Journal of Economic Literature*, 1986, v24(Sept.), pp. 1141-1177.

For conventional goods and services, the analysis of supply usually involves the concept of a production function in which the relationship between inputs and outputs is studied. There have been relatively few studies of this kind of public schooling. Hanushek's review of production--or supply--is an excellent review of the problems researchers have encountered in this area.

A primary problem exists in the identification and measurement of the "product" of schooling; e.g., economic output in a job, satisfaction from work, generation of good health, acquisition of skills used in child rearing, etc. In the absence of a clear measure of product, it is impossible to study the efficiency with which inputs are turned into output. Even when the former student is employed in a traditional market employment in which wages can be used as a measure of productivity, it is difficult to separate the effects of schooling from skills acquired through on-the-job training and experience. Identification of skills or attitudes inculcated by schools that relate to job productivity as a surrogate for measures of productivity on the job could be very useful, but this approach has been singularly unsuccessful thus far. Consequently, researchers generally have fallen back on scores of students at the point of leaving school as the measure of the output of schooling.

Family inputs in the form of socioeconomic characteristics often are intercorrelated with school funding and with unmeasured inputs made outside of school hours, further complicating the measurement of the productivity of school inputs. School inputs generally are measured objectively (e.g., years of schooling of teachers, budgetary dollars) with no way to quantify fundamental differences in skill or approach. One of the major problems is that dollars per pupil are closely correlated to the class size of a given teacher.

Innate abilities of the student also present a problem in measuring the product of schooling. The more productive studies have worked on "value added" by a particular unit of schooling. This avoids the problem of explaining the absolute level of achievement. Even if a value-added concept is used, innate abilities might interact with the other inputs. The measurement of teacher inputs is equally difficult. With large numbers of observations of student achievement, it might be possible to estimate a teacher-specific productivity coefficient that circumvents having to get any of the characteristics of the teacher. But this approach is rarely used in an objective manner.

Specification and simultaneity problems also abound. What if senior teachers get to choose good schools and small classes? In such a case, expenditure per pupil may be mistakenly identified with absolute educational achievement. What if students from homes with high incomes aren't necessarily brighter but get a lot of unmeasured school input? They will appear to be getting more from school. The result is there is no strong, systematic relationship between school expenditure and student performance. Family variables tend to be very strongly related to school

achievement. Characteristics of peers have an ambiguous impact. Objective measures of teacher inputs (in lieu of skills) have not been strong; perhaps graduate degrees serve administrative ease, not classroom performance.

Public schools may be inefficient because of the way incentives are structured in large administrative systems, particularly given the difficulty of measuring output. The author reviewed the question of merit pay in depth. Vouchers and tax incentives to introduce market incentives were also discussed. He closes by touching on the question of whether real production has been taking place in school, in contradiction to the hypothesis that school degrees primarily signal persistence and other desirable characteristics of future employees. He concludes schooling does affect production even though it is not possible to measure output well.

Haurin, D.R. and H.L. Gill. "The Spatial Distribution of Public Services: A Structural Model of Voting, Education Production, and the Government's Allocation of Educational Inputs," *Public Choice*, 1984, v44(3), pp. 481-500.

The goal of this article is to discover how variations in the parameters of the model (the ratio of students relative to the total number of students in the system, number of eligible voters, consumption of housing, household characteristics and the value of taxable property) affect optimizing behavior of the school board's allocation of educational inputs.

The authors develop a model of household and governmental-agency choices related to the financing and spatial allocation of a public service. The model in its general formulation can be applied to any public service that can vary in quantity across subareas within a single jurisdiction. The model consists of (1) a sector describing household decisions; (2) the school board's actions; and (3) a description of the educational production function. A household model calculates utility as a function of composite goods, consumption of household and quality.

Specification of the model includes an education production function, so that expected increases in inputs can be translated into the expected increase in educational output. Scores are measured from standard achievement tests in which quality (measured scores) is a function of inputs allocated by the school board and household characteristics.

Using the model, it is hypothesized that areas with relatively high graduation rates receive relatively high levels of educational inputs. The authors claim "an optimizing school board will allocate relatively more resources to the subarea with the greater number of expected voters per student." (p. 489) In addition, "subareas with relatively high property values will receive a relatively large allocation of educational resources." (p. 490)

The study appears to establish a nonlinear relationship between educational funding and family income. It appears the highest income families support tax levies relatively more often than do other households. It is apparent from the modeling that the standard estimation procedure requires some form of simultaneous equations approach. This discovery suggests that previous studies of voting within a single jurisdiction have omitted variables related to the expected allocation of public services.

The authors believe their econometric results "confirm the significance of the cost measure but generally found the individual determinants of the variations in the yes-no ratio among subareas to be insignificant. An alternate specification suggests the school board may use the

resources under its control to reward subareas that support additional increases." (pp. 497-498) In addition, the authors found no evidence to support the teacher-preference hypothesis discussed by Hanushek (1979).

Hickrod, G. Alan. "Local Demand for Education: Critique of School Finance and Economic Research Circa 1959-1969," *Review of Educational Research*, Feb. 1971, v41(1), pp. 35-49.

The author reports that expenditure per pupil was the primary focus of most of the research into local demand for education in the period 1959 to 1969. Regression analysis was the research tool most often used. Cross sectional studies dominated the area of research, but longitudinal studies were also conducted. Tax effort has been an area of research interest in which expenditure per pupil was not the dependent term. More recent studies have focused on the demand of individual households in which surveys were used to generate data. The author closes his discussion with a list of suggestions for research improvement and development. He touches on variation in funding from district to district and the conflict between egalitarian and libertarian schools of thought.

Honeyman, David Smith. "Financing Rural and Small Schools: Issues of Adequacy and Equity," Charleston, WV: ERIC Clearinghouse on Rural Education and Small Schools, 1989.

"This monograph investigates issues related to the financial support of rural schools. The first section describes various state formulas and the methods used to distribute funds to rural schools. It considers questions about the adequacy of funding adjustments based on sparsity and the relationship of such adjustments to equal educational opportunity. It also synthesizes the current research on the status of school facilities. This section of the discussion details the relationships among wealth, ability to pay and the maintenance and capital expenditure problems rural, small (and usually poor) school districts face.

"The second section describes some of the legal challenges relevant to rural and small schools currently before the courts. At the heart of these challenges is the inability of existing finance formulas to address adequately the needs of rural education. These challenges are compared to discuss state and local support mechanisms and details efforts by some states to make the tax base more responsive to rural education reassessment of property, including relevant economic concerns of primarily agriculture-based economies. Conclusions and recommendations include discussions about consolidation and school reform as related to equal educational opportunity." Abstract from document resume.

McMahon, Walter W. "An Economic Analysis of Major Determinants of Expenditures on Public Education," *Review of Economics and Statistics*, August 1970, v42(3), pp. 242-252.

This paper is a report of what the author calls the first structural analysis of school finance. It is structural in the sense that he posits demand and production cost (supply) functions separately. From this theoretical model he develops a reduced form equation. The model allows him to specify the expected sign of the coefficients of the included variables, even though only a

few of the structural coefficients can be derived from the reduced form analysis. Because his major attention is to the impact of emigration on local school funding, a full review of his work is presented in the section on externalities.

Megdel, Sharon Bernstein. "A Model of Local Demand for Education," *Journal of Urban Economics*, 1984, v16(1), pp. 13-30.

The author used empirical results to address many questions that relate to expenditures and (1) the mechanism for budget determination, (2) the expenditure function over time, (3) whether the parameter estimates are consistent with the author's hypotheses and (4) the theoretical and/or empirical findings reported in the recent literature.

Megdel hypothesized that "school spending varies inversely with the price variable," (p. 17) and "a dollar of categorical aid increases expenditures by more than one dollar, since some support for the funded programs comes from local revenue." (p. 18)

Data for the regression were derived from 177 New Jersey local school districts offering kindergarten to 12th grade for 1970-1971, 1974-1975 and 1977-1978. Different formulas for state aid were in effect for each of these years.

Methods used for state aid distribution for each year were as follows: non-matching funds for all non-categorical state aid in 1970-1971, a portion of the non-categorical state aid was distributed according to a variation of the district power-equalizing formula in 1974-1975 and all aid for compensatory programs was in the form of lump sums in 1977-1978.

The estimates presented have important policy implications, according to Megdel. "Low price elasticity estimates suggest that a program of matching grants might not be successful in stimulating expenditures to meet equity goals in school finance. The results are inconclusive regarding the impact of non-matching block grants and regarding the effect of the budget determination mechanism, and can be used to explain the failure of the aid package in stimulating significant expenditures increases on the part of low-spending districts." (p. 28)

"The fact that the 1977 coefficients for aid-related variables are different from those for earlier years, although the qualitative conclusions are, for the most part, the same, suggests care must be taken when predicting the likely effects of alternative aid policies." (p. 29) In closing, the author says "there is no current conventional wisdom; the refinement and testing of the theory of government expenditure behavior must continue." (p. 29)

Miner, Jerry. Social and Economic Factors in Spending for Public Education (The Economics and Politics of Public Education No. 11), Syracuse: Syracuse University Press, Syracuse, 1963.

This is a landmark, widely quoted study of local public school finance, utilizing a large data set at a time when computational costs were much higher than they are at present. In addition to empirical analysis, the book contains an excellent review of the literature and of the problems associated with the analysis of public school funding.

The author generated data on a sample of about 80 local school systems in 23 states. Later the number of states included in the analysis fell to 21. He used single-equation, cross-sectional, multiple-regression analysis of expenditures of local school districts in each of the 21

sample states and for the total sample. He used four dependent variables for the 1959-60 school year: total expenditure and local expenditure, each taken on a per-capita and per-student basis.

Personal income per capita had a strong relationship to expenditure per capita but not to expenditure per pupil. Median income was not a significant variable, nor were other income variables when the educational level of parents was taken into account. Surprisingly, the proportion of the school-aged population in private schooling did not reduce public funding per student. The number of migrants had a generally negative (but small) impact on funding per student, even though the author's hypothesis had been that immigration increased the fiscal load for a district and would, therefore, reduce per-pupil expenditures. The immigration variable for each school district was assumed to be equal to the state average level of net migration. The proportion of non-white students had a positive coefficient, an unexpected result.

The author did not find a decisive or simple relationship between state aid and local expenditure. In the regression using the pooled sample, state aid appears to have a statistically significant and negative coefficient, suggesting that local boards react to aid by reducing local expenditures, *ceteris paribus*. It is unclear if the coefficient is or is not fiscally important. No state aid variables are reported for individual state regressions. The author concludes that not much of the variance in local expenditure was explained and that further study would be productive. It appears that the author had hoped to find that state aid was powerful in reducing variance among school districts.

Even though there is little or no formal treatment about the impact of positive externalities of schooling not realized by the local community, the author concludes, (p. 146) "Although state grants-in-aid and state taxation take account of certain external effects, there is little doubt that without a mechanism for the reflection of national benefits there is a substantial understatement of the external benefits of education and a consequent failure to reach optimum levels of expenditures for local schools." This conclusion reflects a pro-federal funding policy position taken in much of the literature during this era.

Nold, Patricia Ann. "Public Choice and the Allocation of Public Goods: An Empirical Analysis of Local School Expenditures," *American Economic Review*, 1992, v82(2), pp. 457-463.

A sophisticated, two-stage estimation of the demand for a public service is developed in this article. The regression treats schooling as a publicly-provided service in which residential location is determined simultaneously with the level of school finance. The author identifies schooling as a public good, apparently on the premise that not all taxpayers consume the service directly at the time they finance it. This allows the author to sum the estimated marginal value of schooling across households and arrive at a statement of the optimum: the sum of the marginal values should be equal to the marginal cost of the public good.

The first stage of the estimation process focuses on residential choice; regressors are chosen from the characteristics of individuals who responded to a telephone survey. The resulting coefficients are used to generate a marginal value of local public education per household, which is then used as a regressor in the second estimation stage, which employs a multinomial logit (more, same, less expenditure preferred for public schooling) dependent variable.

Nold determines that the efficient level of public spending is greater than the actual level of public funding. The "efficient" amount of education is assumed to be equal to the mean desired level of public expenditure, which is estimated through regression coefficients and utility maximization, using an assumed utility function, whereas the public funding decision is assumed to be determined by the median voter.

For the second estimation, the author discusses the factors that relate to households preferring more, less or the same amounts of schooling expenditure. She notes her marginal value estimates are not intuitively clear; she obtains low marginal values in high expenditure districts and vice versa.

Pauly, Mark. "Optimality, 'Public' Goods and Local Governments: A General Theoretical Analysis," *Journal of Political Economy*, 1970, v78(May/June), pp. 572-585.

The author examines the supply of and demand for public schooling in a situation of expected migration of post-school individuals. His presentation is relevant to the other articles that focus on supply and demand as well as to other discussions of externalities. He concludes emigration probably leads to a reduction in the supply of local funding of schooling, but in the final analysis the question should be determined through empirical work rather than theory alone. A full review of the article may be found in the section on externalities.

Ranson, Baldwin. "Planning Education for Economic Progress: Distinguishing Occupational Demand from Technological Possibilities," *Journal of Economic Issues*, 1986, v20(4), pp. 1053-1066.

A review of this article may be found in the section on economic growth.

Rosenzweig, Mark R. "Demand of Farm Families for Quality and Quantity of Schooling for Their Children in the United States," *American Journal of Agricultural Economics*, 1976, v58(5), pp. 842-847.

It is well known the optimal levels of school quantity and quality are determined where marginal cost equals marginal returns. According to the author, "the shadow price of the quantity of schooling in agriculture is dependent upon the allocation of production and consumption inputs by the farm family, while the cost of a unit of school quality is not." (p. 843)

To say farm families do not want their children to be educated is incorrect. Farm families, it would appear, desire quality over quantity, so that children's knowledge can be utilized off the farm. According to Rosenzweig, "increases in farm value unambiguously raise the demand for school quality as long as child quality is a non-inferior consumption commodity. An increase in farm capacity leads to a higher demand for schooling and for the quality input because it raises both farm income and the marginal value product of 'skilled' farm children." (p. 843)

The author investigates the empirical aspects of quantity and quality of schooling for families in agricultural areas. Estimates of the demand equations came from material in the U.S.

state cross-sectional data for 1960. Detailed descriptions of the variables and their sources are found in the author's earlier work, cited in this article.

Two dependent variables are investigated representing the quantity and quality of schooling. These two variables are respectively the natural logarithms of the non-enrollment rate of rural farm teenagers aged 15 to 18 and instructional expenditure per enrolled children in rural school districts and counties.

Independent variables central to the analysis are farm value, present potential agricultural income, total non-farm income, and a measure of total factor productivity change constructed from the indices developed by Everson and Landau and used as a proxy for the degree of disequilibrium.

From ordinary least squares analysis, the sign of the coefficient of the farm value variable "supports the hypothesis that the opportunity cost of school quantity, the marginal value product of teenage children in farm production, is a significant deterrent to school attainment in the farm population." (pp. 844-845.)

The coefficient of the productivity change variable suggests "farmers perceive that the returns to schooling are higher in settings where the pace of technological change is more rapid; a 10 percent increase in the rate of productivity change would be associated with a rise in the enrollment rate of farm teenagers of 5 percent." (p. 845) However, the author states that a plausible alternative hypothesis also consistent with this finding is that "a high rate of technological change in agriculture may be associated with a lower demand for relatively unskilled labor, such as that of school-aged children, since such technical change is likely to make the production process in the U.S. context more capital intensive." (p. 845)

A two-stage least squares method is used to obtain consistent parameter estimates of total per-pupil public school expenditures due to the possible influence of teenage school enrollment. These estimates do not differ appreciably in either sign or significance from those obtained using OLS techniques. The one exception is the coefficient of the urban unemployment rate, which may suggest that "a decrease in employment opportunities in the non-agriculture sector significantly reduces the school enrollment rates of farm teenagers." (p. 846)

The OLS result on the sign on the agricultural wage variable within the school expenditure equation suggests "the demand for both rural-farm schooling inputs, school quantity and quality, is greater in areas where agricultural wage rates are high." (p. 846)

The important result within this specification is the sign on the coefficient on farm value, which indicates "a rise in farm value of 10 percent results in an increase in rural-farm school expenditure of slightly more than 1 percent." (p. 846) This result supports the hypothesis that increases in child farm productivity lead to the substitution of school quality for quantity in the farm population.

Rubinfeld, Daniel L., Peggy Shapiro and Judith Roberts. "Tiebout Bias and the Demand for Local Public Schooling," *Review of Economics and Statistics*, 1987, v69, pp. 426-437.

If "individuals sort themselves into communities in part on the basis of local sector activity," (p. 426) estimates of the elasticity of demand for local public schooling may be biased. Following Heckman's approach to sample selection bias, the authors apply a two-stage, least-

squares regression model to the estimation of demand for public school expenditure. Their work in this article draws on the model and data contained in Bergstrom, et al. (1982) and Gamich and Rubinfeld (1982), which are reviewed in this bibliography. None of the work reported before 1987 used a two-stage approach, and consequently the earlier work did not address the question of sample selection bias.

Their sample includes 945 homeowners who were asked questions about their residences and their preferences for level of public school funding: What level of school funding would be preferable: more, the same or less? They first develop a single-equation model for the choice-of-residence question. The results of this regression were used as data for an ordinal, multinomial profit, second-stage estimation process.

Generally the coefficients derived from their two-stage model are lower than those in their earlier single-equation micro data model. The authors suggest the potential for Tiebout bias could be substantial if there are a number of variables in the demand equation that could reasonably be shifted to the residential choice function.

Price and income elasticities derived from two-stage analysis of micro data appear to be lower than those derived from the typical median-voter, district-finance model. The authors defend their lower estimates on grounds that variables typically omitted from aggregate finance models such as the level of education of the parents are strongly correlated to both income and local expenditures. If this finding is sustained, it would suggest there may be persistent differences in demand for local school funding, even if there are transfers of funds based on per capita income differentials among districts.

Taylor, Lori L. "Student Emigration and the Willingness To Pay for Public Schools: A Test of the Publicness of Public High Schools in the U.S.," *Public Finance*, 1992, v47(1), pp. 131-152.

The author examines the supply of public schooling in the presence of both emigration and immigration. A full review is found in the section on externalities.

Turnbull, Geoffrey K. "Alternative Local Public Education Expenditure Functions: An Econometric Evaluation," *Public Finance Quarterly*, 1987, v15(1), pp. 45-60.

The author contends two controversies have received attention in the public education demand literature: (1) "the role of intergovernmental aids in the model: Should block aids be modeled as supplements to resident incomes or should aids and income enter the model separately? and (2) the appropriate tax price definition: Do resident property owners bear some of the nonresidential property tax burden, or is the nonresidential tax burden entirely exported from the voter population?" (p. 45)

The empirical model employs the median voter hypothesis, in which the community demand for local public education per capita expenditure is a function of: (1) the median voter's tax price, (2) income, (3) tax share times community population and (4) block grants to the community.

Three grant specifications are presented and tested to determine the appropriate role of aids in the empirical voter income. The first specification incorporates aid into the model to

augment voter income, whereas the second uses the notion of the "flypaper effect" in which voters respond differently to changes in income and grants. In the third specification, income and share of aid are entered as separate terms in the expenditure function.

Besides grant specification, this study considers the appropriate tax share specification, again suggesting three variants: (1) "The entire tax burden ultimately falls on residents; that is, no taxes are exported from the locale; (2) The burden falls on residents equally and (3) The appropriate tax share is $1/POP$." (p. 48)

Empirical results suggest the Cox specification test rejects the notion of aids as a supplement to voter income in favor of allowing differing income and aid elasticities. A number of references to interesting published work are found in the article.

Williams, Alan. "Optimal Provision of Public Goods in a System of Local Government," *Journal of Political Economy*, 1966, v74(Feb.), pp. 18-33.

The author provides a graphical analysis of the impact of spillover of benefits from a public good. He develops a case that provides for the possibility of too much as well as too little of the good.

Williams, Alan. "The Possibility of Oversupply of Public Goods: A Rejoinder," *Journal of Political Economy*, 1967, v75(Feb.), pp. 91-92.

The author agrees with W.C. Brainard and F.T. Dolbear's conclusion that substitution effects alone will lead to an undersupply of a public good. In this context, the "substitution" effect arises through costs being borne by one group and benefits being received by other groups in addition to the funding group. In defense of his original contention, he concludes income redistribution frequently accompanies reallocation of the benefits of a public good through migration of schooled individuals.

Wyckoff, James H. "The Nonexcludable Publicness of Primary and Secondary Public Education," *Journal of Public Economics*, 1984, v24, pp. 331-351.

The author's objective was to distinguish between the private and social demand for local schooling. If the goal is to attain optimal school expenditure, a substantial share of the total cost of schooling should not be borne by the community if the social value of schooling to the community is low. Wyckoff utilized survey data from 192 households that had responded to questions about six alternative levels of funding. With data on household size, income, presence of students, school graduates, taxable property, preference for funding level and a number of other variables, he used ordered probit regression to estimate coefficients in a single equation format.

He identified the presence of the private interest of households with children in school after testing and rejecting a hypothesis that private interest includes households with pre-schoolers. All households were assumed to have a social interest in schooling. The exact nature of the social interest was unspecified.

He was able to estimate one set of coefficients for all the households in one equation. The private and social coefficients of households with children are estimated based on an assumption that the midpoint of the ranges of alternative funding levels represented the threshold values (points of indifference) for public funding by households. This assumption made it possible to estimate explicit levels for the price and income elasticities rather than ratios, in contrast to the estimation process apparently used in earlier research.

The advantage of Wyckoff's model is the separate estimation of price and income elasticities for those with private benefits and those with social benefits. In general, private elasticities were small and non-significant, suggesting parents had schooling goals established apart from price and income considerations. Social demand elasticities were much larger.

He also estimated the impact of particular household characteristics on the preferred level of funding of a "typical" household, in which all variables except the one being examined are valued at the mean. Local school attendance and time elapsed since last attendance by the respondent played important roles, suggesting to the author the importance of a "fair share" motivation of some voters who were seeking the social benefits of local schooling. Other variables that affected the preferred funding level were occupation, age of head of household and education beyond high school.

The author's estimates of the marginal social benefits of public schooling ranged from 0 to 50% of the observed level of local benefits, and he concluded that school funding based only on local sources would be less than optimal. He does not suggest the mix of funding that would be preferable, but it could include private funding as well as government tax support above the local level. This work does not speak directly to Weisbrod's community interest model in that the social content of public schooling is not assumed to be associated with the residence of school graduates.

SECTION II

ESTIMATING THE RATE OF RETURN TO SCHOOLING

The process of estimating the rate of return to schooling has been controversial since the development of the field of human capital. Some critics argue education is undertaken primarily for non-pecuniary reasons. Under this point of view, any attempt to evaluate education by estimating the rate of return from resources invested in human beings will inevitably fail. These writers believe estimating pecuniary returns demeans the whole educational enterprise by putting it on a cost-and-returns footing. Most economists would readily attribute non-pecuniary benefits to schooling while still believing in the desirability of estimating pecuniary returns. A few of the studies we found specifically included analyses of non-pecuniary benefits arising from schooling. These include the relationship between education and social status, working conditions, and the risk and uncertainty--as well as expanded options--attached to additional schooling. On balance, it seems likely ignoring non-pecuniary factors has biased the estimates of return to schooling investments downward.

Estimation of returns is complicated by the fact that both the public and the individual contribute to human capital investment: the school district footing the bill for most in-school goods and services and the student foregoing income that could have been earned if he or she were not enrolled in school. Some writers have distinguished between private and social (or total) returns to schooling. Some have concluded there has been more than an optimal amount of schooling, others that there has been less than would be productive. Measuring the income given up by attending school instead of working is complicated by the fact some training takes place on the job, and when on-the-job training (OJT) occurs, wages are depressed by about the amount of the cost to the employer of the training.

In some studies, years of schooling are the only index of "cost," but clearly some differences in quality of schooling exist. This problem has led to attempts to incorporate measures of school quality into the analysis of wage responses to schooling. These are interesting attempts, but limited data leave a lot to be attributed to the factors closely associated with the birthplace of the student, which may or may not reflect quality of schooling inputs.

An additional problem relates to the aptitudes and drive of the student. Measuring the returns to schooling implies a person or group of persons is compared to an identical person or group that differs only in the number of years of schooling. But no two persons live that are identical except for a difference of one year of schooling. Constructing proper contrasts between persons at different levels of schooling continues to be a problem and remains an active area of research. Interestingly, no consensus has emerged; the rate of return could be under-estimated or over-estimated based on the choices students make about the optimal length of schooling.

Another continuing debate is about the identification of the product of schooling. Is the only product of schooling the changes that occur in the student? Or does acquisition of a degree communicate or signal to an employer certain pre-existing characteristics of a future employee? If signalling is important, part of the "product" of schooling is the "sorting out" of persons with

drive, persistence or other characteristics related to productivity on the job. A similar continuing question relates to separating the role of on-the-job training from the role of schooling. Schooling may be a substitute for OJT, but it may also enhance the productivity gains from OJT.

Listing Of Citations

Birdsall, Nancy and Jere R. Behrman. "Does Graphical Aggregation Cause Overestimates of the Returns to Schooling?" Oxford Bulletin of Economics and Statistics, 1984, v46(1), pp. 55-72.

In this paper the authors attempt to create a measure of returns to human capital through a graphical education aggregation method. The primary drawback to this method is it creates an upward bias in the standard estimate of the rate of return. A simple method is outlined for estimating a national rate of return to schooling in the presence of mobility. This method is based on disaggregation of the sample by each individual region of origin and destination, using variables of nominal earnings, grades of schooling and experience.

In examining the effect of geographical aggregation on estimates of the equation, the authors divide the sample into six geographical areas. The areas are rural and urban for each of the three major areas in Brazil. For each area, the region in which one went to school, the "origin" and the region where one resides, the "destination" is considered.

The authors calculate (1) mean years of schooling and monthly income by origin-destination combinations, (2) standard and modified estimates for returns to schooling for adult males, (3) constants and percentage rates of return to schooling for 36 origin-destination combinations by modified estimates and (4) the returns to schooling arrived at by using two methods, a geographical aggregation and one using the authors' method. They believe the difference between the methods "suggests geographical aggregation bias can be considerable, and its causes warrant further exploration." (p. 62)

The authors propose six reasons for possible bias in the return to schooling associated with geographical aggregation. Those reasons involve (1) average schooling levels, (2) under-reporting of earnings, (3) schooling and regional income patterns, (4) migration costs, (5) association between schooling and unobserved complementary productive inputs and (6) the private costs of schooling.

Also investigated is how each bias reflects the differences in returns among individuals in the various origin-destination combinations. The authors believe estimates of the rate of return to schooling from cross-national samples are likely to be biased upward. Geographical aggregation can cause such bias for many reasons. Therefore, the authors are not optimistic about the validity of the rates of return based on standard estimates of the impact of schooling on earned income. According to the authors, if the estimates are reliable, "it does not necessarily follow that developing countries are devoting too much of their scarce resources to investments in schooling. Thus, the impact of schooling on earned income should be an important factor in social investment decisions." (pp. 68-69)

Bleman, Dale and John S. Heywood. "Sheepskin Effects in the Returns to Education: An Examination of Women and Minorities," Review of Economics and Statistics, 1991, v73(4), pp. 720-724.

The authors discuss the results found by Hungerford and Solon (1987) in which "sheepskin effects" are claimed to affect estimates of returns to education. A sheepskin effect can be said to occur if a diploma adds some value to being educated independent of the accumulated years of education.

Returning to the data source of Hungerford and Solon, Bleman and Heywood seek to determine whether the claim that minorities receive larger returns to signals indicating higher quality is substantiated by the pattern of sheepskin effects. The signaling is defined to mean that employers generally have available to them a piece of low-cost information that may indicate something about the quality of a potential worker. This claim is different from simply examining the pattern of educational returns for different demographic groups. Following this line of thinking, a signaling model is outlined, predicting that minorities receive greater returns than majorities to signals of high productivity with regression results.

"The results suggest a pattern of the differences among the three new demographic groups and white males. Most clearly, the new groups appear to enjoy larger sheepskin effects for signals of high productivity, college and graduate school. Less clearly, they may also enjoy smaller sheepskin effects for signals of lower productivity, grade and high school." (pp. 723-724)

It is noted in the paper that alternate explanations exist for the pattern of results reported. Those explanations may vary because of different labor markets and/or they may simply reflect different patterns of labor demand and supply. The empirical results show minorities receive a greater value from diplomas than from years of education. The results obtained by Bleman and Heywood predict precisely Richard Freeman's findings for black academics.

"We do not suggest the signaling model presents the only possible explanation. Rather, we are content to confirm the presence of sheepskin effects among minorities and to observe the pattern of differences is consistent with the signaling model. We also reiterate our observation that the statistical significance of these differences must remain in some doubt, given our current testing framework." (pp. 723-724)

Blomquist, Ake G. "International Migration of Educated Manpower and Social Rates of Return to Education in LDCs," *International Economic Review*, 1986, v27(1), pp. 165-174.

The author demonstrates the relationship between emigration and the rate of return on physical and human capital. A full review of the article is be found in the section on brain drain.

Card, David and Alan B. Krueger. "Does School Matter? Returns to Education and the Characteristics of Public School in the United States," *Journal of Political Economy*, 1992, v100(1), pp. 1-40.

The authors note past researchers have found an inadequate association between the quality of schools and students' achievements on standardized tests. Their intent in this paper is to relate the returns to education earned by persons educated in different states to the characteristics of the public school system during the time they attended school. They speculate "the state of birth components in the return to education depend on the quality of the public schools and possibly on a set of state-specific constants." (p. 4)

Analysis revolves around the relationship between earnings and school quality for men born between 1920 and 1949. The authors relate rates of return to schooling to objective measures of school quality, e.g., pupil/teacher ratios, relative wages of teachers, and the length of the school term.

Even though relatively few studies have directly correlated school quality and earnings, a number of studies published between 1966 and 1980 that are referenced within the article.

A statistical model that includes unrestricted state birth effects is presented first. This controls any differences in the mean earnings of men born in different states (i.e., estimated rates of return are purged of any effects of differential family background). This model (1) controls systematic differences in the returns to education associated with an individual's current region of residence and (2) "incorporates permanent state-specific effects in the return to education and uses only the within-state variation among consecutive cohorts to identify the effects of school quality on the return to education." (pp. 2-3)

The initial result, positive correlation between average educational attainment by state of birth group and cohort group, motivated the authors to investigate the determinants more closely. They estimated a nonparametric version of the return to education function and the approximate threshold point in the return to education relation, following the positive correlation result. Next they compared this point to various percentiles of the education distribution in each state-cohort group. The authors note there are 158 explanatory variables in the regression equation for each cohort and a total of 11 different regressions.

They reach five conclusions. The first two are drawn from the reduced-form relationships between earnings, education and school quality. "First, increases in school quality during the past century are associated with increases in years of schooling and average wages. Second, the increases in earnings appear to reflect a gain for the added years of education and an increase in the return for each existing year of education." (p. 36)

Third, the estimates suggest men educated in states with higher-quality school systems tend to earn higher economic returns for their years of schooling, whereas the authors' reduced form analysis "confirms increases in school quality increase the average earnings of students. Thus, the effects of school quality are not simply redistributive, nor are they an artifact of changes in the distribution of schooling attainments.

Finally, the findings underscore the paradox noted in the introduction: school quality appears to have an important effect on labor market performance but is widely believed to have no impact on standardized achievement tests." (p. 36)

Comay, Y., A. Melnik and M. A. Pollatschek. "Dropout Risks, Option Values, and Returns to Investment in Schooling," *Canadian Journal of Economics*, 1976, v9(1), pp. 45-56.

The authors' purpose in this paper was twofold. First, they "construct an educational investment profitability model that explicitly takes into account the chances of dropping out before completion of a degree." (p. 47) Their second major focus was to "amend the computation (of returns) procedure in such a way as to include the option value of an educational stage explicitly in the model." (p. 47)

Using a dynamic multistage educational investment model, the authors reviewed the problem of optimal decision by an individual moving through the educational system. They hypothesized that the process of individual decision-making with respect to educational investment is dynamic and should be a multistage process involving interactions and feedbacks. The explanatory power of the model, which includes risk by way of dropout probabilities, is highlighted in a numerical example relating it to the Canadian educational system.

After constructing the basic model, the authors investigate how an individual planning to study in Canada's educational system may use the model in his decision-making process. The empirical analysis of this article is focused primarily on pursuit of a higher education degree.

The conclusions focus on a person's educational level decisions. The authors maintain the decisions made by the individual at any educational stage will involve explicit considerations of future options. At early educational stages, decisions appear to depend critically on future dropout rates.

Garen, John. "The Returns to Schooling: A Selectivity Bias Approach with a Continuous Choice Variable," *Econometrica*, 1984, v52(5), pp. 1199-1218.

The author attempts to prove consistency of variance in the equation of optimizing choice and econometric modeling in the case of binary variables. Standard simultaneous equations estimation are considered, and the selection bias approach, to obtain consistent estimation for education, is extended.

"The analysis in this paper does not truncate the schooling variable, but allows it to take actual values of years of schooling completed, regardless of educational level, with the goal of proving consistency of variance.

"The schooling choice model outlined in Rosen is reviewed and the specification of the econometric model is discussed. The model is then estimated." (p. 1207) Econometric methods include a standard simultaneous equations estimation, an extension of the selection bias approach to the continuous variable case to obtain consistent estimation for education and a schooling model that discounts the value of school.

After redefining some of the coefficient parameters, Garen used the weighted least squares method on his transformed equation to correct for bias and inconsistent OLS estimation while improving efficiency. The resulting econometric model is very similar to that of the binary variable case. The model shows the standard simultaneous equations estimates are not consistent because of the nature of the disturbances and selectivity plays an important role in schooling choice. In addition, the results suggest evidence of comparative advantage in schooling and earnings.

Readers not interested in the actual equations, steps or methodology involved in Garen's achievement of reliable estimates in moving from the binary case to the continuous case may bypass pages 1199-1207, for within this section are almost fifty different and/or respecified equations.

Griliches, Zvi. "Estimating the Returns to Schooling: Some Econometric Problems," *Econometrica*, 1977, v45(1), pp. 1-22.

Griliches investigates the possible biases arising from using various measures of human ability in estimating earnings functions. He notes most of the work conducted on earnings functions was not undertaken to estimate rates of return to schooling.

In discussing ability measures, Griliches says "since one views schooling and other forms of training as production processes for human capital, one would like to have independent output measures of such processes. But nobody believes we can get close to it by having an elaborate examination and summarizing the results by one final grand test score. We are stuck therefore, with input measures of schooling, measures of the time spent in institutions that are called 'educational.' We should keep this discrepancy between desires and reality in mind when we come later on to interpret the results of our analyses." (p. 3) Further, the author believes "there is no good reason to expect the 'relative ability bias' to be constant across different samples or to generalize easily from one study to another and to the population at large." (p. 5)

Three equations are proposed that summarize the considerations mentioned above. One equation is "an implicit production function for human capital, with time spent in school as the major input and other human capital, augmenting influences." (p. 4) Griliches later proposes a comprehensive model of the whole process for estimating the return to schooling.

Last, the author analyzes the possibility that schooling may be an endogenous variable in the equation. He believes in estimating the equation, he will "illustrate that schooling and the disturbance in the earnings function may be negatively correlated, leading to a downward bias in the usual least squares estimates of the schooling coefficient." (p. 16) "In short, treating schooling and ability symmetrically turns most of the previous conclusions around." (p. 17)

"Two theoretical points are worth reiterating: (1) In optimizing models there is no good a priori reason to expect the 'ability bias' to be positive. Thus, it shouldn't be too surprising if it turns out to be small or negative. (2) An asymmetrical attempt to protect oneself against possible biases by putting more variables into the equation or by looking only within finer and finer data cuts can make matters worse, by exacerbating other biases already present in the data.

"The empirical evidence examined here also points in the same direction: (1) treating the problem asymmetrically and including direct measures of ability in the earnings function indicate a relatively small direct contribution of ability to the explanation of the observed dispersion in expected and actual earnings. (2) Allowing for errors in measurement in such ability measures does little to change these conclusions except increase the estimated bias by another .005 or so. But (3) when schooling is treated symmetrically with ability measures, allowing it, too, to be subject to errors of measurement and to be correlated to the disturbance in the earnings function, the conclusions are reversed. The implied net bias is either nil or negative. In addition, (4) a more detailed examination of data on brothers indicates if we identify ability with the thing that is measured by the test scores, and if we accept the underlying genetic model that postulates that such a variable has a family components of variance structure, then the 'unobservable' that fits these requirements seems to have little to do with earnings beyond its indirect effect via schooling." (p. 18)

Pioneers in this area are Miller, Houthakker and Mincer, who emphasized estimating the average rate of return to individuals from additional schooling. Others, Friedman and Kuznets,

and Hanoch, for example, have investigated the vast assortment of econometric studies involving earnings functions with discrimination, differences between groups and other measures of interferences with the market.

Gustman, A. L. "On Estimating the Rate of Return to Education," *Applied Economics*, 1973, v5(2), pp. 89-100.

The main purpose of this paper is to analyze the impact of variations in preferences on the currently available estimates of the rate of return to education. Gustman provides twelve equations for which he estimated regressions. Variables included years of education, ability, non-pecuniary aspects of occupations, for present and post-investment period earnings as dependent variables. The dependent variable, post-investment earnings, is measured in logarithmic as well as ordinary terms.

"The empirical results indicate there is a substantial difference in the rate of return to education when it is estimated under the assumption of an inoperative capital market facing the student than when it is estimated under the assumption of a perfectly operating capital market." (p. 98)

The findings appear to be sensitive to the instrumental variables employed. Undoubtedly these estimates are sufficiently robust to suggest that if the assumption of an inoperative capital market is more appropriate, the previous market has probably underestimated the returns to education.

The author concludes that not including hours as an endogenous variable in the earnings function appears to have subjected the rate of return estimates to a bias. As a result of this finding, the current available rate of return estimates may provide a reasonable indication of the true returns to education.

Hansen, W. Lee. "Total and Private Rates of Return to Investment in Schooling," *Journal of Political Economy*, 1963, v71(2), pp. 128-140.

Hansen's article "presents estimates of internal rates of return based on both total and private resource costs for various amounts of schooling from elementary school through college." (p. 128) As a prelude to the article, the author believes that because of the allocation of large proportions of resources to schooling both by society and individuals, it has become increasingly important to understand the relationships that deal with internal rates of return. "At the societal level we might be interested in determining whether to allocate more funds to reduce the number of dropouts from high school or to stimulate an increased flow of college graduates. As individuals we would more likely be concerned with deciding whether to continue or to terminate our schooling on the basis of the relative costs that will be incurred and the benefits that will accrue." (p. 129)

Data are compiled to create "life-cycle cost-income streams that show for each level of education the flows of costs incurred during schooling and the subsequent flows of additional income that can be attributed to that schooling." (p. 129)

Correspondingly, the information is used to calculate: (1) average income by age and years of schooling completed; (2) average annual per-student costs, exclusive of opportunity costs, by age and grade; and (3) internal rates of returns to total resource investment in schooling and to private resource investment in schooling before and after tax.

Hansen cites three alternate viewpoints under which private economic returns to individuals from schooling may be examined. Those viewpoints are: (1) value of lifetime income, as set forth by Miller; (2) present value of lifetime income, as set forth by Houthakker and (3) rate of return on investment in schooling, as set forth in this article by Hansen.

Hansen combines these three different viewpoints into alternate methods of comparing the value of private economic returns to investment in schooling. The methods are viewed at age fourteen, for values before and after tax, and at the discount rates of 3, 6, 8, and 10 percent.

The author finds the rates of return to private resource investment exceed those of total resource investment, and that with various increments of education, the rates of return also differ. The rates of return have unique implications for resource allocation at both the societal and individual levels.

In the area of marginal rates of return, evidence suggests with more schooling, up to the completion of the eighth grade, the rates increase and then gradually fall off with the completion of college. Also, it is apparent the private rates of return (after tax) almost constantly exceed the total rates of return, "a situation that could presumably induce private over investment in schooling." (p. 140) Lastly, "ranking of the returns to investment in schooling by the rate-of-return method is clearly superior to the methods employed in the work of both Miller and Houthakker." (p. 140)

Hungerford, Thomas and Gary Solon. "Sheepskin Effects in the Returns to Education," *Review of Economics and Statistics*, 1987, v69(1), pp. 175-177.

The authors investigate whether the rate of return to education increases discontinuously in diploma years, a notion contrary to the prototypical specification. They have generalized the specification between the log wage and education variation by treating the variables as discontinuous spline functions with schooling (S) variations at the eighth, twelfth, and sixteenth grade levels. According to the authors, if dummy variables are introduced for $S \geq 8$, $S \geq 12$, $S \geq 16$ to allow for sheepskin effects, the presence of such effects would be indicated by positive coefficients for these variables.

The authors suggest their results indicate the existence of sheepskin effects in the returns to education. They claim two points of interest: (1) "findings suggest that treating the log wage as a smooth function of years of education, as is conventionally done in the earning function of literature, gives an inferior fit to the data" and (2) "previous authors' dismissal of the screening hypothesis on the ground that sheepskin effects do not exist was premature." (p. 177)

Most authors, including Hungerford and Solon, admit their regression analyses may in some way be biased by the omission or overlooking of certain ability variables or other factors that correlate with degree completion.

Katz, Lawrence F. and Ana Revenga. "Changes in the Structure of Wages: US versus Japan." NBER Working Paper # 3021. Cambridge, MA, July 1989.

The evidence in the paper points to a rise in relative earnings of college graduates over those of high school graduates. This is partially explained by a relative decline in the share of persons with bachelor's degrees. In general, Japanese college degree holders did not advance as far in their jobs, and there was less shift in relative numbers in Japan. Entering workers, unlike workers with experience, benefit by tight labor markets (wage compression, by another name).

A decline in absolute real wages for high school graduates, the first in recent history, is noted. Katz and Revenga are unable to test hypotheses about shifts in technology away from high school skills, increasing competition with low skilled workers abroad arising from freer trade, and lower exchange rates. The high value of the dollar has shifted demand toward foreign manufacturers and weakened demand for the U.S. manufacturing work force.

Knight, J. B. and R. H. Sabot. "The Returns to Education: Increasing with Experience or Decreasing with Expansion," *Oxford Bulletin of Economics and Statistics*, 1981, v43(1), pp. 51-72.

This paper investigates earnings-experience profiles through the relationship between education and the length of employment experience. The authors begin with a discussion of earnings function analysis that links education and experience. They state the link has been confirmed by other researchers, such as Psacharopoulos and Blaug, although in general, there is no agreement on an explanation for the results of such an analysis. According to Knight and Sabot, only two results are universally obtained for this relationship between education and employment experience: a positive coefficient on the education variable (years of schooling) and a positive coefficient on the experience variable (years spent in employment).

The authors believe human capital theory and screening theory, in their simplest forms, cannot predict the desired interaction effects between education and experience. They assert that only with the aid of further assumptions, which may involve internal labor markets, can the effects be specified.

Attempts are made to show that education and employment experience have an interactive effect on earnings. The authors then outline a possible explanation of this evidence and end with an examination of the economic characteristics a worker brings to the job that determine his productivity, which in turn determine earnings.

From empirical evidence they develop, Knight and Sabot formulated two hypotheses as to (1) why the returns to education decrease for successive cohorts of entrants to wage employment and (2) why earlier educated entrants are better insulated than more recent entrants from the forces reducing returns. The first explanation proposed by the authors is "the number of school leavers increased faster than the demand for labor in the occupations earlier cohorts largely entered. The second factor is the lag in the adjustment of the occupational structure of wages to the increase in the relative supply of educated workers." (pp. 57-58)

The interaction between education and experience in earnings functions appears to be more of a general, not universal, phenomenon. An explanation for this can be found in terms of

human capital theory. The theory link involves the requirement of further assumptions that directly involve formal education and the structure of internal labor markets.

"The implications of our explanation for the estimation of returns to education are far-reaching. If the apparent rise in the returns to education with employment experience is partly or mainly due to a fall in the returns to the more recent cohorts, then the coefficient on the education variable in our regression equation, by averaging over the sample as a whole, overestimates the marginal returns to education." (p. 70)

Kraybill, David S., Michael J. Yoder and Kevin T. McNamara. "The Wage Effect of Education and Employer Size," in Rural Infrastructure and Economic Development Issues: Education and Human Capital, Rod Clauser, ed. Southern Rural Development Center, MS, Publication No. 158, May 1992.

Using individual wage, educational level and employer data, Kraybill et al. estimate returns to schooling (5% for an additional year) and estimate returns to the size of employer. Formulation of the model is attributed to Mincer.

The authors generalize by saying a wage rate for blacks that is 61.4% that of the rate for whites rises to 85.6 (14.4 less) when standardized for personal characteristics. They then run an additional regression interacting race and firm size (in addition to an independent firm-size variable) to eliminate the differential.

Low, Stuart A. and Michael B. Ormiston. "Stochastic Earnings Functions, Risk and the Rate of Return to Schooling," *Southern Economic Journal*, 1991, v57(4), pp. 1124-1132.

Low and Ormiston state "the primary concern of this paper is to determine the impact of the independent variables, in particular the human capital variables, on the variance in wages." (p. 1127) They examine the standard stochastic specification of the earnings function, which is overly restrictive with respect to risk considerations. "In particular, the traditional specification implies the explanatory variables must have the same qualitative effect on both expected returns and risk. Thus, the standard earnings function cannot be used to examine the relation between human capital investment and risk in any meaningful way." (p. 1124)

The authors examine the risk implications of a more general stochastic earnings function. They assume level of earnings is a linear function of both the independent variables and a perturbed error term. They proxy higher levels of general human capital by years of schooling, experience and IQ, whereas higher levels of specific human capital are proxied by job tenure.

Later the authors consider a Mincer-type model that explicitly accounts for risk and risk aversion and calculates the estimates of the rate of return to schooling. From these results they create a basis for comparing empirical results, estimate the standard stochastic earnings function and the specification equation, and report the maximum likelihood results. The purpose of the authors' empirical analysis is (1) "to investigate the relation between human capital investment and the riskiness of the wage distribution and (2) to determine the rate of return to education when risk considerations are taken into account." (p. 1126)

Based on results reported in the paper, the authors claim their "findings have important implications for researchers attempting to ascertain the degree of racial discrimination: if risk considerations are ignored then the degree of discrimination will be significantly overstated." (p. 1129)

When a less restrictive model is examined, the authors find general human capital is risk-increasing, while specific human capital is risk-reducing. They also find both risk and risk aversion are significant factors working to reduce the rate of return to schooling.

The authors say "this analysis represents a first step toward exploring the relation between riskiness of income distributions and human capital investment. Based on results, future efforts to estimate earnings functions and discriminatory differentials should incorporate risk considerations. Failure to do so may result in estimates that have little applicability, given the risk/return tradeoffs that exist." (p. 1132)

Lucas, Robert E. B. "Hedonic Wage Equations and Psychic Wages in the Returns to Schooling," *American Economic Review*, 1977, v67(4), pp. 549-558.

"The principle objective here is to discover how individuals' wages vary, *ceteris paribus*, with such indicators of the quality of working life, by inserting these job characteristic variables into a wage equation that also embraces personal data." (p. 549)

The author augmented the existing theory of the hedonic prices for consumer goods, estimated a reduced form outcome of a market wage-setting process and illustrated one application of the estimated hedonic coefficients. These are estimated with wage data only and with the gains (in the money equivalent of psychic wages) included before regression analysis.

Regression analysis is on hourly earnings deflated by a locational cost-of-living index against a piece-wise linear function for four race/sex groups with different levels of schooling, and with the probability of holding a DOT job with specific characteristics (indicators of the quality working life are described in terms of occupational attributes in the Dictionary of Occupational Titles (DOT). The piece-wise linear function has break points at ages 14, 25, 55 and 99 (*sic*), while the break points for the levels of schooling are 0/8, 9/11, and 12.

The author then conducts regression analysis on the psychic wages in the returns to schooling using the standard human capital wage equation. He postulates the "direction of error from omission of psychic wage depends upon whether the share of money wages in total compensation increases or decreases with the relevant personal characteristics." (p. 555)

The results suggest omission of psychic wages leads to underestimation of the average rate of return to schooling. It is shown that, *ceteris paribus*, workers do receive substantially higher money wages as compensation for undertaking jobs entailing repetitive routines and obnoxious physical work environments. It is further established that tasks associated with higher levels of specific vocational preparation and general educational development and (for white males) supervisory jobs do pay considerably higher wages, *ceteris paribus*. This suggests a reward to some omitted set of skills not fully reflected in the common schooling and age variables.

The results presented here on psychic wages in the return to schooling suggest a considerable downward bias from estimating such returns in terms of monetary rewards alone.

Merrett, Stephen. "The Rate of Return to Education: A Critique," *Oxford Economic Papers*, 1966, v18(3), pp. 289-303.

Merrett discusses the problems he believes exist in estimating human capital variables to determine education's rate of return. He focuses on calculating the opportunity costs of a student's attending school.

The author's hypothesis is the traditional method of summing up the year-to-year foregone income of a student is incorrect. Strictly, he believes (1) "income foregone should not include the foregone earnings in a part-training (post) when calculating the opportunity costs" (p. 291) and (2) there is too much variation in what constitutes an outlay and which variables to include in the equation.

Merrett uses multiple correlation analysis instead of simple bivariate analysis to estimate individual earning functions. He believes a simple bivariate analysis overestimates the influence of education on income because some explanatory variables used in the regression are difficult to define, let alone measure. This is true of intelligence and personal drive. In addition, using years of education is questionable when dealing with different educational sectors and different generations of students.

Niemi, Albert W. Jr. "Returns to Educated Blacks Resulting From Southern Outmigration," *Southern Economic Journal*, 1973, v40(2), pp. 330-332.

The author compares the returns to education for a black citizen who has emigrated to another region, at three different levels of education high school, college, and post-college. The goal is to approximate the rewards to educated blacks who migrated from the Southern region of the United States upon completion of education. Rewards are calculated at each level of education based on the assumption the migrant migrated to a Standard Metropolitan Statistical Area (SMSA). Seven SMSAs were investigated: Atlanta, New York, Chicago, Washington D.C., St. Louis, Houston, and Los Angeles. The author's next step was to determine the present value at each level within each SMSA using 6, 9 and 12% discount rates.

The author tests two variants of how the quality of Southern education compared with that of other areas in the country. The first variant "measures the present value of the expected income gain from migration, assuming that Southern black education is transferable at parity. In other words, it is assumed a migrating Southern black earns at the average rate of a native black with similar completed levels of schooling." (p. 330)

The second variant measures the "present value of the expected income gain from migration assuming Southern Black education is not transferable at parity. In other words, it is assumed a migrating Southern black has a lower quality of education and therefore earns at a lower rate than a native black with equal completed levels of schooling." (p. 330)

Results suggest if variant I holds, then migration would offer some possibility of advancing one's welfare. At the higher rates of discount, results are not conclusive. However, if variant II holds, migrating would be a very heavy cost to migrating blacks. "If Variant I could be considered the upper bound and Variant II as the lower bound, the outward migration of Southern blacks would not appear to offer much in terms of a financial return or reward, except in

Atlanta." (p. 332) It is hypothesized that the lower degree of discrimination against blacks is the reason for the Atlanta results.

Sjaastad, Larry A. "Costs and Returns of Human Migration," *Journal of Political Economy*, Oct. 1962, v70(5) part 2, pp. 80-93.

Emigration is one way a person is able to affect the rate of return on investment in his or her own human capital. This article is a very early treatment of migration as an adjunct to human capital formation. It is reviewed more fully in the section on brain drain.

SECTION III

EXTERNALITIES AND THE FUNDING OF PUBLIC SCHOOLS: THE INTERACTION OF DOMESTIC MIGRATION AND SCHOOLING

An interesting question found in the public school funding literature is, "Who should be responsible for paying for public education if the goal is to provide an optimum amount of schooling?" If schooling were a normal private good and investment capital were readily available, individual students (and their families) would determine how much to invest, and the market question would be solved. But public schooling is public in two respects.

First, some of the benefits are garnered by members of the community because an educated electorate helps to maintain democratic government and because educated persons presumably are better behaved and more productive than uneducated ones. Both civility and productivity give rise to benefits to the local community.

Second, public schooling is public as defined by the way funds are raised. The power of the state is used to coerce taxpayers -- who are very often property owners -- to pay taxes. Elections of school board members and county commissioners help determine levels of funding. Bond issue votes determine capital improvement and sometimes operating expense levels for local public schools.

If citizens, once schooled, stayed in the community that funded their schools, the question of who pays for education and who benefits would be fairly simple compared to a situation in which there is a lot of post-schooling migration. Although the reviews in this section are listed alphabetically by author, they constitute a response to several questions of increasing complexity. First, it has been important to determine the significance of schooling on emigration. While this theme predates our reviews, it was a popular subject throughout the 1970s and has been enriched with the addition of longitudinal studies in the last five years.

A second theme is the effect of emigration on funding. If a community invests in young people in the hope and expectation they will remain in the community, expected emigration could lead to lower funding of public schools. If migration is widespread, many school districts might reduce educational spending, leading to a decline in the level of public schooling. In this situation, migrants might impose educational and other costs on the communities to which they immigrate. This theme was introduced in the mid-1960s. In some ways the policy question is the opposite of the problem of the international Brain Drain, in which individuals with "too much" education are presumed to migrate in large numbers from poor to rich nations. The externality literature is strangely and unexpectedly separate from the Brain Drain literature, despite the central dependence of both literatures on the idea of externalities arising from emigration.

The findings of the empirical literature on externalities arising from domestic mobility are very mixed; at least as many studies don't find funding reduced in response to high rates of emigration as studies that do. In sharp contrast, the weight of opinion of economists writing on

the subject is clearly that mobility lowers funding. They also conclude the underfunding can be corrected only through state and federal aid to local public schools.

The concern with mobility and its possible negative impact on funding is quite distinct from the concern with equity: Are children in poor districts necessarily disadvantaged because they live in poor districts? This subject is not included in this volume. It was set aside because of the size of the other tasks we had already built into this review of the literature.

Most of the work on school funding and emigration has assumed causation runs from emigration to funding. While there were warnings in the literature that population flows and school funding could be positively as well as negatively related, only in recent years has the main line of work been challenged by models built on more than one equation. One approach has been to try to explain immigration as a function of school funding at the same time that school funding is being explained as a function of emigration. This appears to be a promising approach.

Another approach, based on micro data, has been a two-stage process that first explains immigration and then looks at the demand for schooling, taking into account the selectivity of the sample of people who have chosen to live in specific districts.

Questions remain about the optimal level of school funding and the optimal allocation of public funding among local, state and federal sources. Future studies could benefit from the experience of earlier students who considered emigration and immigration in a simultaneous equations frame of reference.

Listing Of Citations

Beale, Calvin. The Revival of Population Growth in Non-metropolitan America, USDA, ERS-605. Washington, DC: USGPO, 1975.

The author presents a useful historical review of rural-to-urban migration within the nation at a time when rural areas appeared to be receiving a net in-flow of population. He notes "the appeal of major urban areas has diminished and the attractiveness of rural and small town communities has increased, economically and otherwise." (p.3) Some of the reasons for the change in the balance of migration included massive urban riots, urban crime, pollution, congestion, and social alienation. Reasons for the in-migration in some rural areas during the early 1970s are attributed to the decentralization trend in manufacturing and the development of recreation and retirement activities. Rural areas that had the most uniformly heavy loss of population were the predominately black non-metro counties. These areas were once disproportionately agricultural and received less industrialization than the rest of the South.

Blomquist, Ake G. "International Migration of Educated Manpower and Social Rates of Return to Education in LDCs," *International Economic Review*, 1986, v27(1), pp. 165-174.

Although this article is reviewed in the Brain Drain section, it also has some aspects that apply to externalities. The primary question is the frequency with which labor mobility has been inhibited by public investment decisions. In these cases the public investment machinery may have been used to reduce migration to retain earnings of capital.

A dynamic mathematical model with equilibria is constructed for different labor market impediments (unemployment) and capital market imperfections (different rates of return, some with and some without externalities) to compute the returns to non-migrants from migration. Although an interesting model, neither the income of migrants nor the income of the receiving country is considered. Implicitly the author treats human capital as being privately owned.

Borsch-Supan, Axel. "Education and its Double-Edged Impact on Mobility," *Economics of Education Review*, 1990, v9(1), pp. 39-53.

Using data drawn from the Panel Study of Income Dynamics (PSID) on 736 individuals, the author addressed the question of the impact of education on "labor" mobility and geographic mobility. "Labor" mobility is comprised of changes in job (firm), occupation and industry of employment. Geographic mobility consists of county, city and state moves. The analysis covers the employment history of the individuals from 1968 to 1982. Poisson regression analysis is utilized to derive predictions of the number of changes in employment over the 14-year study period.

The question is addressed because mobility may help in redressing sectoral and regional disequilibria that arise from a number of sources. Educational achievements include completion

of 8 grades, 9-11 grades, high school, high school plus practical training, some college, and B.A. and M.A. degrees.

In general, the number of predicted changes in (1) job, (2) occupation and (3) industry is higher as educational level is lower. This suggests persons with more formal education are more specialized to specific positions, occupations and industries. By contrast, geographic mobility is highest for those with the highest levels of education. This pattern would suggest those with advanced degrees are able to process information more easily than others and face lower costs of mobility. No distinction is made between transfers undertaken to accommodate employers and shifts between employers.

Geographic mobility is relatively high for those who did not complete high school, higher than it is for students who completed high school, attended some college or completed college. No hypothesis for this trend is advanced. Perhaps differences in the personal characteristics of individuals at the various levels of schooling play a role, as might differences in the extent of disequilibrium experienced by persons with different educational levels.

For a study that employed the PSID data base but used a different approach, see the work of Kathryn L. Shaw also reviewed in this bibliography.

Bowman, Mary Jean and Robert G. Myers. "Schooling, Experience and Gains and Losses in Human Capital Through Migration," *Journal of the American Statistical Association*, 1967, v62(September), pp. 875-98. (Reprinted as Chapter 23 in Human Capital Formation and Manpower Development, Ronald A. Wykstra, ed. New York: Free Press, 1971, xxvi, 502. Also as Reading 27 in Investment in Human Capital, B. F. Kiker, ed. Columbia: Univ. of S.C.Press, 1971.)

This is an excellent review of the migration and education literature up to the date of publication. The authors contrast the work of Sjaastad to that of Weisbrod, both of whom based their premises on human capital theory but with the latter treating the community (school district) as the entity that receives benefits and incurs costs. They review the alternatives of one-way, "return" and "re-" migration to demonstrate the importance of distinguishing between gross and net flows. They also develop a typology of migration, schooling and work that introduces topics such as migrant laborers and worker importation policy. In their conclusions they make the following points: (1) Methods being used to calculate human capital gains and losses from migration are too simplistic. (2) Human investment decision models provide the basis for analyzing migrants' motivations, social decisions about the locus of training, the relationship between migration and diffusion of know-how, and the effects of manpower importation. (3) The availability of information on Census tapes can be increased. The addition of information on occupation before migration and the locus of schooling would be particularly useful.

Brainard, W. C. and F.T. Dolbear. "The Possibility of Oversupply of Local 'Public' Goods: A Critical Note," *Journal of Political Economy*, 1967, v75(Feb.), pp. 86-90.

See the section on supply and demand of schooling for a review of this article.

Break, George F. Intergovernmental Fiscal Relations in the United States. Brookings Institution, Washington, D.C. 1967, xv, 273 p.

The author presents a clear and concise discussion of the public goods character of education in a democracy--without the use of data or formal models. It is one of a very small number of works in which the impact of both domestic and international migration on funding of education is discussed. Break distinguishes between pure public benefits, private benefits and fiscal effects in which future tax levels are a function of educational achievement. He concludes that mobility justifies federal support for education.

Cebula, Richard J. "An Analysis of Migration Patterns and Local Government Policy toward Public Education in the United States," *Public Choice*, 1977, v32(1), pp. 113-122.

The author's purpose in the article was "to seek empirically and to ascertain the possible impact of differential local government policies toward (commitment to) public education on migration patterns and to ascertain the possible impact of migration patterns on local government policies toward public education." (p. 114)

The author hypothesizes "areas with more rapidly growing public education budgets (on a per full-time student basis) should be the more attractive ones to migrants, *ceteris paribus*." (p. 115)

Cebula develops two empirical models which are tested: (1) the volume of gross and net non-elderly in-migration to an area, 1965-1970, expressed as a percent of the 1965 population in the area, and (2) the growth in public education spending per full-time student in an area between 1965-1970, expressed in current dollars.

The first model uses growth in public school spending per full-time student, per capita income, 1965 average unemployment rate, number of days per year (on the average) when the temperature falls to 32 degrees Fahrenheit or below, and per capita property tax level for each area as independent variables, whereas the second model uses non-elderly in-migration (gross migration rather than net), growth of per capital personal income, growth of federal funding per full-time student, rate of inflation, 1965-1970, for each area as independent variables.

In lieu of single-equation models estimated by ordinary least squares, a multi-equation model estimated by the two-stage least-squares method is used, since the author argues non-elderly migration and growth in public education may very well be highly interdependent.

Empirical support was found in this article for the hypotheses that (1) both gross migration and net migration to metropolitan areas in the United States (migration patterns) and (2) local government policy toward public education are highly interdependent, i.e., that the causality runs both ways. Additionally, the results support the arguments of Tullock (1971) and Tiebout (1956) that, *ceteris paribus*, "consumer-voters move to communities whose local government best satisfy their public goods preferences." (p. 120)

Clotfelter, Charles T. "Public Spending for Higher Education: An Empirical Test of Two Hypotheses," *Public Finance*, 1976, v31(2), pp. 177-195.

The author used interstate differences in higher (post-secondary) public education expenditures in 1970 to test hypotheses about the impact on public funding of (1) migration and (2) the form of taxation. He used a two-stage process that allowed him to treat enrollment as endogenously determined. He also developed a model of projected emigration based on a lagged structure of earlier migration rates. His dependent variables include total funding, including both taxes and tuition, total funding per resident, total funding of instructional activities and total funding of general activities (research, etc., excluding instruction).

A negative coefficient of the migration variable in the total student expenditure regression convinced him states behave as if they were maximizing state welfare. This result fits what some have termed the "community-interest model." As further explanation, a 10% increase in migration is estimated to cause a 4.4% reduction in total expenditure, *ceteris paribus*.

He was less successful with the hypotheses concerning the form taxation takes. The coefficients of direct taxes were all positive, although they were expected to be negative. They were never statistically significant. The tax structure variable coefficient usually had the forecasted sign, indicating the simpler the tax structure (and therefore the more readily comprehended), the lower the level of taxation.

His references included a number of empirical tests of public funding of primary and secondary education and a number of public choice models of general funding.

Deavers, Kenneth L. "Rural Economic Conditions and Rural Development Policy for the 1980s and 1990s," in Agriculture and Beyond: Rural Economic Development, Madison: University of Wisconsin-Madison, 1988, pp. 113-123.

This article details the history of metro-nonmetro migration flows during the 1970s to the pre-1990s, which concurs with that in other articles about trends over the same period of time. Because the major focus of the article is on rural economic growth, a fuller review is found in the section on growth.

Fein, Rashi. "Educational Patterns in Southern Migration," *Southern Economic Journal*, 1965, v32 (#1, pt.2, July), pp. 106-124.

This paper discusses migration patterns into and out of three Census divisions that make up the Southern region (South Atlantic, East South Central, and West South Central) of the United States. The author's goal is to "illuminate some of the migration patterns for those areas and help provide a basis for assessing the `seriousness' of the migration problem and its impact." (p. 107)

The reasons for migration are not analyzed in the paper; however, some data are included that might suggest some explanations of the issue. (p. 107) The author believes net migration figures for the region mask not only significant division rate differences but also differences in sign, since the region may exhibit net out-migration, while one or two divisions may have net in-migration.

The author refers to the notion the South is losing its most highly educated people. He concludes this is only partly true. He believes "a considerable number of them (the emigrates) are

being replaced, indeed, more than replaced above age 35, and the Southern divisions exhibit markedly different patterns." (p. 115)

Results contained in the article concern historical comparisons and trends for out-migration, in-migration and net migration by color, age, education level, region and interactions thereof. The significant conclusion derived from the data in the paper concerns the impact of the so-called Southern Brain Drain. That resolution is, according to Fein, "when persons are assigned dollar values we find that losses due to migration are not the big Southern problem we had presumed. The South's future may be dim, its out-migration may have social implications, but its economy is not being held back materially because of an exodus of human capital." (p. 124)

Flora, Jan L. "Equity in Financing Primary and Secondary Education: a Midwestern Example," *American Journal of Economics and Sociology*, 1976, v35(April), pp. 175-189.

The per-pupil cost of educating the students who continued to reside in Kansas after their completion of schooling was the focus of the analysis. In effect the cost of educating students who left Kansas is added to the cost of educating non-migrants. The association between cost and the degree to which the county is rural was examined. Also, the relationship between cost per pupil and several measures of the ability to pay was studied. The author concludes that the differences in cost between rural and urban areas is even greater when the effects of migration are included. Her cost analysis is implicitly based on the assumption the community owns the human capital that moves across county lines.

Flora's primary interest is in "equal opportunity" of students and on a positive correlation between the income of tax payers and taxes collected for schooling. The author discusses alternative forms of public finance for schooling, including state-wide property, income, and sales taxes.

Green, Kenneth V. "Spillovers, Migration, and Public School Expenditures: Repetition of an Experiment," *Public Choice*, 1977, v29(Spring), pp. 85-93.

Green challenges Weisbrod's 1964 hypothesis that spillins cannot offset spillouts (gain of educated individuals through immigration as contrasted to loss of educated individuals through emigration).

He attempts to show that by spreading the costs over a larger population, the original residents can be spared some of the costs they formerly bore. This hypothesis is supported by using conclusions of Henry Aaron (that public goods can be provided at low marginal cost), Edel and Sclar (general excess demand is not to be expected in long-run equilibrium) and Williams (even though spillins may not have a marginal impact on the price of education, they could affect the real income of the community, and thereby the level of funding of education).

The author analyzes data on 1970 expenditures in 53 New York district-cities. The results of his analysis lead him to conclude spillins have some impact on expenditures, rather than none as Weisbrod concluded. Green criticizes Weisbrod's use of state data because (1) most important decisions about school funding are not made at the local level and (2) interstate migration could miss a lot of variation in interdistrict migration.

Hadley, Garland R. "Interstate Migration, Income and Public School Expenditures: An Update of an Experiment," *Public Choice*, 1985, v46(2), pp. 207-214.

The author is concerned with the robustness of Weisbrod's results, in which expenditure per student was shown to be negatively related to net out-migration using multiple regression on 1960 state data. He reviews an analysis by Kenneth Green of 53 local school districts in New York that supports Weisbrod's "community welfare-maximization" model in its simplest form but rejects it when additional variables are added.

Hadley examines the correlations between Weisbrod's data series and concludes the high negative intercorrelation between income per capita and percent out-migration "...would have made it difficult to discriminate between the effects of income and net migration." (p. 210)

He updates the Weisbrod model and variables to the 1976-1977 school year and finds there were great changes in the correlation between out-migration and income per capita between the two periods. Regression of school expenditure per student on the rate of out-migration yields evidence contrary to the Weisbrod hypothesis.

Using the eight states that experienced the most substantial change in rates of in-migration and the eight with the most change in out-migration, he examines the changes in expenditures per student between 1950 and 1976 as a function of the percent change in per capita income between 1950 and 1976 and the change in the rate of net migration between 1950-59 and 1970-79.

Using simple regression analysis on this information, the coefficients of the migration variables failed to support Weisbrod's hypothesis.

Hines, Fred and Luther Tweeten. "Push-Pull and Schooling Investment," *American Journal of Agricultural Economics*, 1968, v50(5), pp. 1426-1431.

The authors treat schooling expenditure as an investment by the school district. When migration occurs, a major share of the investment is lost to the region and gained by the community receiving the migrant. The authors proposed three hypotheses: (1) migration rates increase with education; (2) regions with low personal disposable income per student enrolled in public primary and secondary schools will experience net out-migration, whereas regions with high income per student will experience net in-migration (3) migration patterns compound the disparity in income among regions by selecting for migration a disproportionate share of the persons with the greatest future income stream from regions having the lowest income per pupil enrolled in primary and secondary schools.

Migration data from the 1960 U.S. Census by age group and educational attainment are used to investigate the authors' hypotheses. They believe their analysis supports the hypothesis that migration increases with education. The expected negative correlation between rate of emigration and school funding was not found. While emigration patterns may increase the disparity of income among regions, there are some notable exceptions. The authors suggest "federal aid to education can help compensate for the exodus of capital embodied in educated people." (p. 1428)

Hirsch, Werner Z. and Morton J. Marcus. "Intercommunity Spillovers and the Provision of Public Education," *Kyklos*, 1969, v22, pp. 641-659.

The authors broadly analyze the economic interaction among communities, including economic interaction, fiscal interdependence and migration. They investigate data for public schooling expenditures and migration into and out of Clayton, Missouri. These data are used to generate an estimate of the spillovers arising from migration.

Graphical analysis is used to present consumption and educational investment tradeoffs faced by communities. The impacts one community may have on another are then treated in much the same way income and substitution effects are illustrated.

They conclude spillouts and spillins cannot merely be offset against each other in the formulation of a policy proposal because their impacts on income and the relative prices of goods generally will not be equivalent. "The relevant issue is not only the spillover magnitudes, but the spillover effects on consumption-education investment tradeoff rates as well." (p. 659)

Hobbs, Daryl J. "Rural America: A Third Wave?," in Rural Policy Problems: Changing Dimensions, William P. Browne and Don F. Hadwiger, eds. Lexington MA: Lexington Books, 1982, pp. 183-201.

This is an historical review of the way rural education has been organized in America, along with a survey of the diversity of funding arrangements. Student performance, particularly as it related to the movement to consolidate schools in the 1950s and 1960s, was specifically reviewed.

Operational problems of small rural schools were reviewed (poor quality of instruction, difficulty in hiring or retaining good teachers, limited course offerings, limited equipment and inadequate career counseling), and surveys of the characteristics of teachers and administrators were reported.

Hobbs reviews a work by Luther Tweeten in which Tweeten analyzes the source of differences in earnings between urban and rural people as a function of educational attainment, sex and race. Hobbs believes "although there are numerous ways to show the extent to which rural areas have contributed to a greater national concentration of wealth, perhaps none is more easily demonstrated than the geographic transfer of the earnings potential of investment in education." (p. 194)

Toward the end of the article, he notes there exists a generally positive relationship (externality or by-product) of operating a school in a particular community. He closes with a review of Naghtigal's analysis of recent rural school reform efforts.

Holland, David W. "The Impact of Benefit Spillovers upon Economic Efficiency in Public School Finance," *American Journal of Agricultural Economics*, May 1974, v56(2), pp. 300-305.

The author examines the impact of emigration (spillovers) and immigration (spillins) on local school funding in Oklahoma's State Economic Areas, utilizing data from 1960 and 1970. Gross and net migration data were used in formulating the theory. The conditions in Oklahoma

during the data period and the assumptions stated within the article are important in the author's examination of the data.

A two-stage least-squares regression model was employed to keep the impact of emigration on state aid from being confounded with the impact of emigration on local funding. His regression analysis did not find emigration had a negative impact on local funding, as he had predicted. To accommodate his finding, he stated "state foundation aid has, to some degree, internalized benefit spillovers, thus diminishing the likely effect of spillovers on local school funding." (p. 305) The author also suggested that school funding "has become so institutionalized response to spillovers or anything else for that matter may be virtually impossible." (p. 305)

The results indicate spillovers and spillins do not have a statistically significant impact on local funding for public schooling.

Holland, David W. and Luther G. Tweeten. "Human Capital Migration: Implications for Common School Finance," *Land Economics*, 1973, v49(3), pp. 278-284.

The authors address the question of the optimum distribution of school finance between local, state, and federal sources. They address the questions of "ability to pay" and "equality of opportunity" under the assumption that some persons will migrate from non-metro areas to metro areas. The term used to describe the migration of human capital from one district to another is "spillover."

They note "the mix of local, state, and federal revenues for public schooling has become increasingly weighted toward non-local revenue sources." (p. 278) From 1920 to 1968 local funding dropped from 83% to 52%, state funding increased from 17% to 39%, and federal funding increased from 0% to 9%. They see these changes as a response to greater mobility. They conclude local districts will be less likely to support education as mobility rises.

The authors estimate the geographic distribution of schooling benefits in Oklahoma during 1960 and compare them to the known levels of funding for each respective area for that year. In calculating their estimates of schooling benefits they "computed the product of the appropriate earnings increase and the probability of residence in that area." (p. 280)

They conclude with a discussion of the role state and federal governments can play in funding schooling in areas expecting in-flow and out-flow of people.

Holtmann, A. G. "A Note on Public Education and Spillovers through Migration," *Journal of Political Economy*, 1966, v74(5), pp. 524-525.

The author discusses community production of public education in the socially optimal amount. This issue of public education developed from a part of a work produced by Burton Weisbrod, External Benefits of Public Education (1966 pp. 100-116), in which migration is introduced. Holtmann attacks Weisbrod's model on the grounds that Weisbrod's model is "not perfectly competitive and, therefore, there is no general-market price for educated people emerges." (p. 525)

Holtmann hypothesizes that "under the assumptions of a competitive market for educated people and a net-benefit-maximizing community producing education, migration of educated

people does not produce external effects" (p. 524) This statement directly contradicts Weisbrod's statement in which he claims migration serves to create an external effect.

Holtmann supports his hypothesis that communities would not produce schooling at a level leading to external losses by appealing to Gary Becker's "on-the-job training model." In this model, profit-maximizing firms would not provide a worker with schooling of a general nature that might benefit other firms if they could not reduce the worker's wage by an amount equal to the cost of the schooling.

The major point Holtmann makes is that "one may imagine a whole host of reasons why the production of education may be non-optimal, but migration of educated people is not one of them. If the community is a net-benefiting-maximizing entity, it will not produce education for which it cannot be reimbursed." (p. 525)

Ilvento, Thomas W. "Education and Community" in American Rural Communities, A. E. Luloff and Louis E. Swanson, eds. Boulder, CO: Westview, 1990, 108 pp.

The author presents an excellent review of the development of local educational funding and the constitutional basis for state and local responsibility. He notes the role of local schools in maintaining a sense of community among local residents. The author concludes emigration of young adults is regarded as a loss of investment capital by the local community. As a result emigration can be expected to lead to political pressure for additional state and federal aid to education. Differences in the tax base are seen as a primary reason for observed differences in school funding. State and federal funding could also reduce the generally observed "inequities," but one of the problems that might arise with increased funding above the local level is the question of control of curriculum and teaching materials.

Krieg, Randall G. "Human Capital Selectivity in Interstate Migration," *Growth and Change*, 1991, v22(1), pp. 68-76.

The proposition of this article is that traditional models of interstate migration mask the flow of human capital. The author discusses the importance of focusing on the quantity of human capital that migrates rather than solely on the absolute numbers of persons migrating.

Krieg develops four different measures of human capital flows. Parameters, methodology, model, and statistical methods are discussed separately. Next he compares his four alternative measures to the flow of human beings in 48 states and the District of Columbia. Two sample t-tests were run to identify states in which statistically significant differences occurred, compared to the various measures of human capital. He identifies states that have experienced "(1) a net gain of people but a lower net gain or a loss of human capital, (2) a net gain of people and a greater-than-proportionate gain in human capital migration, (3) a net loss of people but a lower net loss or gain of human capital and (4) a net loss of people and a greater net loss migration of human capital." (p. 74)

He concluded (1) traditional models of human capital migration do not capture the costs and benefits associated with the migration of individuals possessing varying degrees of earning

potential and (2) it is not sufficient to examine merely the number of migrants, but one must also examine the human capital embedded in migrants.

Lazear, Edward P. "Intergenerational Externalities," *Canadian Journal of Economics*, 1983, v16(2), pp. 212-228.

Lazear begins by assuming parents may not take into account benefits arising from their own education and/or relocation (migration) in the form of the income of their children. Using this assumption, he concludes the social levels of education and migration may not be achieved.

His estimates indicate black males would under-invest in their own education by 2.3 years if they didn't anticipate the impact their education would have on the income prospects of their children.

Luytjes, Jan B. "Appalachian Brain Drain: Notes on the Impact of Increased Educational Funds in Lagging Areas," *Growth and Change*, June 1971, v2(1), pp. 38-41.

The author focuses on the external impact of school spending and migration of locally schooled individuals on local economic growth. The major review of this article is found in the section on growth.

Margo, Robert A. Race and Schooling the South, 1880-1950. Chicago: University of Chicago Press, 1990.

The author contrasts the Human Capital view (the supply-side explanation) of the progress of blacks in the United States to the Institutionalist view (a demand-side explanation).

Under the former, progress was made in productivity and in relative wages in response to the extent of investment in the human agent, publicly provided schooling being one of the most important forms. By contrast the Institutionalist school contends the decline in the degree of discrimination in employment and remuneration occurred because of legal and social changes.

The author reviews educational achievement by racial groups, examines the decline and then rise in per-pupil funding of black education in the South and then analyzes the contribution of differences in teacher salaries to expenditure differences. He also examines the impact of employment segregation and migration on earnings and residency.

"By the early twentieth century, disenfranchisement had led to racial inequality in educational opportunity, and these inequalities measurably reduced black schooling levels. By limiting the flow of black labor from the rural South, educational discrimination helped perpetuate the traditional existence of a supply of low-wage labor well into the twentieth century, a fact the Southern white elite was keenly aware of (Wright)." (p. 127) The balance of judgment seems to be that economic forces favored both more and less education: supply enough education to keep the parents from migrating; supply enough education keep the children from migrating, respectively.

McMahon, Walter W. "An Economic Analysis of Major Determinants of Expenditures on Public Education," *Review of Economics and Statistics*, August 1970, v42(3), pp. 242-252.

This paper is a report of what the author calls the first structural analysis of school finance. It is structural in the sense he posits demand and production cost (supply) functions separately. Out of this theoretical model he develops a reduced form equation. The model allows him to specify the expected sign of the coefficients of the included variables even though only a few of the structural coefficients can be derived from the reduced form analysis.

He uses cross sectional data from 1955-56 for fifty states and time series data for 1946-68 for the United States as his study base. He got reasonable signs on most variables and R-squares in the mid-70s. Reacting to the special interest of this study, he notes the six states with the highest levels of emigration all spent more than the estimated coefficients predicted. If the states had spent less than the levels predicted in the absence of an emigration variable, one could conclude emigration was a factor in suppressing public finance. Given the opposite result, the author infers that emigration was not functionally related to school finance cross sectionally in 1955-56. An immigration variable included in one regression was not significantly different from zero.

He reasons that the presence of children is evidence of a demand for human capital formation. The coefficient of this variable is always positive; i.e., children lead to enrollment, which in turn leads to school expenditure.

McMahon seems to have undertaken the analysis of migration with Weisbrod's 1964 work in mind. He appears to be aware his work tends to refute the community-interest hypothesis but doesn't make a major point of this result.

Miller, Helen Hill. "Private Business and Public Education in the South," *Harvard Business Review*, 1960, v38(4), pp. 75-88.

The author primarily discusses business conditions in the mid- to late 50s. She focuses on the fact many companies are investing in the Southern region because of favorable cost elements (low wages). With all the new business and development, there is an influx of young, educated males with families, including children, who will eventually need schooling. This is one reason for the need for more education in these developing rural areas-- demand has grown.

Miller also emphasizes the wave of desegregation occurring in the South in the 1950s. With this desegregation, Negroes in the South are attaining higher economic levels than ever before, and as a result, their purchasing power has grown. This increase in purchasing power, the author reasons, will cause Negroes to demand better schooling and education for their children.

Miller, William L. "Education as a Source of Economic Growth," *Journal of Economic Issues*, 1967, v1(4), pp. 280-296.

The paper focuses on the facts and achievements of a number of contemporary economists in regard to education as a source of economic growth. The author contends there are three points of interest in the relationship between education and growth, of which two are statistical investigations, while the third is of less concern. These points are (1) the education-output

approach, which emphasizes the works of E.F. Denison and T.W. Schultz; (2) the rate-of-return approach, which emphasizes the works of Gary Becker and Mark Blaug and (3) forecasting manpower needs.

Denison's and Schultz's rate of return estimates are compared with Becker's and Blaug's, and the problems are cited with regard to the rate of returns approach. These include involving normative judgments in dealing with externalities; separating the effects of schooling on income from those of native ability and social environment exclusive of schooling and dealing with opportunity costs, most notably in computing wages foregone by students.

The author concludes "the rate of return approach does not substantiate there is underinvestment in education in comparison to physical capital." (p. 292) He also concludes "excessive preoccupation by most economists with the problems of statistical measurement has caused them to neglect questions of return and, by indicating that the return from education is substantial, may have obscured the need for increasing the efficiency of the existing system of education." (p. 296)

Mueller, Eva. "Public Attitudes toward Fiscal Programs," *Quarterly Journal of Economics*, 1963, v77, pp. 210-235.

The author reports the results of a survey of consumer attitudes toward taxation for education and a variety of other fiscal programs. Consumer response is reported in summary form as an index equal to positive responses minus negative responses. Strongly positive values were obtained for many subsets of the population, including persons without children and persons beyond normal child-bearing ages. The results indicate support for schooling for social and/or altruistic reasons.

Niemi, Albert W., Jr. "Returns to Educated Blacks Resulting from Southern Outmigration," *Southern Economic Journal*, 1973, v40(2), pp. 330-332.

The effect on emigration is discussed, but the major emphasis in this article is on the impact of migration on the rate of return to schooling. The major review of this article is found in the section on returns to schooling.

Nold, Patricia Ann. "Public Choice and the Allocation of Public Goods: An Empirical Analysis of Local School Expenditures," *American Economic Review*, 1992, v82(2), pp. 457-463.

The author presents a sophisticated, two-stage estimation of the demand for a public service in which the demands of parents and non-parents are estimated in a two-stage model. This article is relevant to the question of external values of schooling, but it is related to the issue of supply and demand for education and is reviewed more completely in the section on that topic.

O'Donoghue, Martin. "Comments on Dr. Maurice Peston's Report on the Theory of Spillovers and Its Connection with Education," *Public Finance*, 1966, v21(1/2), pp. 200-205.

The author comments on Peston's (1966) article on spillovers arising from public schooling. Three areas are examined: (1) externalities and interdependence, (2) spillovers i.e., general externalities and (3) the framework for measuring spillovers. Primary focus is on general and methodological problems.

Ostrosky, A. "A Further Note on Migration Patterns and Local Government Policy toward Public Education," *Public Choice*, 1979, v34(3/4), pp. 505-509.

The author proposes three modifications to Cebula's 1977 article, also reviewed in this bibliography. (1) The dependent variable, volume of gross non-elderly in-migration, expressed as a percent of the 1965 population in that area should be respecified to a specific age bracket. (2) A major concern is that Cebula's analysis focuses on the growth in educational spending, whereas the author believes a more important area of interest is the growth of the level of educational spending. (3) More attention should be given to the level of education.

Ostrosky concludes by saying that by incorporating his "structural changes" in Cebula's model, he finds further empirical evidence for Cebula's hypothesis that migration and schooling expenses affect each other.

Parker, William N. "Education Patterns in Southern Migration: Comment," *Southern Economic Journal*, 1965, v32(1), Part 2, pp. 125-127.

This article is Parker's critical review of Fein's 1965 article, "Educational Patterns in Southern Migration," *Southern Economic Journal*, which is reviewed elsewhere in this bibliography. One comment questions the use of 1955 state of residence rather than state of birth or of education. Parker believes this raises questions about the ultimate origin of the migrants in both directions. He also questions using males only. This specification raises the question of ultimate balance when children and females are added into the amounts of migration.

Parker has taken Fein's data and broken it down into the absolute figures for in- and out-migration by educational level and restructured the information into two new tables. Each table is described briefly below.

Table I emphasizes the difference in the characteristics of the flows among different regions in the South.

Table II indicates essential similarities among regions of the in- and out-migration flows for the South as a whole.

Pauly, Mark. "Optimality, 'Public' Goods and Local Governments: A General Theoretical Analysis," *Journal of Political Economy*, May/June 1970, v78, pp. 572-585.

This research is an exposition of the theoretical relationship between the level of funding of schooling and migration when schooling has a public goods aspect. The article builds on some differences left in the literature by an exchange between Alan Williams (1967), and W.C. Brainard and F.T. Dolbear (1967). Although Holtmann is referenced, his case is not analyzed.

Four hypothetical school funding scenarios are investigated. Case 1: Public schooling is provided, but no part of it is a "public" good in the Samuelson sense (i.e., benefits of schooling are received only by the schooled individual) and taxes are distributed according to benefits. Case 2: Schooling is purely a public good both within and between communities. Case 3: Schooling is a pure public good within a community but purely private between communities, and migration occurs. Case 4: Schooling contains some private benefits but is purely private between communities.

Each of the four cases assumes that taxes levied are equal to the marginal benefits to recipients. The author hopes that even with departures from "perfect" taxes, his cases reveal general trends i.e., that income transfers do not affect the outcomes systematically. If public good benefits are present in local schooling, "the amount of education provided should vary inversely with the fraction of the spillover. But there should be observed some movement toward agreement between communities, either directly or through a federal system, which will make all concerned communities better off... . If, however external benefits are small, ...migration will generate little pressure for adjustment." (p. 585)

The primary contribution of this piece is a clear, simple statement of the problem and its analogy to the behavior of two individuals confronted with the same problem. The author does not address the relative impact of spillovers and spillins as do some previous writers. He raises the empirical question of whether externalities are important and if there already is movement toward financing at higher levels or whether external benefits are so low as not to warrant concern about migration.

Peston, Maurice. "The Theory of Spillovers and Its Connection with Education," *Public Finance*, 1966, v21(1/2), pp. 184-199.

The author discusses modern thought about spillovers and their relationship to education. He lists some examples of externalities relating to education, noting the complexities that may arise if preferences are interdependent. The remainder of the paper is divided into six sections.

Within the first section, Peston distinguishes five units that have an interest in education and externalities: households, local education authority, state governments, central governments, and informal and voluntary groups.

Peston believes when reference is made to "spillovers," attention should be directed toward a geographical or locational dimension. He quotes Weisbrod on this matter: "... we shall distinguish between those benefits that accrue to persons inside the school district --internal benefits-- and those that accrue to persons outside the school district --external benefits. These latter benefits, geographically externalized, are termed `spillovers (p. 189-190)."

Within the third section, the author focuses on research aspects from other persons and/or committees. He highlights works by Weisbrod, Friedman, Baumol and the Crowther Committee.

The fourth section starts by proposing an example of spillover measurement. Four spillovers arising from migration are identified, and Peston comments on each to explain further or refute it.

He emphasized three items in which the migration of the educated do not give rise to spillovers that cause social costs. First, a community may be happy to lose some well educated

people to gain some less educated people; second, as far as the domestic distribution of income is concerned, could not an emigrant's parents argue in some cases they have met the private costs of his education out of their taxes; and third, emigration may be to the advantage of a community.

Romans, J. Thomas. "Benefits and Burdens of Migration (with Specific Reference to the Brain Drain)," *Southern Economic Journal*, 1974, v40(3), 447-455.

A full review of this article is found in the section on the brain drain. The reference is cited here because of the relevance of the discussion to migration within a country and its relationship to schooling expenditures.

Shaw, Kathryn L. "The Influence of Human Capital Investment on Migration and Industry Change," *Journal of Regional Science*, 1991, v31(4), pp. 397-416.

The author used PSID data for 2,534 individuals for 1975 to 1980 on industry and region of employment to estimate the impact of job- and industry-specific capital on labor mobility. Data for 1967 to 1980 were used for personal history and work experience variables. She describes her work as an attempt to examine the impact of demand shocks on industry and location of employment as related to the human capital of the migration decision. She used multinomial logit models for four choices (industry change, regional change, industry and regional change and no change) to estimate the impact of personal and household characteristics in addition to employment data. She concludes the early literature on demand shocks produced wrong signs and non-significant coefficients because it failed to take account of the personal characteristics of potential migrants. She also contends that not accounting for demand changes could lead to misspecification of the effects of worker and household characteristics.

Her findings do not appear to differ from those of earlier studies, and she doesn't compare her results to those of earlier studies cited in the article. In general, investments in industry, occupation and region (as measured by time alone) by individual workers reduced the rate of mobility. Shifts in demand for specific classes of labor apparently gave rise to opportunities to invest in new labor contracts and led to discontinuities in income growth of individuals. Repeat migration of the individual occurred most among the well educated but declined with age of the worker. The rate of migration also declined with job attachment of the wife.

An analysis by Borsch-Supan that employed the PSID data is also reported in this bibliography.

Shertz, Lyle P. "Improvements in the Rural South: They Won't Come Easy," in *The Rural South in Crisis: Challenges for the Future*, Boulder, CO: Westview Press, 1988, pp. 365-375.

In this, the summary chapter in the volume, Shertz notes other authors' numerous calls for increased public provision of schooling. In discussing the impediments to greater funding, he notes immigrants create capital values that support educational opportunities in the communities to which they move, "even though they are traceable to the investments made in education in earlier years in faraway communities...And in some cases these poorly educated people have a

claim on federal expenditures for farm programs, food stamps, and unemployment compensation... Thus there are spillover effects. Inadequate education in communities means higher federal expenditures in coping with the effects." (p. 367)

The geographic distribution of both the benefits of education and the costs of inadequate education motivates Shertz to conclude there is a role for the federal government to play in education.

The chapter ends with an appeal to readers to understand fully the "silent revolution" that increased education could bring to a region.

Sjaastad, Larry A. "Costs and Returns of Human Migration," *Journal of Political Economy*, Oct. 1962, v70(5) part 2, pp. 80-93.

This article is reviewed more fully in the brain drain section, but it is cited here because of its relevance to internal migration and externalities of education. In referring to the impact of taxes, the author notes: "Divergences between private and social costs of migration can also occur when the actual charges for services collectively (such as schools) are based upon the per capita cost rather than the actual marginal cost of providing those services to migrants." (pp. 91-92). He goes on to note that losses arising from migration impinging on the values of capital assets of non-migrants are not admissible because they involve no resource cost.

Taylor, Lori L. "Student Emigration and the Willingness to Pay for Public Schools: A Test of the Publicness of Public High Schools in the U.S.," *Public Finance*, 1992, v47(1), pp. 131-152.

The author constructs a four-equation model in which the level of school expenditures, emigration (MOVEOUT), immigration (MOVEIN), and academic achievement are exogenous variables. Longitudinal data from 1980 to 1986 for individuals from more than 1000 U.S. high schools are used in the analysis. Missing data and related problems force her to construct a measure of academic achievement for the students of each school. Also, immigration data had to be taken from state data rather than from the school districts. State and federal aid variables were from state means rather than from school districts. To escape the effect of external aid on local funding, sample schools were confined to states that use a foundation level of support in which external funding can affect local funding but not vice versa. This left the sample at 153 school districts.

In the completed analysis, the emigration variable has a positive sign and is statistically significant, in contrast to that of Weisbrod and Clotfelter, whose immigration variable has a negative sign. Taylor's result is consistent with the hypothesis that communities see the labor market as an alternative to local production of human capital and with the idea that an externality arises from adults attracted by school expenditures, not from the youth who are schooled. Also, rural school districts do not support schooling per pupil at significantly lower levels than urban areas.

Tweeten, Luther. "Education Has Role in Rural Development," pp. 9-12 in *Rural Development Perspectives*, EDP-3, October, 1980. USDA, ERS. Washington, DC: USGPO.

In reviewing the relationship between residence and schooling, Tweeten concludes rural and urban students of similar backgrounds differ very little in the number of years of schooling completed. Although schooling in rural areas is not necessarily inferior, there may be opportunities to make productive investments in the system. In reviewing the relationship between educational funding and migration of recently schooled individuals, he states, "Migrants from rural areas are often attracted to high-income areas, resulting in geographic displacement of the wealth represented in their educational investment... The impact of such displacements on the willingness of local people to support schools is a real concern." (p. 12)

The author reviews prospects for changes in school funding and concludes "an obvious answer is full state and federal funding of schools, drawing specially from income taxes." (p. 13)

His primary concern is equity among students and among taxpayers. He cites a 54-page paper he authored on the subject "Rural Education and Rural Development" on which this synopsis is based.

Weisbrod, Burton. External Benefits of Education: An Economic Analysis, Princeton: Princeton University Press, Princeton, 1964. xi, 143p.

This article focuses primarily on the impact of migration on the location and distribution of "external benefits" of public education at the primary and secondary levels.

The author produces a measure of the capital account losses of the funding district based on measures of out- and in-migration. In selecting a high-income area, he is closer to the spirit of the international brain drain literature than to that of domestic immigration from poor rural areas to richer urban areas.

His discussion of the benefits of education includes market benefits, benefits to educated individuals, neighborhood benefits and benefits that can be attributed to any complementary good. The author notes most external effects of education are felt only in the area in which the student resides. In discussing "spillovers" he distinguishes between "real" (technological) effects and "pecuniary" (transfer) effects.

He next takes up the case study of Clayton, Missouri, because Clayton is estimated to lose 87% of the educational capital it "creates." He compiles measures of the geographic dispersion of migrants and the expected income of both those leaving and those coming to Clayton. These variables are used to estimate the dispersion of returns, in the form of taxes, to non-Clayton places and taxes collected by Clayton on persons educated elsewhere. At the end he presents the caveat that earnings differences between persons in different educational classes may mask I.Q., ambition and other personal skills present in larger amounts of educated persons, perhaps leading to an overstatement of the social costs of loss through net migration.

The author regressed mean state expenditure per child in 1960 on characteristics of the state "school districts" as well as the net emigration rate of residents of all ages for the states in the previous decade. The resulting coefficients support the hypothesis that school districts will reduce support for schools if emigration rates are high. His results also tend to reject the idea that

education of one person might lead to the employment of additional persons because increased schooling will make the district more attractive to plants being relocated.

Williams, Alan. "Optimal Provision of Public Goods in a System of Local Government," *Journal of Political Economy*, 1966, v74(1), pp. 18-33.

See the section on supply and demand of public schooling for a review of this article.

Williams, Alan. "The Possibility of Oversupply of Public Goods: A Rejoinder," *Journal of Political Economy*, 1967, v75(1), pp. 91-92.

See the section on supply and demand of public schooling for a review of this article.

Wright, Gavin. New South, Old South: Revolutions in the Southern Economy Since the Civil War. New York: Basic Books, 1986, 321 pp.

Wright presents an implicit public choice model of the supply of education (p. 79): "...investment in education was a two-edged sword. Providing some elementary education facilities could be useful in recruiting workers with families to the mill village or the steel mills of Birmingham, and a literate worker was potentially more productive. But a high school diploma was as good as a ticket to leave the mill village." Similarly, rural landowners saw little benefit in providing education to their tenants, for it only had the effect of "making them discontented with farm work and not improving their morals...The inability of rural planters to capture returns to investments in education can, in many respects, be aggregated to the region as a whole. In the absence of established channels of labor market mobility for unskilled workers, education greatly increased the probability a young person would leave both his home county and ultimately his home region."

Page 80: "...as a low-wage region in a high-wage country, the South had no expectation it could capture the return on investment in its own people." This statement agrees closely with the community investment maximization process expounded by Weisbrod.

Wright claims the restraint on investment was applied to both white and black but, of course, more to blacks who were by virtue of de jure segregation more restricted than poor whites in seeking new opportunities for work in their native region. Regarding black education, Wright states (pp. 176-177), "The belief that the South as a region would not capture the returns on investments in education, especially for blacks, was one reason industrial employers so often joined planters in opposing increases in spending on schools. There is a further quote here that disenfranchisement reduced the level of education, potentially further affecting the mobility of wage laborers of both races, but particularly that of blacks.

In discussing the change in the relationship between schooling and migration by the 1940s, the author notes: "Concern for the loss of labor led Southerners to upgrade the level of spending on black schools." (p. 245)

Wyckoff, James H. "The Nonexcludable Publicness of Primary and Secondary Public Education," *Journal of Public Economics*, 1984, v24, pp. 331-351.

The author's objective was to measure the total demand for public schooling by estimating both the private and social demand for local schooling. A full review is found in the section on supply and demand for schooling.

SECTION IV

THE BRAIN DRAIN: INTERNATIONAL MIGRATION OF THE WELL EDUCATED

Although international migration of well educated individuals has been observed from time immemorial, the movement of engineers and scientists to the United States after World War II attracted widespread public attention. As the name "Brain Drain" indicates, observers were concerned labor flows might reduce the viability of development abroad. Economists' interest in the topic appears to have lagged public interest rather than led it. But over time the subject of the Brain Drain generated a sizeable economics literature that reached its peak in the late 1960s.

Before 1980 most academic economists in the United States had moved on to other topics. Currently an article on the Brain Drain occurs only every two or three years. The decline in scholarly interest may have occurred because of the alleged decline in labor flows during the 1970s and 1980s. If indeed there were a decline in immigration, it may have resulted from a decline in the relative after-tax wages of scientists in the United States. This could have occurred because of a rise in wages abroad--which itself could have been a response to manpower outflows. Or it may have reflected a decline in the demand for skilled manpower in the United States arising from de-emphasis of scientific and engineering research and development.

An alternative hypothesis for the decline in new studies on the Brain Drain is that economists had developed a clearer understanding of the economic consequences of international labor flows. In this view of the literature, the claims that migration damaged the welfare of lesser-developed countries were generally debunked and the efficiency gains of mobility were seen to be potentially important. At the very least, a consensus seems to have developed that future international manpower flows are not going to be a threat to economic development abroad, and restrictions on immigration or special taxes on emigrants would not be productive.

Still another hypothesis is that professional education came to be regarded as subject to the forces of comparative advantage. For example, there is a continuing flow into the United States of physicians trained abroad, which does not appear to be of much popular or scholarly concern. It would be interesting to see if the extent of subsidy in advanced schooling and professional training abroad declined in the face of high mobility of trained persons in the 1950s and 1960s.

More recently, international flows of relatively low-skilled labor have become prominent. Some social problems have developed in Europe from the relatively large flows of "guest workers," and some restrictions on migration are apparently being developed. Something of the same sort of reaction may be occurring in the United States with regard to large flows of Latin Americans into Florida and California. This topic has not yet emerged in the literature to a significant degree. At the same time, an occasional article on the international flow of doctors and other skilled individuals continues.

The Brain Drain is of interest to us because it has many intellectual parallels to the migration of post-schooling individuals within the United States, often from rural to urban areas.

Also, the Brain Drain is an interesting case study of the gradual development and clarification of welfare economics as it relates to labor force mobility. The concept of social externalities was gradually refined and used in a more technical and precise manner as the Brain Drain debate continued. Initially "externalities" were taken by some authors to mean impact of any kind arising from migration. These broadly defined externalities might include a reduction in aggregate economic activity, changes in relative wages, loss of future intellectual and political leadership, reduction in the tax base, etc. all in the home country. Only with the advances in the economic literature did externalities come to mean the creation of a second, unpriced product that affects Pareto optimality through the departure from competitive market equilibrium.

One of the mysteries is that the Brain Drain literature was developed with virtually no reference to domestic concern with the impact of emigration on school finance and factor efficiency. Students of domestic emigration ignored the Brain Drain literature, at least to the same degree. This is a curiosity when one considers the two lines of thought were contemporaneous, especially after 1964. The Brain Drain literature was concerned with people who received subsidized education at higher levels, while the domestic migration literature focused on the question of too little subsidy for persons at the lower end of the educational continuum.

Listing Of Citations

Adams, Walter. Chapter 1, "Introduction," in The Brain Drain, Walter Adams, ed. New York: Macmillan, 1968.

The author presents an overview for the set of papers presented at a 1967 conference held in Switzerland. For these authors the brain drain represents the selective international migration of scientists, engineers and professional workers from lesser developed nations to more developed ones.

Most of the papers accept the problem as given and do not employ a formal welfare model to evaluate the magnitude of the losses, the primary exceptions being Johnson and Myint. In general little distinction is made between (1) a technical externality in which one non-priced product is produced simultaneously with one that is priced, and (2) the impact of migration on wages of cooperating factors or on the scale of the entire economy.

Additionally, some hold that social externalities occur if cultural or political leadership is lost through emigration. Some of the writers imply human capital is the property of the society or economy in which it is formed and financed.

Adams presents a clear definition: "The term itself (brain drain) is loaded, pejorative, suggestive of loss of a vital resource, without compensation. This interpretation is supported by illustrations that seem to show human capital, as a strategic resource, is flowing out of economies where it can make the greatest contribution to human welfare, and into economies already well-supplied with trained, capable, scientific and administrative personnel." (p. 1).

The author produces statistics on the direction of flow of medical aid and general aid between countries of population flows. He contrasts the "international" or "cosmopolitan" position (voluntary trade that benefits both parties) with the "nationalist" model, which stresses the importance of specialized ("indispensable") skills in lesser-developed nations. This leads him to mention "external" effects and to suggest reduction in migration may be an analogue to protection of an infant industry.

Adams, Walter and Joel B. Dirlam. Chapter 16, "An Agenda for Action," in The Brain Drain, Walter Adams, ed. New York: Macmillan, 1968.

The main theme of this chapter is that the flows of human capital indicate there is a maladjustment in the process of development that might be eliminated or at least reduced through population flows. The authors reject the imposition of an embargo on migration and list a series of measures to be taken to reduce flows: raise salaries at home, revise the salary structure, increase professional opportunity, increase the receptivity to change, restructure investment in education and rationalize manpower policies, promote economic integration and resist political balkanization, eliminate discrimination and bigotry, remove monopolistic restrictions in "pull" countries.

Beijer, G. "Brain Drain as a Burden, a Stimulus and a Challenge to European Integration," pp. 3-42 in Population Growth and the Brain Drain, F. Bechhofer, ed. Edinburgh, Scotland: University Press, 1967.

The author reviews the state of the brain drain debate, cataloguing the concerns of observers. He provides a useful set of references and notes the publication of 426 works on this topic in the previous decade. Unlike many of the commentators he cites, he believes migration is a natural, continuing phenomena that does not necessarily bode ill. Concern about the brain drain has been around at least since the time of Tycho Brahe, who commented on it in 1570. In particular he rejects a proposal by Brinley Thomas that the cost of advanced degrees be paid by the country of destination of migrants. An antagonistic point of view by A. Sauvy is reviewed later in this work.

Berry, R. Albert and Ronald Soligo. "Some Welfare Aspects Of International Migration," *Journal of Political Economy*, 1969, v77(5), pp. 778-794.

The authors demonstrate theoretically and graphically the impact emigration of persons with endowments of both human and non-human capital might have on the per capita income of non-migrants. Emigrants not having average relative endowments of these two kinds of capital will affect the incomes of those who do not emigrate. Losses occur when emigrants have a relatively large proportion of capital and do not leave some or all of their non-human assets behind. The possibility of increasing returns for the economy and external effects of emigration are not part of the analysis, but their impact on the outcomes could be deduced.

The analysis is undertaken to provide a frame of analysis when population movements are substantial. No reason is given for focusing on the incomes of the non-migrant population. No analysis is made of global welfare that may be affected by migration. One of the areas to which they suggest their work can be applied is rural-urban migration, particularly in developing nations.

Berry, R. Albert and Ronald Soligo. "Comment on 'Emigration: A Bearer of Welfare Loss'," *Journal of Political Economy*, 1972, v80(3), Part I, pp. 604-607.

The authors respond to Wellington's (1972) criticism of their model (1969) by reasserting the conclusion that the distribution of income, in contrast to the relative wages of labor and capital, can be adversely affected by the emigration of persons with relatively large amounts of non-human capital.

Bhagwati, J.N. The Brain Drain and Taxation: Theory and Empirical Analysis, New York: North-Holland, 1976.

Bhagwati discusses taxation of population flows among nations. The primary focus is on who pays the tax and the type of tax. Two groups of taxpayers are identified: (1) the immigrants themselves and (2) the developed country of immigration. Taxes on immigrants and on developed countries are discussed. The alternatives included (1) a tax assessed on the income of migrants payable to the country of origin, (2) general revenue collected by the country of destination paid

to the country of origin and (3) international transfers consigned to compensate the country of origin for losses.

The primary focus of the article is on the theory of assessing the impact of the brain drain on countries of origin and the development of compensatory taxes. Bhagwati presents many of the same topics in his book Taxing the Brain Drain: a Proposal, North-Holland, New York, 1976, which is not reviewed in this bibliography.

Bhagwati, J. and C. Rodriguez. "Welfare-Theoretical Analyses Of The Brain Drain," *Journal of Development Economics*, 1975, v2(3), pp. 195-222.

This article was derived from a 1971 paper by Bhagwati and Hamada. In the 1971 article he and Hamada focused on educational subsidies and sticky wages, two departures from general economic equilibrium. A good deal of what they present in the present article is a review of their growth model under different assumptions.

Their basic model has one product and one factor. Non-migrants lose consumer surplus from a finite change in labor. In concluding they write "...the weight of the arguments above is that, except for the no-impact outcome for infinitesimal emigration, the different models seem to lead to a prima-facie presumption of a loss to those left behind, even under conditions of perfect competition." (p. 207)

The authors support national policies that limit migration as a means of forcing internal redistribution of manpower-- medical doctors in this case. Also, by introducing the dynamics of capital formation in a national setting, they distinguish between world-welfare and domestic-welfare.

Results from the model lead Bhagwati and Rodriguez to reject Grubel and Scott's (1971) conclusion that infinitesimal migration doesn't damage LDCs. They also reject Adam's (1968) conclusion that emigration could lead to greater efficiency through the reduction of unemployment. They note emigration might lead to an increase in educational subsidy. In closing they list further ideas for welfare studies.

Other works by Rodriguez include the following:

"Brain Drain and Economic Growth: a Dynamic Model," *Journal of Development Economics*, 1975, v2(3) pp. 223-248.

Blaug, Mark. Economics of Education 1, Baltimore: Penguin Books Inc, 1968.

This book is a collection of important articles in the areas of education and human capital. Blaug's comments about the articles included in this volume point out unanswered questions and/or unclear thoughts. He also notes his support for or criticism of the authors' conclusions.

Authors included are T.W. Schultz on the topic of "investment in human capital," and H.G. Johnson on the issue regarding a "generalized capital accumulation approach to economic development." Both of these items are reviewed in this bibliography.

Blomquist, Ake G. "Unemployment of the Educated and the Emigration of Post-Secondary Graduates from the LDCs," *Pakistan Development Review*, 1985, v24(3-4), pp. 643-654.

The author presents a good overview of the issues and reviews a portion of the literature on the brain drain that appeared about a decade after the most intense exchanges among economists. He is highly critical of the failure of most brain drain critics to account for the positive benefits received by migrants.

The author's primary attention is directed to the differences between Grubel and Scott, on one hand, and Bhagwati and Hamada, on the other, their assumptions and their policy recommendations.

Implications in the article involve the subsidization of education, rigid wages, an emigration tax, an explicit tax on emigrants, a tax on the receiving country and an addition to tax collections.

In conclusion, the author urges efforts to reduce wage rigidity, taxation of emigrants and reduction of the subsidization of schooling. These are held to be preferable to policies that arbitrarily reduce migration. He notes voluntary remittances may play a role similar to that of proposed brain drain taxes.

Blomquist, Ake G. "International Migration of Educated Manpower and Social Rates of Return to Education in LDCs," *International Economic Review*, 1986, v27(1), pp. 165-174.

The author presents a dynamic mathematical model of national economic growth under various rates of migration. Equilibria are constructed for different labor market impediments (unemployment) and capital market imperfections (different rates of return, some with and some without externalities). The focus is on the impact of emigration on the income of non-migrants.

Implicitly, human capital is treated within the model as if it were publicly owned. The income of migrants isn't considered part of national economic product in either the country of origin or destination, but there is a reference to the receipt of remittances by non-migrants in the country of origin.

Boulding, Kenneth. Chapter 7, "The `National' Importance of Human Capital," in *The Brain Drain*, Walter Adams, ed. New York: Macmillan, 1968.

Building on the international trade model and the flows of physical capital, Boulding suggests human capital could incur a debt to finance schooling and then pay it back to the financing government over the education's economically useful life. But having proposed it, he immediately gives the idea up as impractical. He then goes on to say loan funding of schooling could lead to underinvestment in education, and untaxed migration might lead to externality—producing high rates of population growth (reproduction) in areas losing population.

On balance he is uncertain whether the brain drain is serious. Emigrants do send remittances, and many return to retire in their country of origin. His model is based on the individual rather than the household in which the individual resides.

Dedijer, Stevan. Chapter 2, "Early Migration," in *The Brain Drain*, Walter Adams, ed. New York: Macmillan, 1968.

The author presents fascinating examples from the Ptolemies' importation of Greek culture into Egypt and the contest among cities in the Middle Ages over the location of the first universities. There is an implication that migration of talent is as old as civilization and it has affected the course of development throughout the world. No formal treatment of questions of global or local maximization or similar issues are presented.

Education and World Affairs. Modernization and the Migration of Talent, 1970, Education and World Affairs, New York, pp. 88.

The authors note in the foreword "the problem (the brain drain) continued to emerge from the interplay between fundamental individual rights and national requirements--especially the need of developing countries to retain the services of their own most highly trained people." (p. 6) The authors are guided by the belief that the fundamental conditions of life in the less developed countries underlie their inability to absorb their highly trained people. The primary loss to them is these inability to use people productively whom they have trained at great expense. The question then becomes one of whether those who are not used remain in the country or migrate.

The authors note that in the United States GNP and educated manpower increased 3% and 7% annually between 1900 and 1970. Abroad, however, education was not associated with substantial economic growth.

Characteristics of the countries losing population are reviewed. Ways to reduce migration might include more appropriate education, more development (demand) and adequate social conditions for educated people. They also have a set of policies for developed countries to reduce population flows: increase output of highly trained people at home (less "pull") help lesser-developed countries develop consult with LDCs about migration policy if LDCs think they are being damaged and don't restrict student flow. They conclude with several international agency recommendations they believe would improve education abroad, but they warn against strict controls on migration.

Foster, Phillips. "The Contribution of Education to Development: Effect on the Rural Economy," pp. 97-98 in George Psacharopoulos' Economics of Education Research and Studies, Washington, DC: The World Bank, 1987.

Regarding the problem of rural to urban migration, Foster states "a conventional educational solution to the rural problem has been to suggest curricular reform: the replacement of an ostensibly academic and bookish education by rurally biased curricula that would engender a commitment to life on the land, lower out-migration rates and impart a degree of agricultural knowledge that would facilitate rural economic development." (p. 87) The author notes his reservations about the productivity of the conventional solution.

Foster focuses on the importance of widespread regional economic development if rural-urban migration is to be reduced. In instances in which job opportunities are not developed, emigration is a positive good: "Migration and urbanization thus make a positive contribution to the overall development process, and attempts to artificially restrict their incidence are both counterproductive and ineffective." (p. 98)

Grubel, H. G. "Reflections on the Present State of the Brain Drain and a Suggested Remedy," *Minerva*, 1976, v14(2), pp. 209-224.

This article is reproduced as most of the introductory chapter of his 1977 book, which is reviewed in this section below. The focus of this article is the Bellagio conference on the brain drain.

Grubel, H. G. "The Economics of the Brain Drain," in *Economics of Education Research and Studies*, George Psacharopoulos, ed. Washington, DC: The World Bank, 1987, pp. 201-206.

This is a thorough review of the main themes of the brain drain controversy. Topics include the definition and historical background of the brain drain, long-run output effects, and welfare effects with emphasis on (1) the nationalist model (2) the internationalist model and (3) the role of education financing.

The definition and historical background section breaks down the notion of "brain drain" into its economic components: migration and human capital. "In the terminology of these fields, it involves the crossing of international borders by human capital embodied in and owned by migrants and not recorded in conventional international balance of payments statistics. By this definition, the crossing of borders by highly skilled people on contract to provide human capital services on a project in a country other than their home country does not involve a brain drain. On the other hand, when individuals study abroad and return to their home countries, unrecorded human capital crosses borders and involves a form of brain drain." (p. 201)

Grubel makes an interesting point regarding migration and the production function in the long-run. He states that "under relatively simple and unusual assumptions, total output per worker in the country may be raised, lowered or remain unchanged. It (output) will be lowered if the amount of human capital taken along by the average emigrant is greater than the original overall capital per worker simply because, under these conditions, the post-emigration stock of capital per worker in the country is lowered." (p. 203)

The welfare effects section under the "nationalist" model investigates the purposes of education, while the "internationalist" model focuses on the "marginal productivity theory" in which there are "no externalities from work, so that a skilled person provides no benefits to society other than those for which payment is received." (p. 204)

Two views are developed in the section on educational financing: (1) the investment view of children and education, in which investment yields returns to the parents and (2) the consumption view, in which emigrants owe repayment through taxes to finance pensions and welfare expenditures in the nation of origin.

Grubel H. G. and Anthony Scott. *The Brain Drain: Determinants, Measurement and Welfare Effects*, Waterloo, Canada: Wilfrid Laurier University Press, 1977.

The authors provide a thorough overview of the Brain Drain literature. In the introduction they note the rise and fall of the interest of economists and governments in the issue and correlate it with a sharp decline in migration of engineers and scientists into the United States

at the time expenditures in the space program and defense were reduced in real terms, growth in undergraduate enrollment had declined and the image of the United States was suffering because of urban riots and the Vietnam war.

Following the introduction, the chapters primarily concerned with theory are (2) the determinants of migration; (3) the theory of migration and human capital; and (4) the welfare approach to migration and human capital. Part II consists of seven empirical studies of international migration of engineers and scientists. The book closes with a comprehensive overview of the proposed solutions to departures from efficiency that migration might entail. A selected bibliography covers 1954-1974.

Grubel, H. G. and A. D. Scott. "The International Flow of Human Capital," *American Economic Review, Papers and Proceedings*, May 1966, v61, pp. 268-274. Reprinted in B. F. Kiker, Investment in Human Capital, Columbia: University of South Carolina Press, 1971.

The concepts that have given rise to an interest in international migration of well educated individuals are reviewed in this short paper. The relevant question for the authors is the impact migration may have on the cost of public services for those who remain.

The authors believe the migration of a laborer with above-average skills could result in lowering the per-capita income of workers remaining in the home country, but this "is only a statistical phenomenon that has no influence on the welfare of remaining people..." (p. 480, Kiker).

It is alleged it is difficult if not impossible, to find examples of real externalities, less difficult to find examples of altruism of individuals voluntarily offering services without pay, etc. The second alleged loss, the failure to repay their educational "debt to society," is rejected on grounds that education is an intergenerational compact renewed with each generation and not a personal debt in a concrete sense.

The authors reject the idea emigration may have an adverse genetic impact on the remaining population and culture. In closing the authors state emigres are likely to send remittances to their kin and also enrich them as they contribute to the generation of new discoveries in their adopted homes, assuming these goods have a public goods aspect.

Hamada, K. and J. Bhagwati. "Domestic Distortions, Imperfect Information and the Brain Drain," *Journal of Development Economics*, 1975, v2(3), pp. 265-280.

This is an extension of an earlier paper by Hamada and Bhagwati (1974) in which they presented a theoretical analysis of the brain drain in the presence of wage rigidities and unemployment through the elaboration of a model of a national production function. The current paper modifies the previous work by including over-qualification of workers, reallocation of labor between metropolitan and non-metropolitan areas and imperfect information about labor quality.

The paper "should be taken as an attempt to underline the importance of setting out the nature of institutional rigidities or imperfect information in the labor prior to analyzing the welfare effects of such emigration." (p. 277)

Also, see another closely related article by Hamada and Bhagwati, which is not reviewed here: "The Brain Drain, International Integration of Markets for Professionals and Unemployment: A Theoretical Analysis," *Journal of Development Economics*, 1974, v1(1), pp. 19-42.

An additional article by Hamada on a related topic not reviewed here is "Efficiency, Equality, Income Taxation and the Brain Drain: a Second-Best Argument," *Journal of Development Economics*, 1975, v2(3), pp. 281-288.

Harberger, Arnold C. and David Wall. "Harry G. Johnson as a Development Economist," *Journal of Political Economy*, 1964, v72, pp. 616-641.

In reviewing Professor Johnson's interest in resource adjustment and migration, the authors cite two manuscripts published in 1968 and 1972 that focus on the question of international labor movements.

Dr. Johnson (1968) wrote forcefully in favor of opening up migration in his article "Toward a Generalized Capital Accumulation Approach to Economic Development." This article is reviewed elsewhere in this compilation. Johnson concludes that exit taxation of migrants should be confined to repayment of social capital invested in them. Harberger and Wall cite a further elaboration and quote Johnson (pages 381-2, "Labour Mobility and the Brain Drain," in The Gap Between Rich and Poor Nations, a report of a Bellagio conference edited by Gustav Ranis, 1972.): "...compulsion should be confined to the subgroup of students...whose education is paid for by their own or an advanced-country government as a social investment in the promotion of economic development."

Iffland, Charles, and Henri Rieben. Chapter 4, "Multilateral Aspects: The U.S., Europe and the 'Poorer' Nations," in The Brain Drain, Walter Adams, ed. New York: Macmillan, 1968.

The authors note the importance technological innovation has in the growth of national economies. The loss of leadership of Europe to the United States and the former USSR may seriously affect income growth in Europe. They reject two proposed explanations of a European brain drain: the United States raids Europe; and Europe is training too many scientists and engineers. They look forward to the economic unification of Europe, which they believe will lead to market enlargement through development of the EEC, which in turn will make it possible to retain trained manpower.

Johnson, H.G. "Towards a Generalized Capital Accumulation Approach to Economic Development," in Economics of Education 1, Marc Blaug, ed. Baltimore: Penguin Books Inc, 1968.

Johnson identifies the key relationship between school funding and the residence of the schooled individual as follows: "The fusion of human capital with the personality of its owner raises among other things the problem of how far expenditure on the creation of human capital should be accounted as investment, and how far it should be classed as consumption; while the vesting of control over the use of the capital in the individual, given the imperfection of markets

for personal credit, poses the problem of how far education should be provided at public expense." (pp. 40-41)

Johnson, Harry G. Chapter 5, "An 'Internationalist' Model," in The Brain Drain, Walter Adams, ed. New York: Macmillan, 1968.

Johnson notes migratory flows of skilled labor can be understood in the context of trade in inputs. In some cases a nation may have a comparative advantage in training. Schooling services could be an export industry for some nations.

The idea that migration is a budgetary "gift" of the country of emigration to the country of immigration has some status in the literature. "Thus it is important to the question of ascertaining whether or not there is a loss from emigration of educated people to the country of immigration to determine what the assumptions of its policy of public education are." (p. 84) He reviews four cases in which the losses in the country of emigration might be greater than the gains to the country of immigration. These cases are rejected as being unlikely to result in sizeable losses.

The author proposes loans rather than grants be used to fund education if the brain drain is regarded as a source of loss. He also suggests public policy to discourage immigration as a means of maintaining a given domestic wage structure is likely to be unsuccessful, given the increasing integration of the world economy.

Kahley, William J. "Migration: Changing Faces of the South," *Economic Review of the Federal Reserve Bank of Atlanta*, June 1982, v67(6), pp. 32-43.

Treating the South as a single unit, Kahley reports the educational level of in-migrants exceeded the educational level of emigrants for 1965-70. He produced his estimate by looking at the proportions of migrants in each of four levels of schooling i.e., those that did not complete high school, graduated from high school, attended some college, graduated from college. For 1975-80 the educational pattern of emigrants resembled that of immigrants. Perhaps immigrants have somewhat greater educational achievement, suggesting the South may have been a net gainer of human capital for some time.

Kindleberger, Charles P. Chapter 9, "Study Abroad and Emigration," in The Brain Drain, Walter Adams, ed. New York: Macmillan, 1968.

Conditions that affect a student's decision not to return home after study in the United States are reviewed. There is no formal treatment of welfare losses, but there is reference to rural-urban migration that might result from education: "In 19th-century France, rural opinion opposed secondary education for sons of peasants on the grounds it drove them out of agriculture. In the United States, going east to college has often been the prelude to settling in New York. A similar question is posed today whether expanded education for Negroes may not deprive Southern Negro communities of their potential leaders of ability and energy." (p. 135)

Kwok, Viem and Hayne Leland. "An Economic Model of the Brain Drain," *American Economic Review*, 1982, v72(1), pp. 91-100.

The authors' main hypothesis is that United States employers are more able to perceive the productivity of a worker trained in the U.S. than are employers located abroad. This means domestic firms can afford to offer students incentives to remain in the U.S.

Surveying a large number of students raised in Taiwan who obtained advanced degrees in the U.S., they conclude that: (1) the brain drain arises at least partially because of the asymmetry of information about the productivity of graduates and (2) those who return to the country of origin were of lower quality, and wages in the native country were lower than the wages abroad for similar professions.

Krieg, Randall G. "Human Capital Selectivity in Interstate Migration," *Growth and Change*, 1991, v22(1), pp. 68-76.

The four alternative measures of human capital migration Krieg develops are as applicable to international as to interstate migration. A review of the article is found in the section on externalities.

Lien, Da-Hsiang Donald. "Appropriate Scientific Research and the Brain Drain," *Journal of Development Economics*, 1988, v29, pp. 77-87.

The author uses the analogy of trade in goods among countries based on factor intensity to describe choices in Ph.D. training. The choices are between advanced country problems and data on the one hand and developing country problems and data. The author uses a mathematically modeled theoretical approach to reach the conclusion that if developing countries reward advanced country Ph.D. products to get students to come home, they will stimulate wasteful social research and perhaps tempt even more students to go abroad, first for study and then for work.

Lien, Da-Hsiang Donald. "Economic Analysis of the Brain Drain," *Journal of Development Economics*, 1987, v25, pp. 33-43.

"In this paper we consider the brain drain problem arising from the possibility of signaling and individual's two-stage decision procedures within an asymmetric information framework. Where the ranking of the universities provides a signal to domestic employers, our results indicate that, at rational expectations equilibrium, there is an association between students of a particular quality and corresponding qualities of universities they will choose to attempt to attain Ph.D.'s. Moreover, we can predict whether those graduating Ph.D.'s choose to return home or remain abroad." (p. 33) This work contains an extension of the Kwok and Leland analysis. It is entirely mathematical modeling, no data and no tests.

Lucas, Robert E.B. "The Supply-of-Immigrants Function and Taxation of Immigrants' Incomes: An Economic Analysis," *Journal of Development Economics*, 1975, v2, pp. 289-308.

The author's work is an economic analysis of the responsiveness of migrants to taxation of the kind proposed by Bhagwati. Bhagwati (1975, 1976) proposed imposition of a tax on incomes of professional, technical and kindred worker immigrants from less-developed countries. Lucas presents an econometric analysis of the impact of a tax, simulates the sensitivity of tax revenues to alternative tax rates and then compares these results to those of Bhagwati's.

The conclusion focuses on problems and limitations of earlier analysis due primarily to lack of data (micro and macro) and methodological and/or theoretical generalizations derived from other research.

McCulloch, R. and J. L. Yellen. "Consequences of a Tax on the Brain Drain for Unemployment and Income Inequality in Less Developed Countries," *Journal of Development Economics*, 1975, v2(3), pp. 249-264.

In an earlier work ("Factor Mobility and the Steady State Distribution of Income." Discussion Paper 369, Harvard Institute of Economic Research, Cambridge, Ma. 1974, not reviewed here) the authors showed a "tax on migrants lowers the domestic skilled wage by the amount of the tax, reduces the fraction of the population acquiring education, decreases the percentage migrating, and increases the wages of unskilled workers." (p. 250) The tax leads to an improvement for all classes (on the average) because the cost of education is then distributed equally even though social costs vary with the basic aptitudes of those who are candidates for schooling.

In this paper they allow for unemployment of labor in the modern sector of a developing economy. In this case, the tax on migrants increases the incomes of those who do not migrate because (1) less is spent on education and (2) tax collections are distributed among domestic residents. Total wages earned may decline, and the wage differential between skilled and unskilled actually may increase, leading to an increase in income inequality.

McCulloch, R. and J.L. Yellen. "Factor Mobility, Regional Development and the Distribution of Income," *Journal of Political Economy*, 1977, v85, pp. 79-96.

The authors focus on the process of adjustment in an economy from which skilled labor emigrates. They use a set of difference equations to analyze several policies. The basic model consists of three factors, each with its own level of mobility: capital (perfect mobility), skilled labor (high mobility) and unskilled labor (zero mobility). The quantity of capital and all labor is given, but the proportion of labor that is skilled can be altered through training. Aptitudes for training are assumed to vary among workers: those with the highest levels of aptitude can be upgraded from unskilled to skilled labor for the least amount of time and cost. The wage differential of the two classes of labor is equal to the cost of the marginal unit of education. As more people are schooled, the cost of schooling rises and with it the wage differential. This shift in relative wages brings rents to those with the highest aptitudes who had the lowest costs of schooling.

The three policy measures that are examined and the predictions of the model are the following. (1) Increasing the inflow of capital lowers the rate of return on capital and raises wages of both classes of labor as long as they are complementary with capital. But the wage increase varies differentially depending of the degree of complementarity of the classes of labor. (2) Reducing the cost of education increases the number of persons educated and widens the relative wage level because of the increased cost of education. (3) Reducing the cost of emigration increases outflow and the total number of people educated, which in turn increases the wage differential between labor classes.

McMahon, W.W. "Externalities in Education," Economics of Education: Research and Studies, George Psacharopoulos, ed. Washington D.C.: The World Bank, 1987, pp. 136-137.

This chapter is primarily a review of research conducted by Weisbrod, Hirsch, et al., Flora and others reviewed in this bibliography.

Miyagiwa, Kaz. "Scale Economies in Education and the Brain Drain Problem," International Economic Review, 1991, v32(3), pp. 743-760.

The author builds a model of economic growth in which there are returns to scale for high-skilled workers that potentially raise wages in developed countries above those in lesser developed countries. He appeals to imperfections or distortions in the labor market to explain emigration of those with higher education. He finds that by skewing the earnings function in the developed country, the highest skilled workers would be the most apt to migrate from lesser-developed countries, even in the presence of a proportional tax on the earnings of emigrants.

Myers, Robert G. Education and Emigration: Study Abroad and the Migration of Human Resources. New York: David McKay Company, Inc., 1972.

The author discusses alternative policy measures for minimizing migration losses of highly trained individuals: (1) restricting migration, (2) making study abroad more relevant to home country needs and (3) reducing the wage differentials between areas of origin and destination that have acted as incentives to migrate.

Myers' primary conclusions follow.

(1) "Whether a nation is thought to gain or lose (from emigration) depends upon whether emphasis is placed on economic growth (usually maximization of GNP), on social welfare (usually inferred from what happens to per capita incomes of the relevant population), on income distribution (among either individuals within a nation or among nations, and measured either by a narrowing of the income range or by shift from one group to another), or on the loss of the flow of savings and taxes." (p. 175).

(2) "Whether a gain or a loss is associated with migration may depend on whether one accepts... (a) Equivalence of wages to productivity, (b) Effect of migration on other factors of production: "external economies or diseconomies," e.g. "missing leadership or creation of an imbalance between skilled and unskilled workers", (c) Savings rate of migrants might cause future

capital to be below the level it would otherwise reach, (d) How does one account for the fact that an emigree also takes with him his future children who will not have to be educated at local expense, (e) Do migrants draw on the public purse greater or less than the amount they return in taxes?, (f) Can contribution to national welfare come from emigres (transmittances, etc.)?, and (g) Long run versus short run position on the forgoing." (p. 176)

(3) "If a mechanism for compensating losses exists, and free migration is, on balance, beneficial, there is no rationale for restricting migration--to hinder the flow would, in fact, be detrimental." (p. 321)

Myint, Hla. Chapter 15, "The Underdeveloped Countries: A Less Alarmist View," The Brain Drain, Walter Adams, ed. New York: Macmillan, 1968.

Myint's review of the costs of emigration include financial losses of country of emigration measured either in unrepaid costs of schooling or loss of students' potential earnings social welfare of population losing services of emigrants and the impact on the rate of economic growth.

He focuses on the threat of migration to development and concludes it has not been demonstrated to be important. Loss of some services, such as medical doctors, may have an important impact on the welfare of the non-migrating population. He stops short of claiming the home country has property rights in the flow of services from the migrating individuals: that is, in noting a loss in welfare of consumers of medical services, he does not suggest migration be restricted or taxed.

Niland, John R. "A Human Capital Model for Brain Drain of Foreign Manpower Trained in the United States," *Journal of Economic Issues*, 1971, v5(3), pp. 60-71.

The author develops a procedure for estimating both the gross and net rates of immigration of foreign students who have studied in the United States through the study of visas of 450 students from five Asian nations. The proportion of students who remain in the United States beyond a short period of employment is from 10 to 50% less than the total who stayed beyond their period of study.

He develops a procedure to estimate the present value of the earnings, savings and remittances of students as seen from their home countries. This is implicitly a "nationalist" model in which only (1) the savings of people who have returned or will return to their home countries and (2) remittances count in the present value formulation. He concluded immediate return may not be in the best interest of the home country, but permanent absence from the home country would not likely increase the home country's national welfare because "massive externalities" are not expected.

Oteiza, Enrique. Chapter 8, "A Differential Push-Pull Approach." in The Brain Drain, Walter Adams, ed. New York: Macmillan, 1968.

He characterized the brain drain as a large movement of individuals with at least a university degree. Much of the concern with the brain drain has been raised by natural scientists; economists have not yet developed a full and careful statement of the problem.

Following the development of a rudimentary model of migration based on wage differentials, he notes human capital markets are poorly developed in many countries, with the result that earnings may not reflect social value. There is no formal statement of a welfare problem of human capital migration.

Patinkin, Don. Chapter 6, "A `Nationalist' Model," in The Brain Drain, Walter Adams, ed. New York: Macmillan, 1968.

He concludes concern with the "brain drain" is a good sign: developed countries are concerned about the development of less-developed countries. Within the notes added in response to the discussion following the presentation of the papers, he makes a plea for American funding of research abroad both to increase payoff per dollar of United States Treasury expenditure and to avoid some of the non-market externalities, such as the loss of leadership and weakening of democratic culture that might occur with migration of an elite from smaller countries.

Psacharopoulos, George. Economics of Education: Research and Studies, The World Bank, Washington D.C., 1987.

This is a compilation of economic observations and comments by various authors on the subject of education. The specific topics reviewed include (1) "The Contribution of Education to Development: Effect of the Rural Economy" (pp. 97-98) by P. Foster (2) "Externalities in Education: Spillovers in Education" (pp. 136-137) by W.W. McMahan and (3) "The Economics of the Brain Drain," (page 201) by H.G. Grubel. These articles are reviewed in this bibliography.

Other works by Psacharopoulos that were not reviewed here include the following:

Education for Development: An Analysis of Investment Choices, The World Bank, Washington, D.C., 1985.

"Estimating Some Key Parameters in the Brain Drain Taxation Model," *Journal of Development Economics*, 1975, v2(3), pp. 309-318.

"Measuring the Marginal Contribution of Education to Economic Growth," *Economic Development and Cultural Change*, 1972, v20(4), pp. 641-658.

Diversified Secondary Education and Development, The World Bank, Washington D.C., 1985.

Raymond, Richard D. The Myth of the Appalachian Brain Drain: A Case Study of West Virginia. Morgantown, WV: McClain Printing, 1972.

The author surveys graduates of West Virginia colleges and universities to determine the location of their employment following graduation. He describes migrants generally as being from depressed areas, being relatively young and well educated and without strong property ties and other attachments to the state.

He also reviews the private and social costs of education and migration. He concludes that when the wage is equal to social product, there is no loss from migration: i.e., the returns to the educated person represent the full product of schooling. He implicitly rejects the assumption human capital is owned by the school district in which schooling occurred or the home community loses if the earnings of the educated person (and any associated tax collections) are received elsewhere.

Raymond concludes migration of educated persons away from West Virginia results from slow adjustment of the state's economy, which traditionally has not provided employment to many educated individuals. If migration were prohibited, unemployment would result. Much of the out-migration has resulted from low levels of effective demand and thus does not lead to a labor shortage. This leads him to conclude the brain drain has not limited growth in the state. He also concludes if migration were prohibited, ceteris paribus, unemployment would rise, because the economic development of West Virginia was not sufficient to employ all of its graduates.

Romans, J. Thomas. "Benefits and Burdens of Migration (with Specific Reference to the Brain Drain)," *Southern Economic Journal*, 1974, v40(3), pp. 447-455.

The author's objective is to bring clarity to concepts used in the discussion of the brain drain and to extend some of the arguments. The classification is (1) pecuniary externalities (2) technological externalities, and (3) market distortions.

More than other writers he suggests emigration could reduce market distortions in the home country, sometimes to the detriment of government power. He notes out-migration can benefit workers who remain at home. By implication the incomes of some who don't migrate can increase. Emigration shifts income between people in different regions as well as among people within a region because of the changes in relative quantities of factors. Therefore, the productivity and wages of various factor classes may be affected.

He cites the possibility emigration may increase unemployment of individuals who stay at home--through some fixed coefficients production function by inference. He notes the possibility a country may restrict migration of its educated elite on the grounds research and development is an infant industry that will generate high returns after a period of initial protection. He concludes that in general, the brain drain literature has stressed the home district to the exclusion of the benefits accruing to migrants. Even with a broader, improved accounting, net losses could occur to the joint activity of education and migration.

He closes with a strong suggestion that the intergenerational transfer of skills is the important reason for public investment, particularly given the probability externalities are small. He expects global welfare to increase in response to resource reallocation implied in international migration.

Sauvy, A. "The Economic and Political Consequences of Selective Migrations from One Country to Another," pp. 43-56 in Population Growth and the Brain Drain, F. Bechhofer, ed. Edinburgh, Scotland, University Press, 1967.

The author is concerned emigration could permanently harm the intellectual and economic vigor of an area losing population. His particular example is Scotland's loss to England, but he is also concerned about economic domination by the United States. He proposes that social and political controls be developed to reduce population flows. The difference in outlook between this author and G. Beijer, also reviewed in this work, is noted by R. Illsley in a short comment. (p. 57-62)

Schultz, T.W. "Investment in Human Capital," in Economics of Education 1, Mark Blaug, ed. Baltimore: Penguin Books Inc., 1968.

Schultz notes economic growth may require a great deal of migration to offset changing job opportunities. Migration itself can be viewed as a form of human capital investment. Proportionately more young people can be expected to migrate because they have a long period over which increased earnings will accrue to the act of migrating.

Simon, Julian L. The Economic Consequences of Immigration. Cambridge: Basil Blackwell Ltd, 1989.

The fundamental question relating education and immigration the author identifies is the extent to which the state "owns" a person's output. "Whatever the facts about brain drain, however, the implications for national and international policies are by no means obvious, because there are important disagreements about the relevant values. For example, if a nation has subsidized an individual's education, does that nation have the ethical right to demand repayment of the subsidy before the individual may leave, as the former USSR did with respect to Jews and others for some years? And how is this ethical judgment influenced by the fact the potential migrant's parents, on average, paid for that subsidy through taxes? Would the individual's parents' consent be relevant? And if one believes a nation has this right, is it implied that nations should move to a system where an individual's cohort on average pays for his own education later on, as in Yale University's system for financing loans to students?" (p. 272)

Sjaastad, Larry A. "Costs and Returns of Human Migration," *Journal of Political Economy*, Oct. 1962. v70(5) part 2, pp. 80-93.

Sjaastad develops the concept of migration as an investments and returns question involving time the individual faces. This is an original contribution to the concept of human capital. The migration decision may require acquisition of new skills and training in addition to time spent in job search and sometimes geographic relocation. The greater the investment in migration, the greater the differential between pre- and post-migration wages, and the longer the time at work needed to justify the investment. Sjaastad notes migration will improve total

resource allocation when wages reflect social contribution of work, i.e., when labor and product markets are competitive.

Social and private returns to migration might diverge if taxation rates differ between two alternative work sites. For example, a person who migrates to increase after-tax income without increasing his before-tax earnings would not contribute to factor efficiency. Further: "Divergence between private and social costs of migration can also occur when the actual charges for services collectively provided (such as schools) are based upon per capita cost rather than the actual marginal cost of providing those services to migrants." (p.91-92)

Of direct relevance to the brain drain debate, he goes on to note "capital losses imposed by migrants upon the privately held fixed assets of non-migrants in an area experiencing a population decline generally cannot be admitted as an excess of social cost over private cost. These losses involve no resource cost.." (p. 92)

Thomas, Brinley. "The International Circulation of Human Capital," *Minerva*, 1967, v5, pp. 479-506.

Brinley concludes there are not sufficient data to determine whether Britain is a net loser or gainer of human capital. He cites low tuition and steep tax rates to "recover" the cost of education as inconsistent policies and ones that could increase international migration.

Thomas, Brinley. Chapter 3, "Modern Migration," in The Brain Drain, Walter Adams, ed. New York: Macmillan, 1968.

Brinley compares rates of mobility over time and among a select set of countries and notes, "It (human capital migration) constitutes a gift from the areas that incurred the costs of investment and a return flow of benefits to the investors is not inherent in the process." (p.40) Note this position implicitly assigns ownership of human capital to the region in which education is financed.

Brinley also notes "Because of the increased demand for educated manpower in the technologically more progressive economics and the externalities yielded by education-intensive investment through the stimulation of innovations, there is keen competition between advanced countries for limited supplies of top skills. Immigration policy has come to resemble tariff policy as a flexible instrument for maximizing national advantage." (p. 40)

He presents a model of the growth in demand for trained manpower in the United States and the loss by Britain based on British investment in schooling and high income tax rates.

UNESCO. Scientists Abroad: A Study of the International Movement of Persons in Science and Technology. Paris: United Nations, 1971.

The authors focus on the migration of scientists and engineers at the international level. They note there are those who justify this phenomenon in the name of greater efficiency and those who attack it because of the detrimental effects they claim it has on the country of origin.

They note the emotional connotation in the term "brain drain." "The very term 'brain drain' is a term of revulsion or opprobrium. As another report puts it, the expression, the brain drain, is almost redolent of some modern version of the slave trade or at best conjures up a picture of the United States as an enormous magnet attracting the brains of the rest of the world." (p. 51)

Webb, Michael A. "The Brain Drain and Educational Opportunity in Less Developed Countries," *Eastern Economic Journal*, 1985, v11(2), pp. 145-56.

The author focuses on the question of the impact of emigration on the funding of education in the home economy. His first case is a "neoclassical-minded economy," which responds to migration by cutting back on educational subsidy. This is the same case as Weisbrod's but with no cited reference from that literature. His other model includes a "manpower target" in which emigration is likely to spur additional educational subsidy, as the central planners attempt to reach their target. The work is wholly theoretical. There are no empirical tests or concern with data.

Wellington, Donald. "Emigration: A Bearer Of Welfare Loss?" *Journal of Political Economy*, 1972, v80(3), Part I, p. 603.

The author comments on one of the cases outlined by Berry and Soligo (1969), reviewed above, in which emigrants are assumed to take relatively large amounts of human capital with them when they migrate but relatively little physical capital. This kind of shift in factor shares could result in a relative decline in the returns of physical capital. Wellington noted non-migrants can restore the former relative wage of capital to labor by restoring the pre-migration ratios of human and non-human capital through consumption of physical capital. This leaves the author with the conclusion emigration will not likely affect non-migrants negatively. Berry and Soligo (1972) replied to Wellington's comment. Their reply is reviewed briefly above.

Yudin, Elinor Barry. Human Capital Migration, Direct Investment and the Transfer of Technology: An Examination of Americans Privately Employed Overseas. Arno Press Collection: American Business Abroad. New York Times Company, 1976 (1968 Ph.D. Dissertation, Faculty of Political Science, Columbia University).

Yudin examines the occupational and sex distribution of U.S. citizens employed abroad in 1960 at a time when there were large numbers of immigrants into the United States. She examines the alternative explanations of this phenomenon and concludes it is related to Gary Becker's classification of employer-specific human capital. Workers who know the operations and procedures of their employers may be especially productive when the firm establishes a new unit outside the United States. This is an additional facet of the mobility of highly skilled labor but not generally part of the concern with the brain drain.

Zamanian, Zaman. "Government Policy and the Brain Drain," *Atlantic Economic Journal*, 1987, v15(4), pp. 65-69.

This article is a short, theoretical treatment of the means governments have at hand to affect rates of migration and notes that much of the early literature concentrated on welfare implications of unaltered migration. The article is quite abstract; there is no suggestion the theory might be tested or experiments might be appropriate.

SECTION V

PUBLIC SCHOOLING AND ECONOMIC GROWTH AND DEVELOPMENT

Attempts to explain the rate of economic growth in the 1950s led to a number of estimates of the relative growth of output to inputs. For a time the excess in the rate of change in output over the rate of change in inputs was referred to as "neutral technological change." Some researchers suggested, however, undermeasurement of inputs might be the source of estimated gains in productivity. Part of the search for additional inputs led to the revival of human capital theory and contributed to its rapid growth over the past several decades.

Growth accounting was an early development in this process in which researchers assigned different quantities of human capital to workers with different wage rates on the grounds different flows of services --revealed by differences in wage rates-- represented different quantities of capital stocks. Later studies attempted to estimate empirically the impact of an additional year of schooling on wage rates. This work is described in Section II: Estimating the Returns to Schooling.

Even later work looked at the impact of additional schooling on the differential rates of income growth among communities, states and nations. A number of these articles are reviewed in this section. Estimation of the response of total income to investment in schooling should be made without bias, if possible, because their results could lead to overinvestment or underinvestment if the public takes them seriously.

Among nations and states, the research evidence is fairly clear that schooling contributes substantially to economic growth. As the articles reviewed below demonstrate, however, there is no consensus about the contribution of local school expenditures to local growth. One production function study that treats income as output and schooling expenditures as one of the inputs attributes local growth potential to local public schooling. Other studies find schooling has contributed to one region but not to another. We found that in general the smaller the local geographic region studied, the less likely it is schooling has had a measurable impact on local economic growth. Even in those cases in which school expenditures do not contribute to local growth, the returns to schooled individuals could be substantial.

What role have changes in the relative wages of higher-skilled and lower-skilled workers played in estimating the relationship between schooling and growth? Some writers, whose work is reviewed below, feel that demand shifts in favor of higher-skilled workers in the 1980s in urban areas relative to those in rural areas was so great the impact of public schooling on the incomes of rural residents may have been masked.

Those who believe school expenditures can be used as an economic development tool have stressed the power of a well trained work force to attract capital investment. Numerous studies of plant location have been conducted in which the role of local public finance has played an important conceptual role. Even more sophisticated studies have examined the simultaneous effect of employment and population growth on local income. Some recent studies focusing on

public finance have attempted to separate the positive impact of public expenditures from the negative impact of taxation.

The relationship between schooling and the concentration of income within a given population has long been of interest. Recently studies have been published that attempt to analyze the impact of schooling on income distribution. Articles on these and closely related topics are also reviewed below.

Listing Of Citations

Ayer, H.W. and J. Weidman. "The Rural Town as a Producing Unit: An Empirical Analysis and Implications for Rural Development Policy," *Southern Journal of Agricultural Economics*, Dec. 1976, v8(2), pp. 79-87.

This work is a production function-oriented study of income in 1970 of twenty towns in rural Arizona. Populations of these towns are between 2,500 and 26,000 and none lie within the Phoenix or Tucson MSA. Single equation regression was the primary tool of analysis. Output was measured as the total income of town residents in 1969. Independent variables include mean years of education of persons over 25, number of persons employed in 7 industrial groupings, 6 capital categories and the distance to the nearest SMSA.

The authors discuss conceptual differences between private production by private firms, private production of the public "firm," and public goods, but they do not use the categories for their empirical work. Log/log formulation is used; the resulting coefficients are elasticities.

They conclude there is a disequilibrium for the manufacturing and services subsectors because their estimates of labor productivity exceed average wages. Governmental and construction employment produces negative coefficients they are unable to explain. They get a large "scale" factor by summing coefficients of input variables. This exercise suggests doubling inputs would lead to a more than fourfold increase in income.

Their education variable is highly significant and produces an estimate that an increase of 10% in the mean education of the population over age 25 would increase income (not just wages) 18%. They comment this is significant considering an historical high level of migration of schooled individuals into urban areas. They also note the failure of rural development legislation to give much attention to education.

Factors affecting output they discussed include (1) deployment of government offices into rural areas (2) industrialization (3) isolation as a factor in rural development (4) recreation-based enterprise as a growth stimulant and (5) the scale question. Their primary conclusion is "policies that increase education of the labor force, encourage more labor in manufacturing and service industries and increase utility capital to support these industries and growth favoring larger rural towns should improve the economies of rural towns... More testing based on a larger sample of observations is in order, and some may wish to treat our policy implications more as hypothesis for further testing." (p. 86)

Income data used in the analysis are by place of residence of the recipient, but owned factors can be employed elsewhere. In such a case, measures of output (income) might not parallel measures of input (resources). For example, highly educated retirees may receive a large share of their income from capital employed elsewhere. Conversely, capital employed in a town and measured as an input may not show up as investment income by the residents of the town. This mismatch could lead to biased regression coefficients.

Bolino, A.C. Career Education Contributions to Economic Growth. New York: Praeger Publishers, 1973, 234 pp.

This study is an historical review of education in the United States reaching back to the post-Civil War period. The work puts a heavy emphasis on non-formal education such as apprenticeships and proprietary, non-academic programs for which there was no conventional school enrollment. A second area of emphasis is Denison's measurement of the contribution of formal schooling to the measurement of efficiency or productivity units of labor input.

The author raises some objections related to Denison's assumptions: constant returns to scale production function with factor markets working competitively at all places and times. These assumptions allowed Denison to use income (or wage) differentials as a reflection of productivity differences, which in turn reflects differences in the human capital stock imbedded in labor. Denison arbitrarily assumed 60% of the wage differentials between worker groups (arranged by levels of educational achievement) reflected schooling or capital differences. The other 40% was represented by all the factors that cause students to choose different levels of education: intelligence, discipline, parents' characteristics and education, etc.

Bolino cites Kaldor (p. 15), who raised additional objections to Denison's methods. Bolino uses these suggestions to make several corrections or adjustments in generating a new estimate of the contribution of school (human capital) to productivity.

Borsu, A. and H. Glejser. "Do Protection, Schooling, Product Per Head and Income Distribution Influence Growth? A Cross Sectional Analysis," *European Economic Review*, 1992, v36(6), pp. 1235-1240.

The authors begin by discussing an earlier paper by Bourgirgnon and Morrisson (1990) that contains a cross-sectional analysis of income inequality across developing countries in 1970. In their study the concentration of income distribution is analyzed as a function of GNP per capita, foreign trade protection and secondary schooling. Borsu and Glejser contend the last two variables, foreign trade protection and secondary schooling, were the predominant determinants of differences in inequality. They use the variables in the 1990 study to clarify the differences in real income growth across countries from 1970 to 1973.

Borsu and Glejser present regression results on GNP growth, using the income share of the top 20% of earners, income share of the poorest 40% of earners, secondary school enrollment, GNP/head and effective protection.

The authors' results indicated using the percent rate of secondary school enrollment in 1960 as a proxy of future human capital exerts a positive influence on growth of real income.

Brace, Lloyd. "The Role of Investment Capital in Rural Development," chapter 3 in Toward an American Rural Renaissance: Realizing Rural Human Resource Development during the Decade of the Eighties by Karl Gudenberg, Southern Rural Development Center, MS, 1985, pp. 39-52.

The underlying idea of this paper concerns the provision and development of appropriate technical assistance for sustaining and developing local economic development ventures through

education, business extension services, technical assistance entrepreneurs, and a new demand on banks.

The author stresses the need for generating more investment capital for small and microeconomic ventures. He suggests some attendant problems include (1) the difficulties encountered by a single entrepreneur in assembling sufficient knowledge and skills (2) accumulating a downpayment and (3) access to credit.

Development of realistic incentives for public/private investment is discussed with regard to capital formation access and utilization as well as the ways and means of effectively coordinating federal and state investment capital programs. Brace believes the best routes include the federal/state provided method (SBA-EDA-FmHA-NOAA-DOE-HUD) or using a model for a public/private partnership.

Carlino, Gerald and Edwin S. Mills. "Do Public Policies Affect County Growth?," *Business Review*, Federal Reserve Board of Philadelphia, August 1985, pp. 3-16.

The introduction to this paper examines existing economic theory generally supporting the view that differences in costs and benefits, including those generated by public policies, are influential in accounting for differences in regional growth rates. A general hypothesis about growth in the western part of the United States, for example, is that growth is due "in part to higher levels of educational attainment (as measured by median school years) and the greater density of the interstate highway network in the West than in any other region." (p. 4)

For this study the authors hypothesize "local policies on schooling may influence an area's level of educational attainment. High educational attainment by the resident population is likely to attract people and perhaps jobs as well, and this attainment undoubtedly stands for several amenities that create prime residential areas (such as high income and good schools), which should attract households. High educational attainment in an area also may be attractive to firms, since it signals a highly skilled labor force." (p. 7)

A multiple regression analysis is performed on hourly wage rates, annual per capita taxes, percentage of labor force unionized, annual crimes per 100,000 people, educational attainment and interstate highway density. From the coefficients they produce elasticities to make interpretation easier. From the estimated coefficients the authors construct tables of (1) simple comparisons among major regions and (2) the impact of a 10% increase in the public policy measures listed above on total county employment and on county manufacturing employment.

Findings suggest the features about a county most favorable for local employment growth are its people and their levels of educational attainment. The level of educational attainment (median school years) proved to be the most significant variable of all the public policies. This indicates educational attainment is an important public policy instrument for promoting the growth of local population and employment.

This study also yields evidence an increase in county population growth significantly increased county employment; the effects of interaction of county manufacturing employment and county population are less certain. The authors assert "policies that affect only county employment directly have little indirect effect on county population growth." (p. 10)

Carlino, G.A. and E.S. Mills. "Determinants of Country Growth," *Journal of Regional Science*, 1987, v27(1), pp. 39-54.

This study investigates the simultaneous determination of employment and population in 3000 U.S. counties in one cross-section, circa 1980, allowing for lagged dependent variables from 1969 and 1970. The authors begin with three historic population movements: from metro to suburbs, metro to non-metro of the 1970s and from sunbelt to sunbelt.

This study can be contrasted to (1) studies of the simultaneous determination of migration and employment (citation from Muth and others, p. 50) and (2) studies of the movement toward wage equilibrium in various regions, approximate equality implying joint movement of jobs and people has resulted from initial disequilibrating shocks. The policy-related question seems to be, Do jobs follow people or do people follow jobs?

Within the empirical model, county size in square miles is included as an independent variable to account for arbitrary differences in county size. The authors have income but not wage data and no specific climatic or socially determined quality of life measures. They use 2-SLS to estimate their coefficients and then use these to estimate the reduced form equations' coefficients and elasticities. Both population and employment are assumed to adjust in a lagged fashion; however, it is not clear whether the coefficients they report represent estimates of long-run effects of changes in income, etc.

Regional dummies are used (the base is the South Atlantic), and much is attributed to climate in discussing these coefficients, even though they employ no specific measures of climate. In addition to employment, they treat manufacturing employment in a separate model. In discussing their empirical model, the authors list median schooling level of persons over age 25, but after that, there is no further mention of the variable. Education shows up in their Business Review of the Federal Reserve Bank of Philadelphia, July-August 1985 paper. The reported coefficient in the latter paper was significant. They also have written a working paper, No. 85-3: "The Determinants of County Growth."

Their findings indicate the lagged employment elasticity is nearly twice as large for population as the lagged population elasticity is for employment. With regard to the policy-related question, results suggest people follow jobs more often than vice versa. Structural coefficients for these two variables are significant. In the structural model, race, local taxes, percent union and development bonds are insignificant. Family income is significant, but no accounting is made for cost-of-living differentials. Many geographic dummies are not significant.

A side inquiry has to do with the change in employment and population over the decade, using the dummies and other variables. They report the set with dummies and then note the sign on the central city dummy is reversed from negative to positive by including other variables. This demonstrates the importance of the formulation of the model in addressing questions such as the impact of living conditions on the migration to suburbs (the base class), but they don't report the coefficients of a number of variables of interest.

Christenson, J.A. and Jerry W. Robinson. Chapter 2. "Community Development in Perspective," pp. 26-47 in Themes of Community Development, Ames, IA: Iowa State University Press, 1989.

The authors review more than three hundred articles that have appeared in the Journal of the Community Development Society. They read and classified each article, discussed discrepancies and reached a consensus about classifying each article. The major themes of the chapter are community development, citizen participation, research related to community development, and the profession.

The authors note "most articles present an overall theme, or at least recognizable strategies, philosophies, techniques, and procedures for conceptualizing or practicing community development. Only a few of these articles (8 percent) present any data or data analysis." (p. 30)

Almost 90% of the contributors to the Journal are from academic institutions; the remainder are from the private sector and the government. At least 30% of the contributors are affiliated with the Cooperative Extension Service.

Deaton, Brady J. and Anne S. Deaton. "Educational Reform and Regional Development" (pp. 304-324) in The Rural South in Crisis: Challenges for the Future, Boulder, CO: Westview Press, 1988.

This paper traced the historical development of the concept of human capital, with a focus on changing fiscal structure. The limited role social scientists currently play was illustrated by referring to Hobson vs. Cline, (p. 311) in which the judge disqualified testimony on the relationship between input and output of education based on the immeasurability of educational output.

The concern with equality of educational opportunity based on varying endowments of taxable property that flowed from the Serrano vs. Priest decision led to a period of great interest in funding by state legislatures. The decision four years later in the case Rodriguez vs. San Antonio Independent School District in 1973 returned primary responsibility for funding decisions to the states and reduced the pressure for legislated equalization across districts. Alternate forms of improving publicly provided schooling are reviewed, taking into consideration the income losses that could occur in the years ahead if educational achievement lags.

Deavers, Kenneth L. "Rural Economic Conditions and Rural Development Policy for the 1980s and 1990s," in Agriculture and Beyond: Rural Economic Development, Madison: University of Wisconsin-Madison, 1988, pp. 113-123.

The author gives a basic history of metro-nonmetro migration flows during the 1970s to the pre-1990s. The discussion then turns to the importance of rural life and the economy, with further trends/history. This information concurs with other articles on the trends over the same period. The main discussion focuses on four different types of policies (macro, sectoral, territorial and human resource) and the impact of each on rural development. The general policy notion of each is as follows.

(1) Macro policy emphasizes "rural employment is slightly more sensitive to changes in monetary and fiscal policy than is urban employment." (p. 116)

(2) Sectoral policy stresses any type of sectoral policy yields growth in one area (non-metro) at the expense of another area (metro).

(3) Territorial policy is a natural market condition related to migration. As economic opportunities have shifted, large numbers of people have followed.

(4) Human resource policy underscores that as the U.S. economy shifts more to the service sector from a manufacturing sector (blue-collar jobs), persons employed in rural areas 75% of whom are employed in manufacturing are of little direct use in the services sector. "The reasoning is those who live in the rural areas have skills in farming, mining and manufacturing (textiles and apparel) and much training would need to be conducted before those persons would be useful in the services sector, whether they migrate or not." (p. 120)

Deavers concludes the choice in a national rural development policy is mostly political. However, while communities undergo structural changes, the question of "how well rural people are educated and trained has the broadest national implications." As such, federal programs to improve the human capital endowments of rural youth and the rural work force are the only way to overcome chronic underinvestment in rural human resources." (p. 122)

DeYoung, Alan J. "Economic Development and Educational Status in Appalachian Kentucky," *Comparative Education Review*, 1985, v29(1), pp. 47-67.

A full review of this article is found in the section on supply of and demand for public schooling. It is relevant to the question of growth as well as funding.

Glomm, Gerhard and B. Ravikumar. "Public Versus Private Investment in Human Capital: Endogenous Growth and Income Inequality," *Journal of Political Economy*, 1992, v100(4), pp. 818-834.

This paper is very mathematical, with no empirical data or results. The authors propose a model described by the title and then attempt to provide all variations that apply. Specifically, their purpose is twofold. First, the effects on growth of public investment in human capital are examined and second, the evolution of income inequality in an economy in which individuals have different income/skill levels is analyzed.

The authors examined the economic growth models of Romer (1986) and Lucas (1988), both of whom emphasize investment in human capital as an important factor contributing to growth. Glomm and Ravikumar believe these models do not account for the large involvement of the public sector in human capital investment, whereas most models of long-run growth are representative agent models and, therefore, cannot address issues related to income distribution. An exception is Tamura (1991).

Simple functional forms for preferences, technologies and the initial income distribution (with preferences as logarithmic, production technologies as linear, and the learning technology as Cobb-Douglas) are explored. The authors assume "the quality of school is an argument in the learning technology is consistent with Card and Krueger (1992), who provide estimates of the effects of quality measured by student/teacher ratio, the average term length and the relative pay of teachers on the rate of return to education for men born in the United states between 1920 and 1949." (p. 821)

Regression results suggest public education reduces income inequality more quickly than does private education. On the other hand, private education yields higher per-capita incomes, unless the initial income inequality is sufficiently large. After endogenizing the choice of education regime, the results imply that if a majority of agents have incomes below the average, the vote favors public education.

Gudenberg, Karl A. Chapter 8 "Toward a More Rational Education-Economic Development Connection in Rural America: The Collaborative Model," in Toward an American Rural Renaissance: Realizing Rural Human Resource Development during the Decade of the Eighties, Southern Rural Development Center, MS, 1985, 173 pp.

The author begins his discussion by pointing out the problem of finding a consistent definition of the term "rural." He highlights methods of classifying areas as rural as determined by the Bureau of the Census and the Department of Labor. He also reviews the definitions used in the "non-metropolitan" classification.

The second problem emphasized is the realization private and public sector employment opportunities are severely limited in rural areas. This problem is compounded by inferior labor market information systems and inadequate educational and vocational preparation in these areas.

Gudenberg examines a few longitudinal studies, one of which was done in Marion County, Oregon, and had results similar to findings of national studies. In the Marion County study, "high school performance appears to be related to the migration pattern. High achievers move more frequently to metropolitan or urban settings as young adults than low academic achievers or dropouts." (p. 131) Results lead him to conclude "greater and more varied options regarding education and economic development need to be brought about in rural America." (p. 132)

Standard indicators such as rates of unemployment and underemployment, public assistance, out-migration and similar measures of the economic well being of rural communities are discussed and seen frequently to be inadequate or even inappropriate.

The author suggests "rural economic development cannot occur without parallel human resource development. All too frequently, rural inhabitants, particularly those with limited academic and vocational achievement, are relegated to supportive, low-income positions in economic development efforts. Deficient and sparse rural education and training programs and services have resulted in the importation of skilled personnel and managers. Thus, in the main, only limited improvement of local educational and economic development efforts occur." (p. 138)

Helms, L. Jay. "The Effect of State and Local Taxes on Economic Growth: A Time Series—Cross Section Approach," *Review of Economics and Statistics*, 1985, v67(4), 574-582.

Helms analyzes changes in state personal income for 48 states over the period 1965-79. Cross sectional and time series models are combined, with considerable emphasis on the statistical model. This is an industry location model that emphasizes income determination and the offsetting effects of taxing and spending.

The author, following McClure's lead (1970), performs regression analysis in which lagged variables are based on the general proposition that resources are less mobile in the short run. This allows him to produce both short- and long-run coefficients.

The dependent variable is personal income deflated by 1967 prices. Independent variables include taxes and revenues (deflated by the level of personal income), public expenditures (using the same personal income deflator) and some demographic variables (including the real wage rate).

By using lagged variables and fixed coefficients, Helms attempts to escape simultaneity between taxation and economic growth factors. For example, economic growth caused by an inflow of workers based on some preexisting disequilibrium might increase taxes and expenditures. The impact of expenditures and taxation on local schooling is estimated in the short run (one year). He also discussed the use of fixed state and time effects.

He finds the negative impact of transfer payments to be equal to the coefficient for taxes. This suggests the transfer variable had a zero net impact on growth. Several coefficients for other expenditures are also reported. Additionally, an instrumental variables model is run as well as generalized least squares; the fixed least squares model is judged to be best.

He further concludes there may be some endogeneity between income and welfare (transfer) payments (e.g., cyclic decline in employment and income could lead to an increase in transfers as well as vice versa), but even here he contends the lagged variables help him avoid the taxation-growth problem.

Hobbs, Daryl J. "Learning To Find the `Niches': Rural Education and Vitalizing Rural Communities," Elmhurst, Ill.: North Central Regional Educational Laboratory, 1987.

"During the past two decades, rural America has undergone substantial restructuring that affects both rural education and prospects for rural economic development. Rural restructuring has made rural America more economically dependent and more economically and socially diverse, has replaced relatively autonomous communities with regional units of social and economic function and has triggered the incorporation of rural services into national systems. Prospects for growth in natural resource and goods producing industries (those that rural economies are most dependent on) are dim, but service employment strategies should consider the job-creating potential of small business and entrepreneurship, especially in finding and filling local `niches,' the importance of knowledge-based enterprise and the need to create new networks and partnerships to support avenues of alternate development. To these ends rural schools must provide sound basic education and train students to be innovative, to have multiple skills and to work as members of small, problem-solving teams. There are also needs for continuing education, educational attention to the locality, and educational partnerships to improve both education and community development. School Based Development Enterprises have produced school-community economic development partnerships in rural areas across the country. Article contains 117 references." (Author/SV) Abstract from document resume.

Hobbs, Daryl J. "Rural America: A Third Wave?," in Rural Policy Problems: Changing Dimensions, William P. Browne and Don F. Hadwiger, eds. Lexington MA: Lexington Books, 1982, pp. 183-201.

This study is an historical review of the way in which rural education has been organized in America, with a survey of the diversity of funding arrangements. Student performance is reviewed, particularly as it related to the movement to consolidate schools in the 1950s and 1960s.

Operational problems of small rural schools are reviewed (poor quality of instruction, difficulty in hiring or retaining good teachers, limited course offerings, limited equipment and inadequate career counseling) and surveys of the characteristics of teachers and administrators are analyzed for trends. The author also discussed and reviewed Tweeten's analysis of the source of differences in earnings between urban and rural people (educational attainment, sex and race) as related to the role of education in rural development.

Hobbs adopts a frequently found attitude toward ownership of human capital formed in a youth's community of residence: "Despite the relatively small impact of additional education in influencing the earnings gaps between residential, racial and sexual groups, there remains a significant problem of equality between the geographic location of those making the investment in education and the location where the beneficiaries choose to relocate that form of wealth. Although there are numerous ways to show the extent to which rural areas have contributed to a greater national concentration of wealth, perhaps none is more easily demonstrated than the geographic transfer of the earnings potential of investment in education." (p. 194)

The generally positive relationship (externality or by-product) of operating a school in a particular community is noted. This may reflect a reaction to the consolidation of earlier decades. The author closes with a review of Naghtigal's analysis of recent rural school reform efforts.

Hobbs, Daryl. "Rural Education," in Rural Policies for the 1990's, Cornelia B. Flora and James A. Christenson, eds. Boulder, CO: Westview, 1990, pp. 151-165.

In addition to documenting many changes in the funding and organization of education in rural areas, Hobbs cites several studies that relate education and development. He concludes "there is little evidence education or training alone directly cause either individual economic or social mobility, or rural community or regional economic development. Evidence is stronger in support of investments in education, training and counseling that are combined with local and regional economic development strategies." (p. 159).

Killian, Mollie S. and Timothy S. Parker. Chapter 4, "Education and Local Employment Growth in a Changing Economy," Education and Rural Economic Development: Strategies for the 1990's, USDA, ERS Staff Report No. AGES 9153, Washington, DC: USGPO, 1991.

The authors note the implications of and differences between urging education for individual returns and urging education for local area development. Their work can be seen as a challenge to analyses that have found a strong, positive association between education of the local work force and growth in employment.

The percentage growth in employment in commuting zones (508 non-metro and 255 metro local labor market areas) is studied over two time periods, 1969-1979 and 1979-1988. When mean education of the population over age 25 is used, its coefficient is only positive and significant in metro areas for 1969-1979. Positive coefficients are obtained for variables representing the percentage of college graduates and percentage of dropouts for 1979-1988, but these have coefficients statistically significant only in the metro areas.

The authors demonstrate the impact of moving from a simple to a multiple regression format to make their point that earlier researchers may have reached wrong conclusions about the power of education to generate local employment. Readers are warned about other forces that may have been at work. Also stressed is the possible gain to individuals of continued education. Even so, the weight of the authors' analysis is that locally funded education is not a good policy instrument to generate growth in employment in a local area.

Killian, M.S. and T.S. Parker. "Higher Education No Panacea for Weak Rural Economies," *Rural Development Perspectives*, Oct. 1990/Jan. 1991, pp. 2-7. USDA. Washington, D.C.: USGPO.

The authors report a portion of their findings presented in "Education and Local Employment Growth in a Changing Economy," Chapter 4 of Education and Rural Economic Development: Strategies for the 1990's, which is reviewed above.

Layard, P. R. G. "Denison and the Contribution of Education to National Income Growth: A Comment," *Journal of Political Economy*, 1973, v81(4), pp. 1013-1016.

Layard comments on what he believes to be a previously overlooked error of principle in Denison's analysis of the contribution of education to national income growth (Denison 1962, 1964, 1967). The error is deemed to lie in the index of labor force quality, which supposedly incorrectly measures the efficiency units per worker in the economy. "The index is only correct if the efficiency unit chosen happens to be a worker earning the national average wage, whereas in Denison's practice the choice is arbitrary." (p. 1013)

The alleged oversight is based on an assumption Denison made regarding his stock calculation. He assumed "the non-educational human capital per worker is the same in each education group as in the group chosen as the efficiency unit, although in his change-of-stock calculation he took such trouble to make the opposite assumption. One reason he should have made the average wage earner the efficiency unit is that in his assumptions this is the only group whose non-educational human capital equals that of the average worker in the economy as a whole." (p. 1015)

Luytjes, Jan B. "Appalachian Brain Drain: Notes on the Impact of Increased Educational Funds in Lagging Areas," *Growth and Change*, June 1971, v2(1), pp. 38-41.

He begins with an appeal for greater equality of educational opportunity and the treatment of education as a right. He compares funding at three points in time across Kentucky counties with little formal model or summary statistics. He concludes that educational expenses increase local income by a multiple of the expense. With the advent of birth control and increased migration of youth, educational expenditures will decline, leading to a further fall in local income of the poorest counties.

Machlup, Fritz. Education and Economic Growth. Lincoln, NB: University of Nebraska Press, 1970, 106 pp.

Parts of this book examine the production function of education, the cost of education and the demand for education. Within the "Production Contribution of Education" section, items relevant to growth that Machlup discussed are (1) factors of economic growth, (2) assessing the contributions to growth, (3) education and population growth, (4) unproductive and counterproductive education, (5) fast payoff: training on the job and adult education and (6) isolating the effects of education.

The author notes "in industrially advanced countries this influence, education on labor-force participation and employment, is usually positive and sometimes highly significant. It is not difficult to find a theoretical explanation of this positive association of labor-force participation with educational experience: as education raises the market value of labor, the cost of not working increases, and in advanced economies, the chance of obtaining a job improves. The expectation of getting a better job at better wages increases the willingness of the more educated to seek employment. Those with less education have less to lose staying out of the labor force and, hence, more of them actually fail to "participate" in the labor force." (pp. 16-17)

Machlup believes "after surveying the various processes by which education can contribute to economic growth, it is hardly necessary to point out that surely not every kind of educational effort and expenditure can be credited with such effects. Whether they accelerate the growth of productivity will depend on what is taught and how, to whom and at what levels, in what proportions and under what conditions." (p. 21)

Mankiw, N. Gregory, David Romer and David N. Weil. "A Contribution to the Empirics of Economic Growth," NBER Working paper No. 3541, Cambridge, MA, 1990.

The authors studied the change in income in 121 nations over the period 1965-1980 using a modified Solow approach. This study is clearly within the tradition of the post-World War II macro-economic analysis of growth. A number of references to that literature are provided. The fraction of output saved and the fraction of output invested in human capital both contributed positively to the growth in Gross Domestic Product (GDP) per worker. Higher rates of population growth reduced the level of growth in GDP per capita. The three variables explained 80% of variation. Their results suggest the time required for a national economy to adjust to change is much longer than in other studies. Their work highlights the role schooling and human capital play in income growth.

McCrackin, Bobbie. "Education's Contribution to Productivity and Economic Growth," *Economic Review*, Federal Reserve Board, Atlanta 1984, v69(10), pp. 8-23.

This paper describes how, over time, the study of human capital has changed and narrowed to focus on specific issues and subject matter. The major theoretical and empirical contributions of various authors and the arguments and policy implications developed by the leading scholars in this field are highlighted. Three main criticisms of education are proposed. The first "maintains the apparent relationship between education and higher lifetime incomes is really the result of greater ability or favorable family characteristics." (p. 8) The second criticism stresses the "interaction of demand and supply in determining returns to investment in education. Proponents of this view maintain that if demand for 'educated' workers fails to keep pace with supply, the rate of return to additional education may fall over time." (p. 9) The third criticism "alleges schooling contributes minimally to productivity, even though additional years of schooling add to income. The explanation given is employers use education as a means of screening job applicants: the higher the level of education, the more likely is an applicant to be a productive employee." (p. 9)

The works of forty-five authors are reviewed as related to such topics as: (1) classical and neoclassical views of education, (2) national income growth accounting, (3) rate of return to investment in education, (4) better model specification, (5) education vs. ability, personality, and family background, (6) segmented labor markets, (7) interaction of supply and demand, (8) screening hypothesis and (9) consumption value of education.

The author's opinion of the general findings suggests "state and local efforts to boost productivity in regional labor markets by investing more in education may lead to investing too many resources in schooling in the aggregate. The reasons are with advanced education students migrate to other regions anyway, particularly at the post-secondary level. On the other hand, if all states were to rely too heavily on in-migration and reduce sharply their support of education, a macroeconomic under-investment factor of migration, could result. Because of this important complicating factor of migration, it is important to gain a fuller understanding of the role of education in regional economic development in education nationwide." (p. 21)

McGranahan, David. "Key Challenges Facing Rural America" (Appendix III, pp. 59-61), in Rural Development: Rural America Faces Many Challenges, U.S. General Accounting Office (GAO/RCED-93-35), Washington DC: USGPO, November 1992.

The author discusses the differentials in educational attainment for younger workers, noting the differences measured as high school attendance or completion are small. The relatively low educational attainment of both whites and blacks in the South has meant low incomes in the past 10 to 15 years, with falling relative (and real) wages for workers with the least education.

He suggests there may have been wage equilibrium between urban and rural areas by 1979, with the 10% wage differential approximately equal to cost-of-living differences. But in the 1980s urban wages for young men completing college had risen 30%, suggesting a relatively greater shortage of educated workers in urban areas. Not surprisingly, given the increasing wage differential, the migration of college-educated workers has been toward urban areas.

Using data from a major 1988 survey of people aged 24-31, the author concluded that migration after age 14 reduced the number of college graduates in rural areas by 37%. Beginning in 1990 there may have been a positive flow of dropouts into rural areas, further reducing the observed educational achievement of rural residents.

After reporting on the Killian and Parker finding that higher educational expenditure did not appear to be associated with rural areas' growth, McGranahan concluded education may have been important for higher skilled industrial jobs. He implies there is no evidence low education levels impeded rural job growth in the past decade. Instead growth in demand for educated labor was an urban phenomena.

He also concluded "...while rural areas may be able to compete with urban areas on the basis of low wages for low-skilled but reliable workers, the internationalization of markets means rural areas will be competing more and more with less developed countries. This competition will serve only to drive rural wages down unless rural areas can find specialization niches or rural employers begin to adopt or develop technologies requiring workers with somewhat higher levels of education and skills." (p. 63)

McGranahan, David A. and Linda M. Ghelfi. Chapter 3. "The Educational Crisis and Rural Stagnation in the 1980's," Education and Rural Economic Development: Strategies for the 1990's, USDA, ERS Staff Report No. AGES 9153, Washington, DC: USGPO, 1991.

The authors trace relative wages by rural/urban counties over the 1970s and 1980s. They noted rural areas had a relative decline in wages for persons with more schooling, and urban areas experienced the opposite. This led them to conclude schooling was not the reason for "lagging rural growth." (I.e., if local suppliers of jobs don't pay more for better educated employees, workers will seek employment in areas where the premiums for more schooling are higher.)

They hypothesized the decline in educational achievement in the 1980s was a response to the low payoff to schooling in the 1970s, a trend that was reversed by the end of the 1980s. With this in mind, the authors conducted an "among rural county" analysis and discovered that counties with the lowest education levels had the greatest premia for schooling. They conclude migration was strong enough during this period to explain the decline in educational achievement of rural residents.

McNamara, Kevin T., W.P. Kriesel and B.J. Deaton. "Human Capital Stock and Flow and Economic Growth Analysis," *Growth and Change*, Winter 1988, v19(1), pp. 61-66.

The authors briefly summarize past works involving human capital investment such works as those by (1) Schultz (1961), (2) Hines, Tweeten and Redfern (1970), (3) Smith (1981) and (4) Smith, Deaton and Kelch (1978). They distinguish between the existing stocks of human capital and the rate at which investments are being made in human capital. The former is termed a "stock" and the latter a "flow." This concept is in contrast to those in most of the labor economics literature, which call human capital a stock and labor services "the flow" from that stock. Under traditional nomenclature, additions to the stock--which represent a conversion of flows of inputs into units of the capital stock-- are not called flows.

They next report the ways in which human capital may influence economic growth. (1) An increased level of educational investment can lead to a more productive labor force. This becomes a critical difference, depending upon whether the student stays in the region or migrates. (2) A high level of the current rate of investment in schooling and other public services will be attractive to company managers and their families.

Most of the paper focuses on different stock and flow measures, which are discussed in great detail. The measures are (1) the stock of human capital in a community's work force (2) focuses that relate to marginal improvements in the work force, or human capital flows (3) the human capital produced through investment in the school system and (4) the process of human capital accumulation. Within each category different variables and methods are investigated. Variables such as the number of persons 25 years old or older with a college degree, per-pupil expenditures and standardized achievement scores were investigated.

McNamara, Kevin T., W.P. Kriesel and B.J. Deaton. "Manufacturing Location: The Impact of Human Capital Stocks and Flows," *Review of Regional Studies*, 1988, v18, pp. 42-48.

The authors report on regressions of educational stock measures on the probability of plant location as well as review the analyses that used education in economic development work. There is nothing on wages directly. In contrast to Killian and Parker, this research supports the productivity of schooling in local economic growth.

Mulkey, David and Mark S. Henry. "Development Strategies in the Rural South: Issues and Alternatives," in *The Rural South in Crisis: Challenges for the Future*, Boulder, CO: Westview Press, 1988, pp. 249-264.

Following a review of the levels of employment in the nation, the South, and metro and non-metro portions of the South, the authors draw several policy conclusions. They distinguish between development and "transition" policies. By transition they mean "movement of people and resources out of rural areas." (p. 260) Human capital development is seen as necessary for efficient development or transition.

They conclude the positive correlation between education and mobility "provides strong justification for a strong state and federal role in providing quality education to rural residents. To the extent education programs are perceived to facilitate the movement of people out of local communities, local support for such programs may be reduced. This is especially true when increased expenditures for education come at the expense of investments in physical infrastructure." (p. 262)

Psacharopoulos, George. "Measuring the Marginal Contribution of Education to Economic Growth," *Economic Development and Cultural Change*, 1972, v20(4), pp. 641-658.

The author reviews the various ways proposed in the literature to measure the contribution of knowledge to economic growth. Estimation procedures he reviewed include (1)

the productivity indices of Denison, (2) the production functions of Griliches and (3) growth equations by Harberger and Selowsky. He also reviews different specifications of the education variable and returns to investment. The two primary procedures he examined are (1) the earnings differentials of labor classified by different levels of schooling as formulated by Denison and Griliches and (2) the amount of capital invested in education and the rate of return on that capital, as formulated by Schultz, Harberger and Selowsky.

"The methodology of this study follows the growth equation accounting scheme Harberger and Selowsky have suggested. The main difference is the contribution of education to growth will be assessed without estimating the educational capital stock and the marginal productivity of educational capital. The contribution of education to growth is measured by means of the earnings differentials of labor classified by the level of schooling. Thus, this approach introduces the Denison concept into the growth equation, whereas the Harberger-Selowsky approach used the Schultz concept." (p. 645)

The author applies the growth-accounting framework to the sources of growth of the Hawaiian economy in the 1950s. The author is able to estimate the marginal growth contribution of each educational level through the use of regression analysis. The results show "if we accept as plausible the income adjustment factors adopted in this study, improvements in the quality of labor seem to have contributed 16 percent to the observed rate of growth, whereas increase in the quantity of labor have contributed 20 percent. To put it another way, improvements in the quality of labor between 1950 and 1960 in Hawaii have contributed to income growth almost as much as the increase in the number of persons employed." (p. 658) The authors note the figures showing the contribution of the quality component of labor to growth represent an underestimate.

Public School Forum of North Carolina, All That's Within Them: Building a Foundation for Educational and Economic Growth, Raleigh, North Carolina, 1990.

This is a foundation-supported call for more public funding. There is no original data, model or estimation procedure.

Quan, Nguyen T. and John H. Beck. "Public Education Expenditures and State Economic Growth: Northeast and Sunbelt Regions," *Southern Economic Journal*, 1987, v54(2), pp. 361-376.

This is a study of wage, employment and income per capita for 1964-1983 for 15 northeast and 17 sunbelt states (separately and pooled) using polynomial distributed lag and 2-SLS. Most variables are ratios of the state relative to the nation for particular observations, which avoids any need to deflate for price level changes. Employment demand is obtained from a production function in which human capital levels and tax rates are treated as exogenously determined. Given the fact of migration, a lagged term is used based on the notion that the immobile fraction of the labor force responds slowly to the independent variables. Wages are derived from a demand-for-labor function in which human capital is given exogenously.

Independent variables are the tax rate, local education expenditures, higher-education expenditures and other or general tax expenditures (non-education and non-welfare).

Results suggest that K-12 educational expenditures positively affect wages and employment in the Northeast but not in the Sunbelt, where they tend to be negative and significant. However, in 2-SLS, analysis, employment and wages are positively related for the Sunbelt. This makes suspect their finding that local funding for K-12 had a negative influence on wages and employment.

Ranson, Baldwin. "Planning Education for Economic Progress: Distinguishing Occupational Demand from Technological Possibilities," *Journal of Economic Issues*, 1986, v20(4), pp. 1053-1066.

The main question the author asks is "Should mass educational institutions conform to occupational structures?" With this question in mind, Ranson presents (1) examples of answers provided by educational policymakers in which the answers fail to analyze the technological factor in industry and (2) two historical examples of policymakers adjusting educational institutions to the technological factor that contributed greatly to economic progress. He also explains the nature of technology of both educational and occupational structures.

"After two centuries, economists have arrived back at the laissez faire advice of Adam Smith. They conclude that efforts to plan education for economic progress are doomed to fail unless those efforts conform to wants expressed in the marketplace. They continue to assume self interest will lead employers to create all the jobs technologically possible and profitable and that self interest will lead workers to acquire the education necessary to qualify for those jobs." (p. 1055)

"The thesis of this essay is educational planners can promote economic progress by providing everyone with the skills necessary to master the best technology. That planning objective is not dictated by any occupational structure but rather by the nature of technological progress: the more a community knows, the more it can learn. Transmitting the ability to adapt to evolving technological opportunities will maximize economic progress as well as educational excellence, not as measured by competitive superiority of one group over another, but by the growing potential for economic and social well-being of the entire community." (p. 1063)

Razin, Assaf. "Economic Growth and Education: New Evidence," *Economic Development and Cultural Change*, 1977, v25(2), pp. 317-324.

The author sets out "to provide empirical results regarding the relationship between the rate of increase in the productivity of labor and the fraction of the economically active population engaged in schooling." (p. 317) He begins with an aggregate production function and determines the three major variables accountable for the proportional rate of growth of per capita income are (a) the investment-income ratio, (b) the fraction of the economically active population engaged in schooling and (c) the proportional rate of population growth.

Information on 11 developed countries from 1953-1965 is gathered from United Nations data and estimation by a single equation and by 2-SLS of simultaneous equations. The index

numbers of per capita gross national product are regressed on the ratios of gross domestic capital formation and GNP, percentage of the population aged 15-19 enrolled in the secondary level of education and index numbers of population growth.

From the results Razin surmises there "are positive associations between the growth of per capita GNP on the one hand and the investment-GNP ratio, and the percentage of the population aged 15-19 enrolled in the secondary level of education on the other." (p. 320) He points out this is a major result of a cross-sectional analysis over a period of 13 years, but there seems to be no significant association between the growth of per capita GNP and population growth. Thus it would be premature to make specific policy recommendations concerning education based on the results of this study.

Romer, P. M. "Human Capital and Growth: Theory and Evidence," NBER Working paper No. 3173, Cambridge, MA, 1989.

This study focuses on modeling and data problems related to cross-country studies of the impact of education on growth. The author chooses the degree of literacy (in contrast to percentage completing high school, number of scientists and engineers, etc.) and looks at both literacy and change in literacy on growth over a period of 20 years. He presents a theoretical distinction between manual skills, literacy and advanced scientific learning, but there is no empirical application.

He concludes, after correcting variables for measurement errors, that levels of literacy and growth in literacy both affect physical capital investment, which in turn affects growth, but neither the initial level of literacy nor any changes in literacy affect its rate of growth directly.

Sander, William and Peter V. Schaeffer. "Schooling and Urban Employment Growth," *Journal of Economics and Business*, 1991, v43(1), pp. 69-78.

This study found that counties that were 90% urban showed a positive correlation between median years of schooling and employment growth between 1980 and 1984; rural counties did not show the same relationship. There was a positive relationship between employment growth and some kinds of industry, but no relationship was found between employment growth and educational expenditures. It should be noted the difference between correlation and causation is not explored.

The widely recognized shift in the demand for higher skills as measured by relative wage shift may be at work here. Alternatively stated, the industry effect may be the primary factor at work, and schooling may be but another manifestation of the shift in trade in products.

Selowsky, Marcelo. "On the Measurement of Education's Contribution to Growth," *Quarterly Journal of Economics*, 1969, v83(3), pp. 449-463.

The author analyzes education's contribution to growth in the lesser developed countries of Chile, Mexico and India, which show sharp per capita income differences both among themselves and compared to developed countries in Western Europe and the United States.

The main purpose of this paper is to point out that many earlier studies of education and economic growth examined only the effects of increases in the educational level of the labor force while ignoring educational contributions derived from maintaining the average level of schooling of the labor force.

Sher, Jonathan. "Linking Education and Local Development: An International Perspective," Chapter 6 in Toward an American Renaissance: Realizing Rural Human Resource Development during the Decade of the Eighties, Karl Gudenberg, ed. Southern Rural Development Center, MS, 1985, 173 pp.

This paper is based on discussions presented at a CERI conference on Education and Local Development (ELD) held at Stornoway, Scotland, June 1981. The first section of the paper reviews the history of the project. The remainder gives many examples of cases in which communities or areas have benefitted one way or another from education. The paper closes with many general conclusions about education and local development, government intervention, the role of formal education in rural development and the role of non-formal and adult education in rural development.

Shertz, Lyle P. "Improvements in the Rural South: They Won't Come Easy," in The Rural South in Crisis: Challenges for the Future. Boulder, CO: Westview Press, 1988, pp. 365-375.

In this chapter, which serves as a summary for the volume, Shertz notes other authors' numerous calls for increased public provision of schooling. In discussing the impediments to increased funding, he notes immigrants create capital values that support educational opportunities in the communities to which they move, "even though they are traceable to the investments made in education in earlier years in faraway communities...And in some cases these poorly educated people have a claim on federal expenditures for farm programs, food stamps and unemployment compensation... Thus there are spillover effects. Inadequate education in communities means higher federal expenditures in coping with the effects." (p. 367)

The geographic distribution of both the benefits of education and the costs of inadequate education prompt Shertz to conclude there is a role for the federal government to play in education. This conclusion might be a result of the assumption the federal government is interested in minimizing its outlays for its whole set of programs. That would suggest the government could invest in additional amounts of education to the point the marginal costs of education equal marginal savings on "welfare" programs.

Federal funding of rural education might be more efficiently implemented through the USDA than the Department of Education, particularly if funds could be transferred from commodity programs, as Shertz suggests occurred with the growth of the Food Stamp program in the 1970s. The chapter ends with an appeal for full understanding of the "silent revolution" increased education could bring to the region.

Smith, Eldon D. "Reflections on Human Resources in the Strategy of Rural Economic Development," *The Review of Regional Studies*, Winter 1989, v19(1), pp. 13-22.

This interesting paper focuses on the notion that educated workers returning to their home communities may provide role models for local residents and thereby increase the demand for education.

Smith, Eldon D. and Alan J. DeYoung. Exploratory Studies of Occupational Structure of the Workforce and Support of Public Education in Rural Appalachia, Southern Rural Development Center, MS, Publication No. 160, June 1992.

The first section of this study is largely anecdotal, reporting on the support of employers for local education. In the second part, the authors examine the impact level of schooling of voters may have on the degree of support they exhibit for local school funding. They note local communities suffer losses in income because of the emigration of educated individuals. They are even more concerned emigration of people with more than average education will reduce the demand for local funding of education in the future.

Southern Growth Policies Board. Halfway Home and a Long Way To Go: A Report of the 1986 Commission of the Future of the South. Research Triangle Park, NC. 1986.

The primary focus in this paper is on the development of individuals rather than on communities: "Continuing investments in public schools can make Southern students nationally competitive as thinkers and doers in the next century's workplace..." (p. 9) The authors cite statistics that indicate that the South is 20% behind the rest of the nation with regard to school funding, high school leaving rates, and achievement of students on standardized test scores.

Swaim, Paul L. and Ruy A. Teixeira. Chapter 5. "Education and Training Policy: Skill Upgrading Options for the Rural Workforce," Education and Rural Economic Development: Strategies for the 1990's, USDA, ERS Staff Report No. AGES 9153, Washington, DC: USGPO, 1991.

This is an analysis of the educational production functions. Most of the emphasis is on supply, with little emphasis on the reasons to support public schooling. Several references to other studies are presented, including John Bishop's "Incentives for Learning: Why American High School Students Compare So Poorly to Their Counterparts Overseas," a background paper for Secretary of Labor's Commission on Workforce Quality and Labor Market Efficiency, USDL, Washington, DC. 1989.

Swanson, Linda L. "What Attracts New Residents to Nonmetro Areas?," USDA, ERS, Rural Development Research Report No. 56. Washington, DC: USGPO. April 1986, 15 pp.

The purpose of the article is to "assess migration into nonmetropolitan (nonmetro) counties during 1975-1980, whether the migrants came from metropolitan (metro) or other nonmetro areas, and in which parts of the country these rates of in-migration were highest." (p. 1) Explanation of migration into nonmetro areas is focused on measures of attraction. The two basic measurable reasons given for immigration were (1) job-related reasons, with income, employment

and commuting patterns as characteristics and (2) leisure lifestyle opportunities, which include reasons of retirement, second homes and recreation employment. The author then took the economic and leisure lifestyle characteristics and showed the rate of in-migration by source--metro and nonmetro and graphically displayed the results.

Figures are presented on (1) metro to nonmetro migration 1975-1980 and (2) nonmetro to other nonmetro migration 1975-1980. The two figures show state-by-state breakdowns by percent. The graphical representations are analyzed, and the relationships between rates of 1970-1980 nonmetro population growth and 1975-1980 in-migration for both metro and nonmetro counties are discussed.

Regression analysis was used to explain migration from metro areas and from one nonmetro county to another. All of the job-related and leisure lifestyle measures as well as a third group of measures were included in the regression equations. The third group of measures for county characteristics included (1) colleges and universities, (2) military bases and (3) mental hospitals and prisons. According to the author these measurements were included because "a false impression could have been given of the county's attractiveness to metro residents if the presence of such institutions had not been taken into consideration, because, for example, few of the residents of prisons chose their place of residence." (p. 8)

Two results were presented: (1) "most people who moved from a metro area to a nonmetro county during the 1970's were apparently less motivated by job-related reasons than by a life-style revolving around amenities" and (2) "people who moved from one nonmetro county to another seemed more motivated by job opportunities than amenities, although county characteristics in general were not particularly useful in explaining such moves." (p. 11)

Tallman, Ellis W. and Ping Wang. "Human Capital Investment and Economic Growth: New Routes in Theory Address Old Questions," *Economic Review*, Federal Reserve Bank of Atlanta, 1992, v77(5), pp. 1-12.

This article is a summary of existing studies in the area of human capital and its relation to growth. The literature on human capital and growth highlights the idea of human capital as a mechanism to advance technology, improve productivity and generate growth. Both theoretical and empirical aspects in the existing economic studies are summarized, with the conclusions of each article pointing out policy implications of the findings concerning human capital and its relationship to output growth. In all, the studies of about twenty different authors in the field of education and/or growth are examined.

The human capital and growth literature is broken down into six major sections: (1) the Solow-Swan growth model and growth accounting, (2) education and human capital investment, (3) empirical evidence on returns to education, (4) human capital accumulation and output growth, (5) the main ideas that characterize the role of human capital in aggregate production function to the predictions of theory and (6) empirical evidence on human capital and growth.

Wasylenko, Michael and Therese McGuire. "Jobs and Taxes: The Effect of Business Climate on States' Employment Growth Rates," *National Tax Journal*, 1985, v38(4), pp. 497-512.

This article follows the long-standing tradition of examining the location of industry based on characteristics of the community, the work force and the public finance of the area in a single equation framework. This is a study of the rate of growth in employment in six separate industrial classifications and in total employment from 1973 to 1980 in the contiguous 48 states.

Single equation regression is used to estimate the impact of labor market variables, cost of energy, fiscal measures, market factors and area-specific factors on the rate of growth. The experiment investigates both nominal and effective tax rates, selecting the latter as preferable theoretically and empirically.

The authors use the estimated coefficients to illustrate the importance of the several variables for many states, even though the coefficients had high standard errors. A drawback of the paper is the model presented provides only an estimate of the net impact of these amenities on employment.

The references listed in the paper and the tie to recent literature are useful and insightful.

Wykstra, Ronald A. Human Capital Formation and Manpower Development. New York: Free Press, 1971, 502 pp.

The author has collected a number of landmark articles in the area of human capital. The chapter by Bowman and Myers has the most direct application to questions related to public school funding. It is reviewed elsewhere in this bibliography.

Wykstra, Ronald A. Education and the Economics of Human Capital. New York: Free Press, 1971, 296 pp.

Reprint of articles from the topical area, primarily for readers in the field of education.

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