

4. For efficiency, should there be a price for using the Internet? If so, how should it be determined? In particular, is "flat rate billing" efficient? Would you charge the same amount for sending 800-byte electronic-mail messages as you would to send 1 million bytes of digital video? Would you charge an access fee?
5. Suppose there is an "access fee". Some have argued that it may be difficult to exclude users and that some may be able to bypass such a fee. An economist claims that such an action could actually be "efficiency enhancing". Could the economist ever be correct? Explain.

To What Extent Is Education A Public Good?*

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Recently, the issue of "privatizing" various aspects of government has received a great deal of attention. Responsibility for the provision of a good can be shifted between the public and private sectors in a number of different ways. Society could "privatize" the production, the finance, or the determination of price and quantity of a good, or any combination of these. While much has been made of getting the government out of the provision of goods and services by shifting those responsibilities to the private sector, the discussion seems to have ignored the public finance theory that could form the basis for such decisions. First we will address the issue of how to define and measure the degree of "publicness" of a good or service; then we will empirically estimate the publicness of primary and secondary education.

For economists, the decision of the appropriate division between public and private responsibility frequently rests with the criterion of efficiency. The theory of public goods is often employed to justify public expenditures, or the lack thereof, for particular activities. Public goods are defined as goods that are consumed in a nonrival and nonexcludable manner. Nonrivalness implies that the cost of an additional consumer is close to zero, while nonexcludability suggests that an individual cannot be easily prevented from receiving the benefits of the good. An example of a public good would be the flood control benefits produced by a dam. Additional down-river residents can consume the benefits without reducing the benefits of others (nonrivalness), and once the dam is built they cannot be prevented from receiving the benefits (nonexcludability). Goods that are either nonrival or nonexcludable in consumption may not be allocated efficiently by the private market because the marginal unit benefits many people. Decentralized markets do not have a mechanism to sum the benefits of the marginal unit, and thus marginal benefits do not equal the costs of the marginal unit.

THE DEGREE OF PUBLICNESS IN A MIXED GOOD

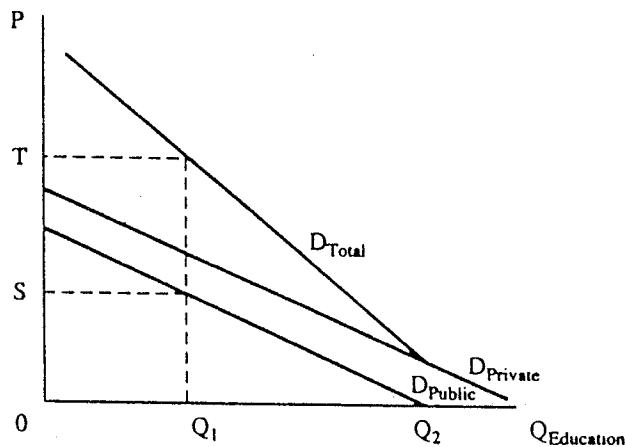
While some goods may be public goods in the strict sense of being nonrival and nonexcludable, others may only be partially nonexcludable and/or nonrival. To understand the appropriate financial role for government in such circumstances, we need to understand the relative extent of these public and private good attributes. This article concentrates on defining a measure of publicness for goods that are nonexcludable and applies that measure to the socially and financially important case of primary and secondary education.

Primary and secondary education is often modeled as a mixed good—one that embodies both private and public benefits. Students and their parents receive direct benefits from education, such as increased

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earnings potential, child care, and improved quality of life. These benefits are rival and excludable in that additional resources are required to educate another child and society could exclude children from receiving an education. The benefits that accrue to the child and parents are reflected in the private demand for education. It has also been suggested that there are benefits to society that are not captured solely by the educated child and the child's family. For example, education causes individuals to be better informed voters and citizens, reduces crime and other antisocial behaviors, and redistributes wealth. These benefits accrue to everyone in society, whether or not they have children in school. Individuals with children in school will have both a private demand for the education of their own child and a public demand for the education of all school children.² Individuals without children in school would express only public demand for education.

Figure 1



Public and private demands are shown in Figure 1. The aggregate public demand is obtained by summing the individual public demands vertically, since the nonexcludability of the benefits allows each unit produced to satisfy the demands of all consumers for that unit. The aggregate private demand is the horizontal sum of the individual private demands. The total demand for education is obtained by vertically summing the aggregate public demand and the aggregate private demand.

The publicness of education is measured as the willingness to pay for the aggregate public benefits divided by the total willingness to pay for the marginal unit. This is the proportion of total demand that is public at the margin. In Figure 1 the publicness coefficient at Q_1 is OS/OT . A pure private good, one with no public externality at the margin, would have a publicness coefficient of zero (as at Q_2), while a pure public good, one with no private benefit component, would have a publicness coefficient of one.

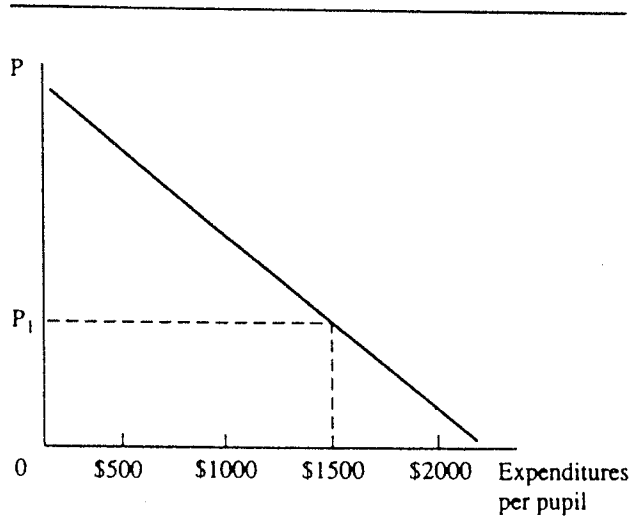
It is important to note that the definition of publicness is calculated at the marginal unit. In the case of education, for example, there are likely to be substantial inframarginal externalities. That is, citizens may place a high value on children learning to read, write, and perform basic computations. They may see less value to society of children learning calculus, which may be in the child's own self-interest to pursue. A publicness coefficient of zero does not imply that society does not value education; rather, it means that, at the margin, society does not receive any benefits from education, illustrated at Q_2 .

Many goods are neither purely public nor private, but are likely to have an element of publicness to them. The measure of publicness defined above allows us to broaden the debate from the appropriateness of public versus private finance to what proportion of public finance is appropriate. It may be appropriate, for example, to charge some tuition for children to attend public schools.³ The portion of costs paid for by tuition could depend on the magnitude of the publicness coefficient.

ESTIMATING THE PUBLICNESS OF EDUCATION

To estimate the publicness of primary and secondary education we must be able to determine the willingness to pay for the public aspects of education separately from willingness to pay for the private components of education. Figure 2 represents an individual's demand for education. The cost of an extra unit of education is distributed among property taxpayers according to the assessed value of their property. So there is a price, a tax price, that each property owner pays to finance an extra unit of education. The tax price varies from person to person, due to variation in assessed value. By estimating the relationship between price and quality of local education preferred for a number of otherwise identical individuals we will be able to trace out the demand curve shown in Figure 2. It is assumed that the demand revealed by individuals without children in school is only the public demand for education. Individuals with children in school reveal a demand that is the sum of their public and private demands for education. The private demand for education can be inferred as the difference between the demand estimated for individuals with children in school and the demand estimated for individuals with no children in school.

Figure 2



There are at least three potential problems with this delineation of private and social demands. A child's relatives or family friends may, like the parents, express what is most properly defined as a private demand, but it will be recorded as part of the social demand if these interested parties have no school-attending children of their own. Second, parents of preschoolers may express higher than otherwise expected demands in the belief that it takes time to develop school quality. Again, this is most appropriately thought of as a private demand for education.⁴ Finally, nonparents may express a willingness to pay for education in the belief that the higher expenditures will be attractive to individuals considering where to live and thus would be favorably capitalized into the value of their property. Such

behavior should be included as part of the private demand. Each of these possibilities is ignored in the estimates presented below.

To obtain data to estimate the individual's private and social demands for education, a mail survey was conducted immediately following a referendum on school operating expenditures in a Michigan community. Referenda are one of several collective choice mechanisms for determining the quantities of publicly provided goods and services. The preference revelation problem typically associated with determination of demands for public goods (people refuse to admit their willingness to pay for a public good if they think they will then be forced to pay for it based on their expressed interest) is not an issue in this context because individuals decide on quantity with the knowledge that price is given. In Figure 2, an individual with a price of P_1 would like to choose a quantity as close to \$1500 as possible.⁵ Revealing more or less than the desired quantity at the given price may make the individual worse off if the collectively chosen quantity is changed as a result.

Individuals in the community, both those who voted and those who did not, were asked how they voted (or would have) on six proposed levels of expenditure per pupil (\$875, \$939, \$1004, \$1684, \$1749, or \$1813). Expenditures per pupil is employed as a proxy for the quantity (quality?) of education since defining a measure of output for education is difficult.

The survey collected information on the individual's choice of expenditures per pupil; the assessed value of property; the number of children in school; and the education, sex, occupation, and age of the individual—as well as some other information. Knowledge of variables other than price and quantity are important so that in constructing estimates of the private and public demands, other variables that may affect demand can be controlled for. Expenditures per pupil is the dependent variable; price, income, number of children in school, education, sex, occupation, age, and other characteristics are independent variables. Using the data collected in the survey, a statistical estimation technique called an ordered probit model, which is similar to regression analysis, estimates the shape of the private and public demand functions.⁶

EMPIRICAL RESULTS

The estimates suggest several interesting relationships. With the recognition that expenditures per pupil may not represent the quantity of education demanded very well, individuals were asked whether they believed that increased expenditures affected the quality of education. Those who answered yes to this question are estimated to have demands for education that are 25 percent greater than those who said no. An individual employed by the school district has a private demand that is estimated to be 40 percent greater than a similar individual who is not employed by the school district. These individuals may value education more highly than others, but it is also likely that self-interest is at work here. Individuals who have some college education are estimated to have demands that are 13 percent greater than those who did not attend college. Someone who has two children in school has a private demand that is nearly 25 percent greater than an individual with only one child in school and over 50 percent greater than someone with no children in school. The estimated coefficients on price and income imply that the public demand for education is inelastic with respect to both price and income. The price elasticity is minus 0.21, and the income elasticity is 0.46. The private demand for education is not statistically affected by price or income. This may indicate that families place a high priority on the education of their own children and are unwilling to reduce quantity with increases in price or decreases in income over the ranges of those variables represented in the sample.

Employing the estimates of individual private and public demands, we can compare the size of the aggregate private demand for education with the aggregate public demand and compute an estimate of the publicness coefficient for primary and secondary education. As noted before, the private demands

are summed horizontally and the public demands are summed vertically to arrive at the aggregate demands. The estimated aggregate curves are then used to compute the publicness coefficient at various levels of education expenditures per pupil.

The publicness coefficient for the level of expenditures desired by the median voter⁷ is estimated to be 0.09. This estimate implies that at an expenditure level of about \$1500 per pupil, roughly 10 percent of the marginal benefits are social, with about 90 percent being private. Reasonable bounds on this estimate are from 0.0 to 0.50.

While the estimate of the publicness of education is only illustrative, because of the limited nature of the sample employed in the estimates, it does suggest that efficient allocation of primary and secondary education may be achieved with less than complete public finance. To date, little empirical research has been done to address the issue of the appropriate financial role of government in the provision of mixed goods and services. Building upon traditional public finance theory, further empirical work can contribute to our economic perspective on this increasingly important set of public policy issues.

NOTES

1. The nonrival dimension of publicness is addressed in Borcharding and Deacon (1972) and Bergstrom and Goodman (1973).
2. The public demand may be spatially limited to one's own town or state. This would be an example of a local public good.
3. As with other goods, such as food, health care, or higher education, society would likely want to ensure the poor would not be excluded from receiving an education due to the cost.
4. However, in preliminary estimates of demand, a dummy variable indicating the presence of preschoolers in the household was statistically insignificant.
5. The referendum stated how much each quantity of education would affect the millage (tax) rate; P_1 is calculated as the per-unit millage rate increase times the individual's assessed property value.
6. Estimation by ordinary least squares regression is inappropriate in this case because the dependent variable is limited to one of six values rather than continuously varying. Employing OLS would cause the errors to be heteroskedastic and would lead to inefficient estimates.
7. The median voter is the voter whose quantity demanded is in the middle of all voters when voters' demands are arrayed in ascending order. In an election employing a majority rule decision criterion, the median voter is the decisive voter.

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