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VALUES AND EFFICIENCY IN FINANCING EDUCATION

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Within the last few years several economists have advocated that our public elementary and secondary school system be replaced with a system of grants for education [2, 8]. The Office of Economic Opportunity has proposed a pilot project for poor children which embodies some of the suggestions of these critics of the public school system [1]. Pauly [8], however, is to my knowledge the only individual who has attempted to do a rigorous analysis of efficiency in financing education. While his article is an excellent pioneering effort, it contains several methodological and substantive shortcomings. In particular, his major substantive conclusion may not be valid.

No one has demonstrated, however, that there are inefficiencies inherent in equal provision of public support to each student, whether facilities be publicly or privately owned. This paper will show that, if efficiency considerations are controlling, ethical canons of distribution being neglected, unequal public support is necessary under most plausible circumstances. [8, p. 12].

Pauly also argues that if the "community desires every child to have some fixed minimum level of education, then efficiency requires unequal lump-sum public payments for different families."

In this paper I will show (1) that the efficient kind and level of public support of education depends upon the very ethical canons or judgments Pauls wishes to neglect; (2) that to the extent that education vouchers or lump-sum payments differ from cash grants they are less efficient than price subsidies; and (3) that equal public support may be efficient under a set of plausible circumstances. In the first section I will argue that values about the distribution of income have implications for the analysis of efficiency in financing education. In the second section I will examine the relative

efficiency in achieving different social-policy objectives of alternative methods of financing education.

I. INDIVIDUAL VALUES AND SOCIAL POLICY GOALS

Pauly asserts that the only rationale for government subsidization of education is that private consumption of this good generates external citizenship and literacy benefits. Assume for the moment that this is true. Even in this case, it is impossible to determine the appropriate government role in financing education without considering the ethical judgments Pauly wishes to neglect. Suppose that "the"¹ socially efficient minimum level of education consumption for all children exceeds the private demand of some parents for the education of their children. One method of increasing the consumption of these children is to subsidize their education. Another method is to require through legislation that all children must have at least "the efficient" level of education. If income effects are ignored, education consumption will be identical in the two cases, and in both cases the Samuelson conditions will be satisfied.² Both methods are efficient. The choice between the two methods involves an ethical judgment about the distribution of income between potential taxpayers and potential beneficiaries of the government subsidy.

Distributional considerations, therefore, would play a very important role in evaluating alternative methods of financing education even if the only rationale for a government role in financing education was the citizenship and literacy benefits generated by private consumption. However, distributional considerations per se undoubtedly provide a

good deal of the impetus for government subsidization or provision of basic education. Consequently, to ignore these values in an analysis of the efficiency of the public school system is to ignore the heart of the problem.

In a discussion of the social benefits of basic education, Levin [6] suggests that elementary and secondary schooling generate two kinds of externalities:

1. Provision of minimum levels of literacy, knowledge, and understanding of our common heritage which are necessary for the functioning of a stable and democratic society.
2. Reduction of disparities in incomes and opportunities presently associated with race and social class.

Implicit in the latter argument is the assumption that the degree of equality in the consumption of basic education is an argument in the utility functions of many individuals in society. Given legislation such as Title I of the 1965 Aid to Education Act, Head Start programs, the Supreme Court decisions on segregated schools in which the concept of equal education has played such a crucial role, and finally the widespread belief in our country that more equal educational opportunities is one of the best cures for poverty, this assumption is quite "plausible."

In the implications for financing medical care differ substantially depending upon whether equalization or minimum provision is the relevant argument in individual utility functions, it is impossible to analyze the efficient method of financing education without considering the very ethical canons Pauly ignores. In Part II I show that the implications for the appropriate government role in financing education are quite different for these alternative values.

II. EFFICIENT METHODS OF ACHIEVING POLICY GOALS

I now consider the efficiency of alternative methods of achieving a minimum level of consumption and equal consumption of elementary and secondary education. To simplify the analysis, I assume: (1) education is a homogeneous good or that higher-quality units of education can be treated as a multiple of lower-quality units; (2) the supply of education is in private hands and is perfectly elastic; (3) the demand for education is a function of only income and price and is linear; (4) at a price of zero, all families demand the same amount of education for their children;³ (5) policymakers have knowledge of individual demand curves and the aggregate supply curve; and (6) income effects (including those of taxation) can be ignored because they are so small. Finally, I assume that society's social welfare function is such that forcing individuals through administrative fiat to increase the education consumption of their children would be unacceptable.

Consider a society composed of three individuals: a rich, a middle-income, and a poor man. Their demand curves for education--RD, MD, and PD--and the aggregate demand curve RABC are shown in Figure 1. If the initial price is OX, the consumption of the three individuals would be decidedly unequal. The rich man would purchase Q_R , the middle income man Q_M , and the poor man only Q_P units of education for their children. Aggregate output would be Q_0 . In the absence of any desire by citizens to subsidize education this would be the efficient output. For at Q_0 the costs of producing the benefits from consuming education are equal at the margin.

A. Minimum Provision

If, on the other hand, society wished to assure that all individuals consumed no fewer than Q_A units of education, subsidizing only the poor man's consumption so that he pays only OY per unit of education would achieve the goal.⁴ The cost would be $XYST$ dollars.⁵

It can be shown through the use of indifference-curve analysis that a lump-sum grant or voucher for education may be no different than an unrestricted cash grant and that achieving the same minimum level of education through a voucher system would cost more money.⁶ In Figure 2 dollars are measured along the vertical axis and dollars spent on education rather than units consumed are measured along the horizontal axis. The original budget constraint AB therefore has a slope of -1 . Indifference curves are not drawn so as not to clutter the diagram. The initial or pre-subsidy equilibrium is at E_1 . AE_1P is the price consumption line, which in this case is generated by either taxing (along AE), or subsidizing (along E_1P) education. OI is the income consumption curve, which in this case may be thought of as being generated by negative or positive cash transfers. Finally, E_1DG is the locus of points generated by transfers via vouchers for education.

First note that vouchers may be no different than cash transfers. Consider a voucher of AC dollars. The budget line for the beneficiary is just ABC' . If he were given AC dollars in cash, his budget line would be $A'B'$. In either case equilibrium is at E_2 . Only if the voucher is larger than AD will the voucher stimulate more spending on education than a cash grant.

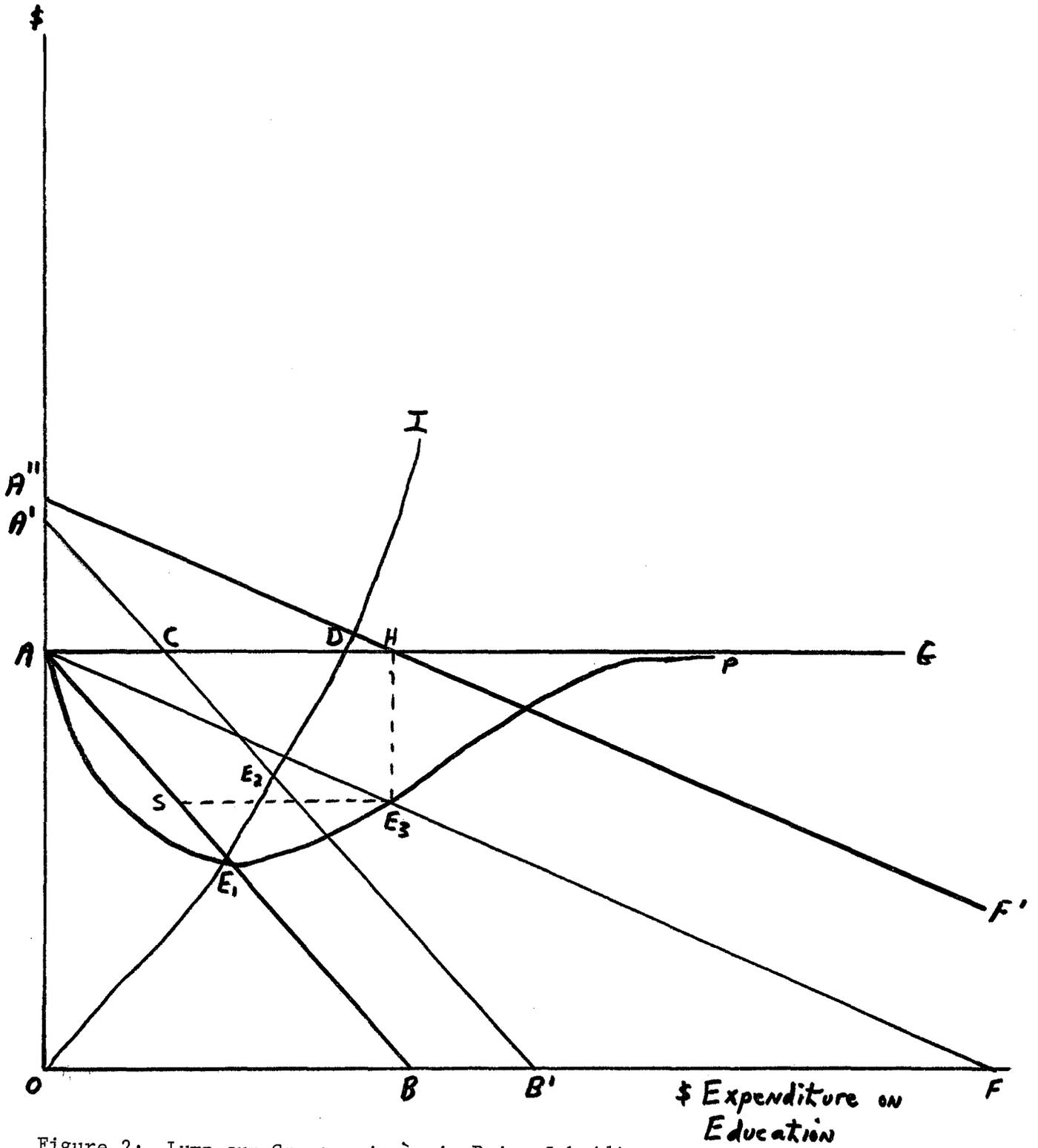


Figure 2: Lump-sum Grants vis-à-vis Price Subsidies

Even in this case, however, the price subsidy will stimulate as much spending for less tax money. A voucher worth AH dollars would lead to a total expenditure on education of AH dollars. A price subsidy which pivoted the price line to AF would lead to an identical total expenditure on education but the subsidy cost would be only SE_3 dollars. For extremely large subsidies the difference between the two methods will be less pronounced. But since E_1P always lies below E_1DG , a price subsidy will always be more stimulative than a voucher of equal dollar size.

Finally, if the effect of the voucher differs from a cash grant, i.e., the value of the voucher is greater than AD, the voucher must be inefficient. For the taxpayer who derives utility from increases in the beneficiary's consumption of education would prefer to spend SE_3 rather than AH dollars for the same increase in the beneficiary's consumption. As long as the taxpayers pay AH dollars, the beneficiary would prefer to have the $AH-SE_3$ dollars in cash. The taxpayer would be no worse off in this case. Alternatively, it might be possible to hold the beneficiary's welfare constant along the indifference curve through H and increase the welfare of the taxpayer by spending less than, more than, or exactly AH dollars on a pure subsidy scheme.⁷ What combination of in-kind and cash redistribution will be efficient will depend on the taxpayer's and beneficiary's preferences.⁸ In any case it is clear that in this case the voucher system is inefficient.⁹

B. Equal Consumption

Suppose that individuals in our society believed in equalization rather than minimum provision. Even if the degree of equality in basic educational consumption were an argument in the utility functions of all individuals, it might not be efficient to achieve equal consumption. Whether or not equal consumption is efficient involves the question of the efficiency of in-kind redistribution which I have discussed elsewhere.¹⁰ Initially I will assume that achieving perfect equality is efficient, then I will examine the case where greater but not perfect equality is efficient.¹¹ In discussing the equalization value I assume that the argument in individual utility functions is the standard deviation in the consumption of X.

Consider Figure 1 again. Equal consumption can be achieved by subsidizing the consumption of both the poor and middle-income men so that the price is reduced to OZ per unit for the former and OY per unit for the latter. In this case they will both purchase Q_R units of education, aggregate output will be Q_E , and equal consumption will be achieved. While I will show that this is not necessarily the most efficient method of achieving equality, it is more efficient than free provision with unrestricted supply. If the government assumed the responsibility of paying for everyone's education, this would reduce the price of education to zero. If no restrictions on supply were introduced, aggregate consumption and output would be C units. If income effects are of second-order importance, the value to R, M, and P of their own additional consumption can be measured by the area under their demand curves, which when summed equals $Q_E CF$ dollars. Since the

additional consumption does not lead to more equality in consumption-- what can be more perfectly equal?--no one will place any value on this additional consumption of care by others. But the cost of the additional units of education is equal to Q_E CHE dollars. A partial measure of the inefficiency of achieving equal consumption through a free system therefore is CHEF dollars. To this measure must be added the welfare cost of the extra taxation needed to finance the free education system.

A system wherein the government assumed responsibility for paying all education costs, therefore, would be an inefficient method of achieving equal consumption because it would entail (1) devoting an unnecessary large amount of resources to education and (2) raising an unnecessarily large amount of revenue to finance the program. Equal consumption would be more efficiently achieved through a subsidy scheme wherein the subsidy varies inversely with income and ceases altogether after some income level. The same argument, of course, applies to minimum provision.

1. *Subsidies, Taxes, and Equal Access*

If there were no political feasibility constraints the most efficient method of achieving equal access would be to subsidize the consumption of some individuals and tax the consumption of others. A pure subsidy scheme would be inefficient. Since society has decided that everyone must consume the same amount of education, every individual's private consumption becomes a public good. Hence the efficient output level is where their summed marginal rates of substitution equal the marginal rate of transformation, or if there is a numeraire good,

where their summed marginal benefits equal marginal cost. This solution is depicted graphically in Figure 3.

RM and PM are the rich and poor men's demand curves. In the pre-subsidy state, the market price is OX, the poor man's consumption is Q_p , the rich man's is Q_R . CM reflects the sum of the rich and poor men's valuation of their own education consumption. Given the decision to achieve equal access, the community marginal cost curve is CMC rather than MC. For although education consumption can be treated as a public good, it still has the private good attribute that one man's consumption reduces the amount left for others. The cost to society of producing $2Q_E$ units of education is not $OX \cdot Q_E$, but $2(OX \cdot Q_E)$, or in general, s times marginal cost, where s equals the number of individuals in society. The efficient level of output is therefore given by the point where CMC intersects CM, or at Q_E . At Q_E costs and benefits are equal at the margin.

A subsidy which reduced the price of education from OX to OY for the poor man and an excise tax which increased the price from OX to OW for the rich man would induce both of them to purchase Q_E units of education. A subsidy which reduced the price to OZ for the poor man would induce him to purchase Q_R units. In the absence of an excise tax on the rich man's consumption this would also result in equality. But this would be an inefficient level of output. The cost of the extra output would be equal to $Q_E Q_R FD$ while the benefits of the extra output to the rich and poor men would be equal to the areas under their demand curves, or only $Q_E Q_R BD$. Hence, a partial measure of the inefficiency of the pure subsidy scheme is DFB. To this measure must be added the "welfare cost" of the additional unnecessary taxation.

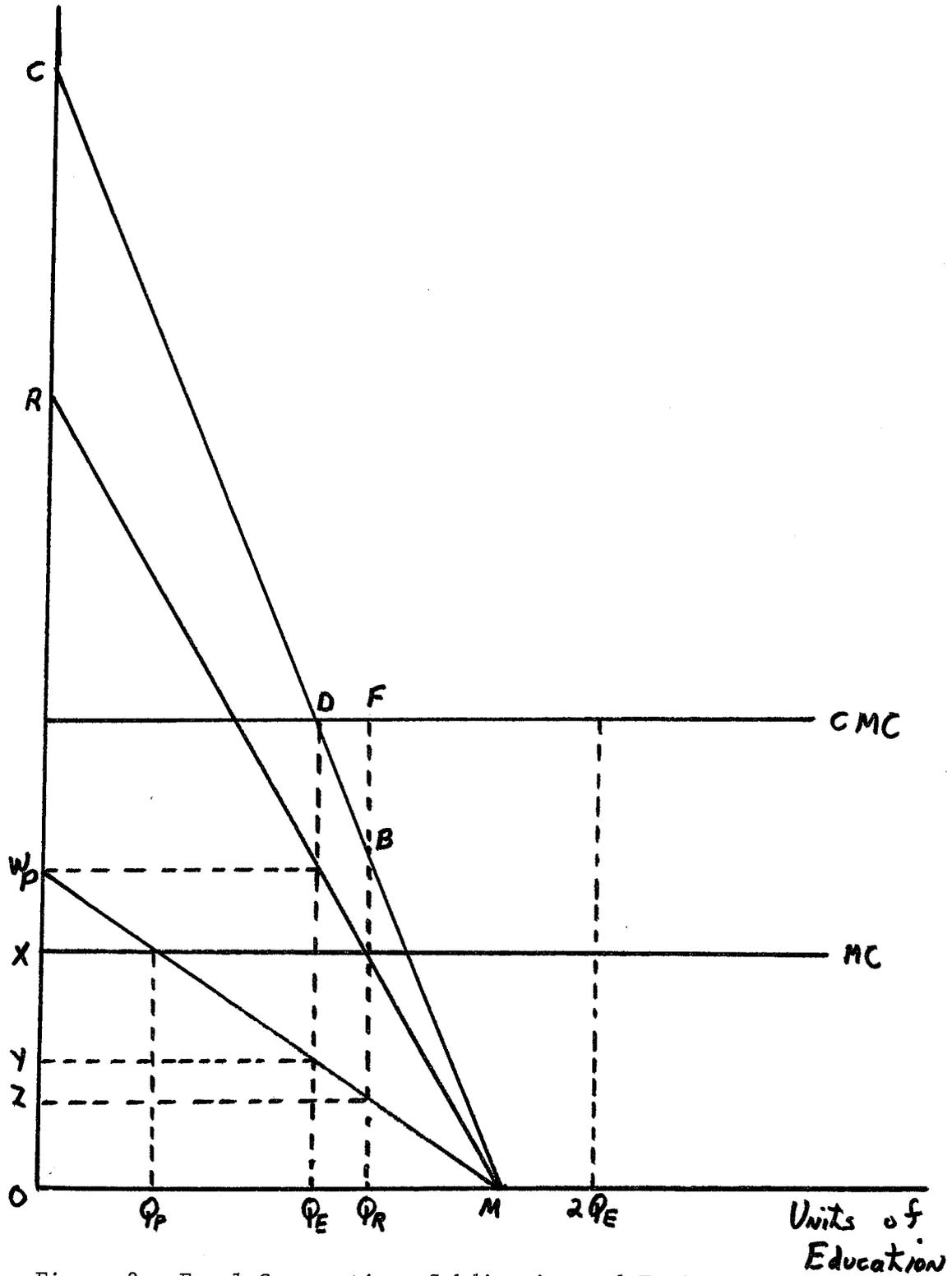


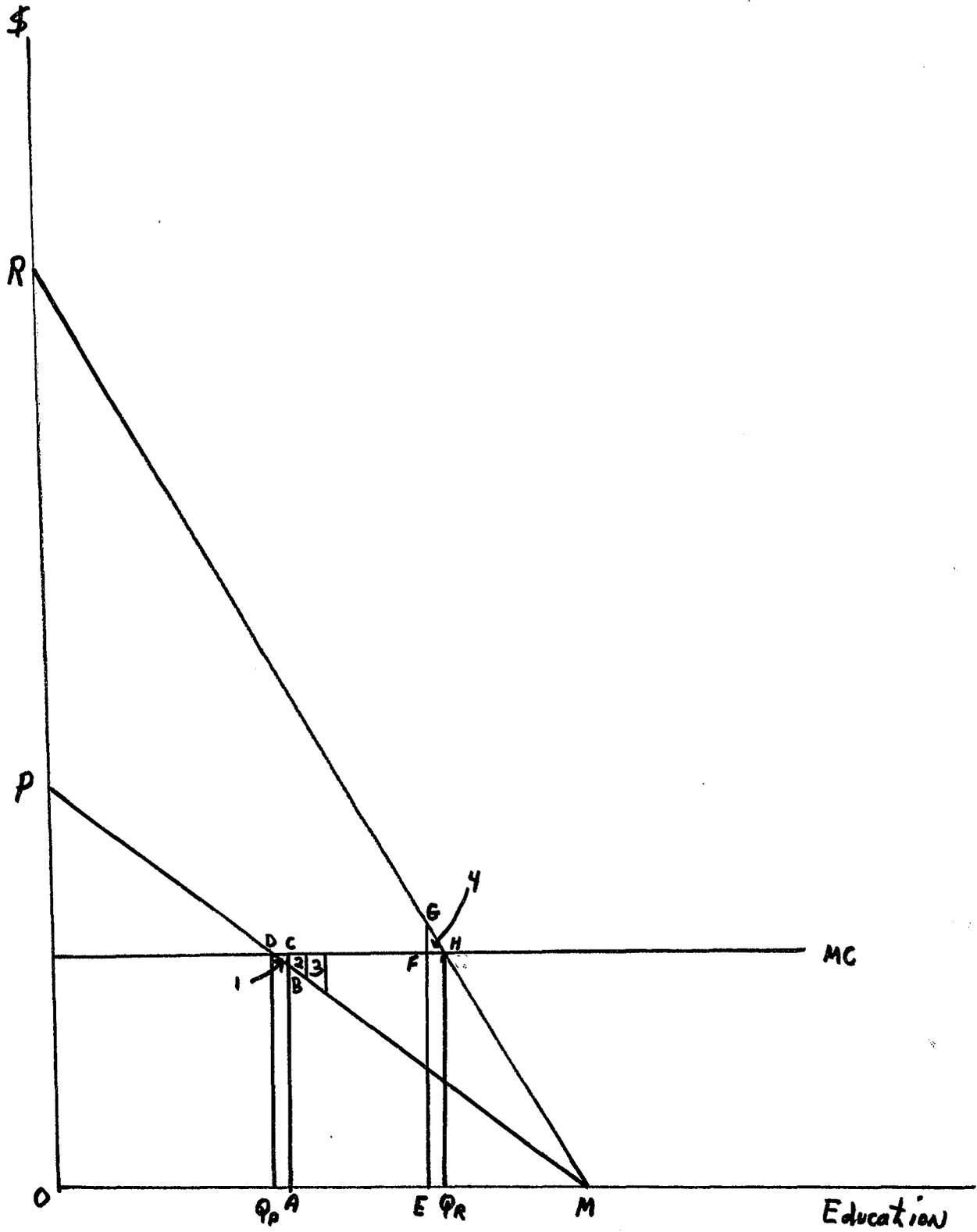
Figure 3: Equal Consumption, Subsidization and Excise Taxation

2. *More Rather Than Perfect Equality*

Now consider the case where greater equality than currently exists, but not perfect equality, is efficient. Greater Equality can be achieved by equalizing up, or equalizing down, or some combination of both. Unless the efficient increase in equality is very small, a combination of increasing the consumption of the poorer members and decreasing the consumption of the richer members of society will be efficient. This is illustrated in Figure 4, which is similar in all respects to Figure 3.

A one-unit reduction in R's consumption reduces inequality by the same amount as a one-unit increase in P's consumption. In the former case the net cost to society is given by the value R places on the forgone consumption of the unit of education, which in the absence of income effects is equal to the area under his demand curve, $EQ_R HG$, minus the savings to society of not producing that unit, $EQ_R HF$. Hence the net cost is equal to the area in triangle 4. Similarly, the net cost to society of increasing P's consumption is the cost of producing another unit ($Q_P ACD$) minus the value P places on that extra unit ($Q_P ABD$) or the area in triangle 1. Since 4 is larger than 1, in Figure 4 the first unit of equality should be produced by increasing P's consumption. Since 4 is also larger than 2 the second unit of equality should be similarly produced. But since 3 is larger than 4, society is better off if the third unit of equality is produced by curtailing the consumption of R. While the particular solution in Figure 4 depends upon the shapes of R's and P's demand curves and the supply curve, it is

Figure 14: Efficiency in Achieving More Rather than Perfect Equality



easy to see that any significant changes in equality will require both increasing the consumption of the poorer members and decreasing the consumption of the richer members of society.

However, the appropriate income-based excise tax might create serious notch or incentive problems in the individual income-tax system. Moreover, it seems fairly safe to assume that it is not politically feasible to impose an excise tax on, or otherwise directly restrict, wealthier individuals' educational expenditures. Consequently, in subsequent discussion I compare the efficiency of a pure subsidy scheme to that of free provision.

3. Restricted Supply and the Inefficiency of Free Provision

Up to this point I have assumed that if the government took over the responsibility of paying the total cost of everyone's education, supply would be allowed to expand to meet demand. However, if the industry is nationalized, the government can restrict supply below the level needed to equilibrate the demand for education at a zero price. If the alternative rationing device is neutral with respect to income class, equal consumption will be achieved.

If supply were restricted to the same level that would result from a pure subsidy system that achieved equality, the latter would be a more efficient system since taxes would be lower. But supply could also be restricted to the optimal level that would result from a combination subsidy/excise-tax system. In this case the free provision alternative might even be more efficient than the pure subsidy scheme. The welfare cost of the extra taxation of the former would have to be weighed against the excess output cost of the latter.

Since we do not have sufficient information on the demand for education to judge how close to optimal is the output level of education, it is difficult to make a judgment about the efficiency of the current system. In any case, if an excise tax on education is politically unfeasible, the efficiency or inefficiency of equal state provision cannot be decided on theoretical grounds alone. Rather, it is an empirical question.

III. CONCLUSION

The efficient financing of education depends on the values, particularly those that are concerned with distributional issues, held by individual citizen-consumers in society. Consequently, the appropriate government role cannot be determined *a priori*. One must first determine what kinds of values individuals in society hold.

However, it is possible to show that some kinds of government subsidies are inherently less efficient than others. For example, to the extent that a voucher or lump-sum grant for education differs from a cash grant of equivalent magnitude it is less efficient than a price subsidy. Similarly, if equal consumption is desired, either a pure subsidy system or free state provision would probably be less efficient than a combination subsidy/excise-tax system. But the latter may involve undesirable incentive effects and is probably not politically feasible. Moreover the relative inefficiency of free state provision may be limited to the welfare cost of the additional taxation needed to finance it. This will probably be quite minor.¹²

Free state provision may therefore be efficient under a very plausible set of circumstances. Of course, it is possible that the quality of privately produced education would be superior to that of publicly produced education. This claim of education-voucher advocates rests in good part on the notion that the quality of an industry's output depends upon whether that industry is competitive or monopolistic. While intuitively I believe that the quality of education might improve if the industry were made competitive--in many cases its hard to believe things could get any worse--the analytical validity of this claim is not obvious.

NOTES

¹I put "the" in quotes because contrary to what Pauly implies, there is no one efficient level of subsidization. There is an infinite number of such efficient levels depending upon the initial distribution of income and society's social welfare function.

²Taxpayers who would pay for the subsidy under the first alternative might be willing to pay for more subsidization under the second alternative. If the minimum is set high enough, however, their willingness to pay will disappear, even though they have paid nothing.

³Since the opportunity cost of sending children to school would probably vary somewhat among individuals, this assumption is undoubtedly false. For expositional purposes, however, the assumption is a useful one. A more realistic assumption would not alter the analytic argument.

⁴If the federal government assumed responsibility for subsidizing education, the price subsidy could easily be achieved through a vanishing income tax credit with full rebate. For further details of a similar proposal for financing medical care see [4].

⁵I do not consider the case where the government attempts to capture P's consumer surplus (see [8]). If the administrative cost of this approach were equal to the full price-subsidy approach, the choice between them would entail a welfare judgment. However, since the administrative cost of the former would be extremely high, it is less efficient than the price-subsidy system.

⁶Pauly's use of the oligopoly model of behavior is not only unnecessarily complex but misleading as well. While it is true that how much the community spends depends on how much the individual spends and vice versa, the externality is not reciprocal. There is no incentive for the individual to engage in strategic behavior. Because each individual makes up so small a part of the group his behavior will have no appreciable effect on the subsidy he and members of his income group receive. In other words, he will adjust his behavior to government policy which he takes as a given--except in his role as a citizen. The fact that he adjusts his behavior in response to price changes or changes in his budget constraint does not make him comparable to an oligopolist.

Most of the analysis that follows is based on James Wilde's analysis of the expenditure effects of general block grants, categorical block grants, and matching grants [9].

⁷The taxpayer's welfare would increase only if the utility he derived from an increase in the beneficiary's consumption of education outweighed the disutility he derives from giving up more of his income--if the latter is necessary.

NOTES (con't)

⁸See my discussion in [3].

⁹In the case where the voucher is equivalent to a cash grant it may not be inefficient precisely because it is equivalent to a cash grant. The beneficiary will be indifferent between the two. A price subsidy will make him worse off, but may improve the welfare of the taxpayer. Only if the utility the taxpayer would gain sufficiently outweighs the disutility the beneficiary would suffer from the change so that the taxpayer can compensate the beneficiary, will the voucher be inefficient. See my discussion in [3].

¹⁰In [3] I show that to analyze the efficiency of in-kind redistributions it is useful to postulate the following kind of potential taxpayer utility function:

$$U^T = U^T(Y_T, Y_B, X_B),$$

where Y_T is T's net income after redistribution, Y_B is dollars of cash redistribution from T to B (the beneficiary), and X_B is dollars T spends on subsidizing B's consumption of X. For the equalization case X_B would include the dollar value to T of his own forgone consumption of X which resulted from equalization.

¹¹Lindsay [7], in his discussion of equalization of health-care consumption, arrives at the same general conclusions as I do. However, his analysis is faulty in several respects. First, he assumes that the "efficient" level of equalization is determined by taxpayer demand for equalization, where taxpayers are defined as net subsidizers. In terms of the utility function in note 10, this means that the efficient level of equalization is achieved when

$U_{X_B}^T = U_{Y_T}^T$. In [3] I show that this is only one of an infinite number of efficient levels of equalization. $U_{X_B}^T$ may be less than $U_{Y_T}^T$, in other

words the taxpayer may not wish to pay for, or demand further equalization, but so long as $U_{X_B}^T > U_{Y_T}^T$, further equalization may be efficient.

Second, in comparing the efficiency of alternative methods of achieving equalization, he examines the cost to the taxpayer. While his conclusions happen to be qualitatively correct, conceptually his approach is incorrect. Finally, and most important, while Lindsay asserts that free state provision may be the best alternative in a world of second best, his analytical approach precludes him from including the free-state-provision alternative among the alternatives he examines analytically. In particular, his approach leads him to overlook the fact that the potential relative efficiency of free state provision depends upon restricting supply below the amount needed to equilibrate demand at a zero price.

NOTES (con't)

¹²Harberger's estimate in [5] of the welfare cost of the entire individual income tax in 1960 was less than \$1 billion.

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