Government's Role in Primary and Secondary Education

Lori L. Taylor
Senior Economist and Policy Advisor
Federal Reserve Bank of Dallas

This article describes three rationales for government participation in primary and secondary education, discusses the economic evidence in their support, and examines their major implications for the role of government.

Public primary and secondary education is big business in the United States.[1] As Table 1 illustrates, nearly 90 percent of U.S. children attend public schools, at an annual public expenditure of more than 3.5 percent of gross domestic product. In 1994 government spending on primary and secondary education exceeded $235 billion, or roughly 3.5 percent of GDP.

Public education is also big business internationally. In 1994 the governments of Germany, Italy, Japan, and the United Kingdom each spent at least 2.9 percent of GDP on primary and secondary schooling, while the governments of Canada and France each spent at least 4 percent of GDP. Worldwide, public spending on primary and secondary education in 1994 topped $1.275 trillion.

The fact that societies around the world spend so much public money on education does not prove that government has an economically legitimate role in primary and secondary education, however. Education's pervasively public nature could also be interpreted as evidence that special interests around the world successfully use governments to further their own, private objectives. One must look elsewhere for economic insight into the government's role in primary and secondary education.

Traditionally, economists offer three broad rationales for government participation in primary and secondary education (for example, see the discussions in Hoxby 1996 or Poterba 1996). If any of these rationales hold, the only open question is the nature of that participation. This article describes the three rationales, discusses the economic evidence in their support, and examines their implications for government's role in primary and secondary education.

RATIONALES FOR GOVERNMENT INTERVENTION

First, many economists believe that imperfections in the capital market cause it to fail to provide the socially desirable level of educational investment. For example, because human capital is embodied in people, it is difficult to use as collateral for a loan.[2] Therefore, if the education market were purely private, lenders would charge a premium for educational loans that they would not charge for other types of investment loans. Such a premium leads to underinvestment in human capital from a social perspective.

Furthermore, because children, by virtue of their youth, cannot commit to repay educational loans, they must rely on their families to invest appropriately in their educations. Becker and Murphy (1988) argue that parents who do

Table 1

Government's Role in Primary and Secondary Education in the United States

	Public enrollment as a percentage of total enrollment	Public expenditures as a percentage of GDP
1990	88.7	3.8
1991	89.0	3.8
1992	88.8	3.5
1993	88.8	3.8
1994	88.7	3.5

SOURCE: National Center for Education Statistics (1998, 1997, 1996).

not plan to leave bequests to their children also tend to underinvest in their education.[3] In their view, "both parents and children could be better off with a 'contract' that calls for parents to raise investments to the efficient level in return for a commitment by children to repay their elderly parents" (Becker and Murphy 1988, 6). A system of tax-supported education coupled with transfers to the elderly could function like such a contract. Creating and enforcing desirable contracts that fail to exist in the market could be a rationale for government participation in primary and secondary education.[4]

Second, some economists argue that education generates positive externalities—that is, benefits to society that exceed the benefits to the students themselves. For example, Friedman and Friedman (1990) argue that "a stable democratic society is impossible without a minimum degree of literacy and knowledge on the part of most citizens." Because students and their families don't consider these benefits when they make educational decisions—such as whether to drop out of high school—they tend to invest less in education than would be socially optimal. If increased education is the most cost-effective way to produce externality benefits, society has an interest in encouraging people to invest in more schooling than they otherwise would.

Finally, some economists argue that society feels altruistic toward children—especially poor children—and education is a tool for redistributing some of society's resources in their direction. Although the recipients might prefer cash, society gives education, either because educational transfers are an efficient strategy for ensuring that children—rather than parents—are the recipients of public funds or because educational transfers satisfy society's taste for charity.[5] The latter reason is similar to the argument for why the government gives poor people food stamps instead of cash: society wants the recipients to consume what *it* thinks is good for them, not necessarily what *they* think is good for them.

THE EVIDENCE

No economist has found a smoking gun that irrefutably supports any of these rationales for government intervention in the education market. Furthermore, because economists generally accept it, the capital-market-failure rationale has been the subject of little or no empirical research. However, a substantial body of work suggests education may generate positive externalities, and a few researchers examining the demand for education have found evidence that could support either the altruism or the externality rationale.

Analyses of Externalities

Educational externalities fall into two broad categories—second-best externalities and first-best externalities. Second-best externalities arise when education generates nonprivate benefits as a consequence of an unrelated and distortionary government policy; first-best externalities arise independent of such policies. Because the nonprivate benefits associated with second-best externalities would not exist (or would be private benefits) if the distortionary policy did not exist, second-best externalities are not as persuasive as first-best externalities for justifying government intervention in the education market.

Second-Best Externalities. The tax code is a major source of second-best externalities from education. Because incomes increase with education, income tax payments increase with education. The increased earnings and consumption of educated individuals also lead them to pay more in sales, payroll, and property taxes.

Although the magnitude of the effect is unknown, education may also produce a second-best externality through its positive effect on a community's tax base (Weisbrod 1964, Hirsch and Marcus 1969, Holtmann 1971). An increase in the average level of education generally raises the income of the community, which (because housing is a normal good) tends to lead to higher property values. High levels of educational attainment appear to attract firms (see, for example, Fox and Murray 1990, Bartik 1989, Carlton 1983), which also positively affects property values. This externality is a purely distributive one, rearranging the business environment in the local best interest at the expense of another, less attractive locale. Furthermore, to the extent that communities tax business property at a higher rate than residential property, attracting new businesses can increase the tax base even if aggregate property values remain unchanged. With a larger tax

base, local governments can generate a given level of tax revenues with lower tax rates. Because the deadweight loss associated with taxes generally falls as the marginal tax rate falls, government activities can be less distortionary in communities with higher tax bases.

The social safety net is the other major source of second-best externalities from education. Educated individuals are less likely to receive welfare, Medicaid, or unemployment compensation (McMahon 1987). They and their children tend to be healthier (Grossman and Kaestner 1997), which should reduce their use of the public health system. Their children are less likely to become teenage mothers, live in poverty, or suffer from severe child abuse (Maynard and McGrath 1997), all conditions that are not only personal tragedies but also drains on the public purse.

First-Best Externalities. Most of the first-best externalities the literature examines are related to productivity and economic growth. Such externalities arise whenever education enhances productivity or economic growth in a way that is not reflected in the private returns to education. Thus, whenever wages do not capture the full effects of a worker's education, externality benefits may arise. Similarly, if patents do not fully capture the benefits of scientific or technological discoveries and education fosters such discoveries, part of the productivity gain from technical change would also represent externality benefits from education.

Rauch (1993) observes that if educational externalities enhance worker productivity, "economically identical workers will tend to earn higher wages in human capital rich, rather than human capital poor," regions. Migration in response to the higher wages will bid up rents in such areas until worker utility is equalized across the country. "Cities with higher average levels of human capital should therefore have higher wages and higher land rents" (Rauch 1993). Using data from the 1980 census to test this hypothesis, Rauch finds that the average level of education in a standard metropolitan statistical area (SMSA) has a significant, positive effect on both wages and rents.[6] His estimates suggest that "each additional year of SMSA average education can be expected to raise total factor productivity by 2.8% with a standard error of estimate of 0.8%." The estimates also imply that "the social return [to formal education] exceeds the private return by a factor of…roughly 1.7."[7]

Rauch examines factor prices, but a number of other researchers examining factor quantities have also found evidence suggesting that there are first-best externalities from education. For example, in analyzing the forty-eight contiguous states, Wasylenko and McGuire (1985) find that the level of educational attainment contributes to employment growth, independent of its effect on wages. Fox and Murray (1990) analyze Tennessee counties and find that for a given wage, the firm entry rate (number of new firms/number of active firms) increases as the educational attainment of a county increases, implying that the educational attainment of a county enhances firm productivity. Because all private productivity benefits from education should be internalized by the labor contract and be incorporated into the wage, these findings suggest education may generate externality benefits.

The pattern of international capital flows also suggests there may be education externalities. Capital should flow to the countries where it can earn the highest rates of return, which, according to neoclassical growth theory, should be the countries with the lowest capital–labor ratios. However, we do not observe strong capital flows into poor countries with low capital–labor ratios. Although both discuss other possible explanations, Lucas (1988, 1990) and Gundlach (1994) explore the hypothesis that externality benefits from human capital could explain this discrepancy.[8] Examining data on India and the United States and assuming that the total stock of human capital grows at the same rate as that part of the stock accumulated through formal schooling, Lucas (1990) finds that "taking the external effects of human capital into account…entirely eliminates the predicted return differential." Gundlach (1994) finds similar results for rate-of-return differentials between the United States and South Asia, Latin America, and other Organization for Economic Cooperation and Development countries.

A number of other cross-country studies also examine the important contribution human capital makes to economic growth (for example, see Engelbrecht 1997 and Benhabib and Spiegel 1994 or the discussions in Carlino 1995, Sala-i-Martin 1994, and Barro 1992). Unfortunately, such cross-country evidence does not build a persuasive case for externality benefits from primary and secondary education. As Levine and Renelt (1992) illustrate, the results of cross-country growth models are disturbingly fragile.[9] A number of models that do not incorporate human capital externalities also seem to fit the cross-country data equally well (see, for example, Benhabib and Jovanovic 1991 and the discussion in Jorgenson 1998). The researchers usually do not rule out the possibility that the

growth benefits of human capital are fully private. In addition, much of the recent literature explicitly dealing with externality benefits focuses on spillovers from research and development or learning by doing, both of which only loosely relate to primary and secondary education. Furthermore, as Behrman and Rosenzweig (1994) discuss, international variations in the completeness of the data and in the measurement of enrollment and literacy can make cross-country data on education very problematic. Similarly, cross-country data on educational attainment are problematic because they do not control for potentially large differences in school quality.[10] Finally, as noted education researcher George Psacharopoulos (1996) put it in discussing the use of cross-country data to evaluate education externalities, "Beyond the quality of such data, countries differ in many other respects than the general level of education of their labor force or population for the desired effect to be credibly picked up in such analysis....Thus, the externality in question might just be another name for our ignorance on what really determines economic growth."

Some have argued that in addition to its apparent effects on growth, education might also generate an externality by deterring crime (for example, see Usher 1997 or Haveman and Wolfe 1984). Unfortunately, as with analyses of cross-country growth, the empirical evidence is unpersuasive. In her survey of the literature on crime and education, Witte concludes that "most crime is committed by young men during their adolescent years" and that "neither years of schooling completed nor receipt of a high school degree has a significant effect on an individual's level of criminal activity. However, greater amounts of time in school are associated with lower levels of criminal activity" (Witte 1997, 233). Apparently, custodial supervision reduces the opportunities to offend. Thus, the evidence does not support the hypothesis of externality benefits from primary and secondary education per se, but rather one of externality benefits from keeping teenagers off the streets.[11]

ANALYSES OF THE DEMAND FOR EDUCATION

Analyses of the demand for education use information about voting and expenditure patterns to tease out information about the public's willingness to pay for education. The underlying premise of all these studies is that households reveal their preferences for education either by choosing to vote in a particular way or by choosing to live in a place that offers a particular mix of taxes and educational services.

Of interest here are studies that differentiate between private and social demands for education. Such studies incorporate the premise that households not directly benefiting from educational spending would only be willing to pay for it if school spending satisfies some social objective. Because that social objective could be either redistribution or the production of externality benefits, a finding of significant social demand for education can support either of the two rationales for government intervention in the education market.

In one such study, Wyckoff (1984) examines survey data about a referendum in Michigan. Voters were asked to choose one of six possible tax rates, each of which would support a different level of educational spending per pupil. The survey contains information about which of the six tax/expenditure levels the voter preferred, the household's tax price of educational expenditures, whether the voter is employed by the local school district, the number of children the household has in local public schools, whether the voter believes increased school spending affects school quality, and other characteristics of the household. Wyckoff hypothesizes that the preferences of households with children in the local public schools reveal information about private demand for education, while the preferences of households without such children reveal information about social demand for education.

Like other researchers (for example, Rubinfeld and Shapiro 1989, Lankford 1985, Rubinfeld 1977), Wyckoff finds evidence that households with children in public schools favor higher spending on education than households without such children. However, he also demonstrates that, all else being equal, households without children in the local schools seem willing to pay for public schooling. Evaluated at the mean of all other characteristics, households with no children in the schools were willing to pay $1,222 per pupil, while otherwise equal households with one child in school were willing to pay $1,532 per pupil.[12] Wyckoff concludes that at the margin, 9 percent of the benefits from educational expenditures accrue to households without children in school. However, he notes that because his sample is small and the estimation is imprecise, the social portion could be as low as zero or as high as 50 percent.

Weisbrod (1962, 1964) originated a line of analysis that uses expenditure, rather than voting, data to evaluate the social demand for edu-

cation. He hypothesizes that any social benefits of education accrue primarily to the community in which the educated person lives. Although Weisbrod does not put it in these terms, his premise could also be seen as implying that society feels altruistic only toward locals who remain local. In either case, a community's willingness to pay for education should correlate with expected migration patterns.

Everything else being equal, if a community's willingness to pay for schooling arises from the expectation of social benefits, educational expenditures should follow a particular pattern. Communities anticipating high emigration of locally educated individuals should be less willing to pay for investment in education because they are unable to capture externalities produced by the education of those who subsequently move away; it is not rational to pay for benefits not received. On the other hand, if educational expenditures attract new residents who are already highly educated, then, all else equal, communities that experience high immigration of educated persons should be more willing to pay for schooling. Finally, if school spending is not a strong attraction for the educated, communities that anticipate high immigration of educated individuals should substitute this "imported" human capital for the locally produced variety and be less willing to pay for schooling.

Weisbrod (1964) constructs a simple linear regression model that explains current educational expenditures at the state level (circa 1960) by total personal income (both in per-pupil terms); the percentage change in state population from net immigration and net emigration (separate variables); the fractions of expenditures attributable to state and federal aid, respectively; and by certain characteristics of the student body.[13] He finds the state and federal aid percentages insignificant at the 5 percent level in explaining differences in educational expenditures for the forty-eight contiguous states. Personal income per pupil is a significant and positive explanatory variable, as is the percentage of public school students in high school. Weisbrod attributes the explanatory power of the latter to the higher cost of teaching high school students. Net migration has an asymmetric effect on expenditures. While net immigration has no statistically significant effect, net emigration has a significant, negative effect on current expenditures. Although cautious about reading too much into his results, Weisbrod concludes that his analysis supports the case for significant nonprivate benefits from education.

Subsequent tests of Weisbrod's hypothesis have yielded mixed results. Hadley (1985) updates the analysis, excluding the intergovernmental aid and demographic variables and measuring personal income per capita rather than per pupil.[14] He confirms Weisbrod's hypothesis for the 1959–60 school year but rejects it for the 1976–77 school year.

Greene (1977) and Holland (1974) observe that local data are more appropriate than state-level data for testing Weisbrod's hypothesis. Their results are also mixed. Using 1960 data and treating state aid as endogenous (but, like Hadley, excluding student demographics), Holland finds no relationship between migration and per-pupil expenditures in Oklahoma State Economic Areas. Using 1970 data and including data on both intergovernmental aid and student demographics, Greene finds that expenditures by New York school districts positively correlate with immigration and negatively correlate with emigration.

A common shortcoming of all these studies is that they rely on migration data ill suited to the analysis. The data do not differentiate the emigration of those educated in the region from the emigration of those educated elsewhere, nor do they indicate the human capital endowments of the migrants. Furthermore, none of these analyses adjusts the emigration data for the presence of parents with school-age children. A search for school quality could lead parents to migrate in direct response to the level of school spending—attracted to communities with high expenditures and repelled by communities with low expenditures. Because this migration pattern mimics the negative correlation between expenditures and emigration expected under Weisbrod's hypothesis, data that include the emigration of parents with school-age children are biased in favor of the hypothesis and should not be used to test it.

Another shortcoming these studies share is that they treat emigration and immigration as exogenous when they clearly are endogenous. Research on migration and labor finds that the number of years of schooling significantly and positively correlates with the propensity to migrate (Borsch-Supan 1990, Myers 1972, Schultz 1982). By extension, there should be a similar correlation for educational quality. To the extent that school quality is attributable to school spending, local expenditures on education will influence the future migration patterns of students. At the very least, characteristics of the local labor market that help determine a community's ability to pay for schools also deter-

mine the likelihood of migration for reasons of employment.

Taylor (1992) refines these studies by examining the relationship between migration and educational expenditure when both emigration and immigration are endogenous rather than exogenous. Her analysis focuses on the emigration of locally educated high school graduates who are unlikely to have school-age children and the immigration of high school graduates. She also incorporates an educational production function to reflect efficiency differences in producing human capital. The analysis is conducted across a subset of states, using school-level data on expenditures and including a wide variety of student demographics.

Taylor finds that the emigration of locally educated individuals does not reduce local willingness to pay for schools, but the immigration of individuals already endowed with at least a high school education does negatively influence expenditures. This pattern implies that locally produced and imported human capital are substitutes, and if a great deal of human capital moves into an area, it may be unnecessary to pay to produce it locally. Thus, while her analysis of community spending patterns suggests significant nonprivate benefits to education, it also suggests that communities expect those benefits to arise from adult migrants rather than from locally educated children.

THE IMPLICATIONS

Considered individually, each piece of the empirical evidence provides only modest support for the government's role in primary and secondary education. However, taken together, the sheer volume of evidence is rather persuasive. Furthermore, any gaps in the empirical evidence may indicate a complex measurement problem—or a lack of research on the issue—rather than the absence of significant social benefits from education. Finally, there is little doubt in economic circles that capital market imperfections would lead to some degree of underinvestment in education in the absence of government intervention.

For the sake of argument (if nothing else), assume a significant public interest in education. What guidance do these underlying rationales offer for government's role in primary and secondary education?

The first guiding principle is that families should remain the primary educational decision makers—and the primary educational financiers. Unless taken to extremes that are unsupported by empirical or theoretical evidence, all three rationales give the government a subordinate role in primary and secondary education. The market-failure rationale implies that the government should efficiently ensure families have access to credit and that they pay no more for education loans than they would for any other type of investment loan. However, this rationale does not imply education should be subsidized or the government should determine the amount of education students receive. The externalities rationale implies education should be subsidized, but it also implies the subsidy should be proportional to the externality. Because the private benefits from education greatly exceed the nonprivate benefits,[15] families should pay the lion's share of educational expenses. (For a discussion of the U.S. family's role in education finance, see the box entitled "How Families Pay for Elementary and Secondary Education.") Finally, the altruism rationale implies that society wishes to transfer resources to the young, but it does not imply that society cares more than parents about the welfare of their children or that society's transfers to their children should be large relative to the parents' transfers.

One important consequence of this primacy for parents is that parents retain control over the level of educational spending. One-size-fits-all financing, wherein society tries to equalize expenditures or sets a very high floor on spending per pupil, violates this principle. Issuing an overly generous school voucher—or any type of voucher that parents are not allowed to supplement—would also violate this principle.

The second guiding principle follows directly from the notion that government has a significant financial interest in primary and secondary education. To the extent that the government has money on the table, it also has a legitimate interest in monitoring the outcomes of the educational process. Thus, if the government subsidizes education because education generates positive externalities, it should ensure schools behave in a way that produces such externalities. For example, if the externalities arise from the scientific literacy of the population, the government should confirm that schools promote scientific literacy. Similarly, if the externalities that justify government subsidies arise from socialization and the development of common values, the government should make eligibility for public funds contingent on producing such outcomes. Even if the government is only responding to market failure by acting as an educational lender, it is obliged

to monitor the use of its funds. Just as a prudent private lender has an obligation to make sure that car loans are used to buy cars, the government has an obligation to ensure education loans are used to buy education.

Monitoring educational outcomes does not imply controlling the production process, however. The final guiding principle is that government does not necessarily have a role in providing educational services or in regulating the manner by which private schools provide educational services. The market-failure rationale is silent on this issue, as is the altruism rationale. Some economists have argued that public provision of education generates externality benefits (such as socialization and the promotion of democracy) that the public finance of education alone cannot generate because public schools provide a "common educational experience that cannot be left to the vagaries of individual or family choice."[16] However, there is no empirical evidence this effect outweighs the possible inefficiencies associated with the public provision of education[17] or that private schools are less cost-effective than public schools at generating such effects. Furthermore, as West (1991) points out, there is little commonality of practice among public schools in the United States. If providing a common educational experience were the rationale for public provision of education, we would expect more homogeneity in the public school system. Absent significant externalities that are uniquely generated by a public school system, no economic rationale requires the public provision of education.

CONCLUSIONS

Economic theory provides three broad rationales that can warrant a role for government in primary and secondary education, and a substantial body of research provides empirical support for these rationales. Some degree of government participation in the education market is clearly appropriate from an economic perspective.

It is hard to justify the pervasive nature of government participation in the current system, however. On the basis of these rationales, government's role in primary and secondary education should be subordinate to the role of families and primarily focused on assisting in education finance and ensuring that schools produce desirable social outcomes. Instead, we have a long history of public provision of education wherein the vast majority of school-age children attend public schools, parents cannot

How Families Pay for Elementary and Secondary Education

Although the true extent of their burden is unknown, families pay for the education provided by "free" public schools in a variety of ways.

The value of the time students bring to the classroom represents an enormous share of our educational resources. At the high school level, between one-half and two-thirds of U.S. school resources come from the students themselves in terms of opportunity costs.[1]

Another direct source of revenue from the family to the school is the school taxes individuals pay on their residences. Whether they own or rent, residents usually foot the bill for property taxes, although landlords may bear some portion of the tax burden for rental property (Martinez-Vazquez and Sjoquist 1988, Roche 1986).

In addition, research suggests that homeowners are willing to pay a premium to live in a neighborhood with good schools (Hayes and Taylor 1996, Black forthcoming). Any such premium represents a payment for public schooling, whether or not that payment is captured by the schools in the form of higher tax revenues.

Finally, families with children pay for schooling by picking up much of the school tax burden that originates at the business level. Because capital must earn a comparable after-tax rate of return in all parts of the world, taxes on business capital are actually paid by the parents and the nonparents who work for the firm or buy its products. Furthermore, landlords seldom bear the full burden of taxes on business real estate. For example, Man (1995) finds that Phoenix property owners pay only 60 percent of the property taxes on commercial real estate while property users pay 40 percent. Similarly, McDonald (1993) finds that Chicago landlords pay only 55 percent of property taxes on commercial real estate, while the remainder is passed through to tenants in the form of higher rents. For the same reasons taxes on business capital are passed through to workers and customers, rent differentials resulting from property taxes also tend to be passed through to workers and customers.

[1] In 1996, average annual earnings were $15,478 for 18- to 24-year-old males with less than a high school diploma who worked full time (U.S. Bureau of the Census 1997). Therefore, assuming a nine-month school year, the opportunity cost of a year of school would be $11,609. Alternatively, the minimum wage in 1996 was $4.75. Again assuming a nine-month school year and full-time employment, the opportunity cost of a year of school would be $7,125. Average expenditures on public elementary and secondary schooling for the 1996–97 school year were $5,957 per pupil (U.S. Department of Education 1998).

Comparable calculations cannot be made at the grade-school level because child labor laws make it impossible to observe potential wages for younger children and because very young children are not only unemployable but also require costly supervision.

know the full extent of their responsibility for education finance because the tax code assigns that responsibility to an array of parties, and pundits see no dissonance between pursuing expanded subsidies for education and opposing government plans to gather and disseminate information about educational outcomes. Education policy in the United States is apparently about something other than economics.

NOTES

[1] The data on educational expenditures are from National Center for Education Statistics (1997, 1998).

[2] Even if lenders could legally enforce long-term labor contracts, there are substantial principal–agent problems associated with forcing people to use their human capital.

[3] "Some altruistic parents do not leave bequests because they get less marginal utility from consumption by their adult children than from their own con-

sumption when elderly. They would like to raise their own consumption at the expense of their children's, but they cannot do this if unable to leave debts to children....Selfish and weakly altruistic parents would like to impose a large debt burden on their children....

Parents who cannot leave debt can substitute their own consumption for their children's by investing less in the children's human capital and instead saving more for old age. Therefore, in families without bequests, the equilibrium marginal rate of return on investments in children must exceed the rate on assets saved for old age; otherwise, parents would reallocate some resources from children to savings. These parents underinvest in their children" (Becker and Murphy 1988, 5–6).

[4] Because college students are overwhelmingly adults, this argument does not apply to postsecondary education.

[5] Alternatively, de Bartolome (1988) argues that "in-kind transfers may be a necessary instrument of redistribution" when household wealth is unobservable: "A family 'reveals' its wealth by its choice of house size and education level: redistribution may be effected by linking tax policy to housing and educational choice. Cash transfers alone cannot be used to effect redistribution because all families appear alike."

[6] On the other hand, Maré (1995) demonstrates that Rauch's results can be sensitive to the inclusion or exclusion of metropolitan areas, the choice of discount rate, and the specification of metropolitan area characteristics. His analysis also suggests that educational externalities (if any) arise from postsecondary education rather than from primary or secondary education.

[7] In this context, the social return includes the private return.

[8] Other possible explanations include imperfections in the market for physical capital and variations in political risk.

[9] Levine and Renelt find that although the initial secondary-school enrollment rate enters their basic model of growth in real, per-capita GDP with a significantly positive and robust coefficient, it is insignificant in models with a richer set of explanatory variables (Levine and Renelt 1992, 950).

[10] For example, Behrman and Birdsall (1983) find that in Brazil quality differences are as important as attainment differences for understanding variations in earnings and that analyses of attainment alone can be misleading.

[11] Donohue and Siegelman (1998) find evidence that pre-school enrichment programs targeted to at-risk students can cost-effectively reduce crime. Because "the available evidence does not demonstrate any delinquency-reduction effect for Head Start" (a general enrichment program for preschoolers), their results are unlikely to extend to general primary and secondary education.

[12] Wyckoff does not indicate whether the $1,222 is significantly greater than the lower bound expenditure on the survey of $825 per pupil. Twenty-seven percent of survey respondents chose the minimum level of expenditure.

[13] The demographic variables are the percentage of the school-age population in public schools, the percentage of public school students in high school, and the percentage of public school students who are non-white.

[14] Hadley does not explain why he excludes the variables on state and federal aid and student demographics. While the aid variables are insignificant in Weisbrod's original estimation, the nonracial demographics are individually significant at the 5 percent or 10 percent level. (Weisbrod does not report a test of joint significance.)

[15] Even if one postulates that the benefits from education arise primarily from signaling productivity to potential employers rather than from the creation of human capital, the private benefits clearly outweigh the non-private benefits of such signaling.

[16] Levin 1991, 139.

[17] For a discussion of such inefficiencies, see Grosskopf, Hayes, Taylor, and Weber (1997).

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