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THE PARADOX OF INTERPERSONAL CARDINAL UTILITY: A PROPOSED SOLUTION

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THE PARADOX OF INTERPERSONAL CARDINAL UTILITY:

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Abstract

The impossibility theorems of Arrow, Sen, Kemp-Ng, and Parks show that interpersonally comparable individual cardinal utilities are needed for making social decisions. But virtually all economists regard cardinal utility and interpersonal comparisons of utility as practically impossible to obtain, if not conceptually meaningless and/or scientifically inadmissible. This paradox (Section 1) can be largely solved by a simple method (Section 2). Almost incredibly, this simple method calls for treating a dollar as a dollar except in the general tax/transfer system. This achieves a tremendous simplification in the formulation of economic policy in general and in cost-benefit analysis in particular. More astonishingly, pursued to its logical conclusion (Section 3), the argument compels us to say that, economists, as a group, should be in favour of the reversed weighting system (counting a dollar to the poor as worth less than a dollar to the rich)! The separation of "polity" (where "one person one vote" instead of "a dollar is a dollar" applies) from "economy" is mainly sustained by the attitudes of non-economists (Section 4).

1. The Paradox of Interpersonal Cardinal Utility

Arrow's (1951/1963) impossibility theorem shows that social choice[1] cannot reasonably be based on individual ordinal preferences only. Little (1952) and Samuelson (1967) rejected the relevance of Arrow's theorem to welfare economics. Specifically, it is maintained that what is relevant to welfare economics is a SWF for a given set of individual orderings. It is true that individual preferences may change. But for any new set of individual orderings, we have a new SWF. The Arrow impossibility result only applies by requiring that the same rule is used to derive the new SWF (or social ordering) from the new set of individual orderings as the one used for deriving the old SWF from the original set of individual orderings. By not restricting ourselves to observe such inter-profile consistency, ie, the same rule over different profiles or sets of individual orderings, we can free ourselves from the Arrow paradox.

Without agreeing to the argument of Little and Samuelson, Kemp and Ng (1976) and Parks (1976) show that, even operating within a framework of a given set (or profile) of individual preferences, ie, without considering a change in individual preferences, it is still impossible to base social choice on individual ordinal preferences only. This single or intra-profile impossibility result was quickly generalised (Hammond 1976, Pollak 1979, Roberts 1980), establishing a corresponding single profile impossibility result for every multi-profile result. Thus, whether one agrees with Little and Samuelson or not, one must accept the impossibility of a reasonable social choice based on ordinal individual preferences. One is compelled to consider the admission of cardinal utilities. Moreover, such individual cardinal utility indices must be interpersonally comparable. Disallowing interpersonal comparison, we have the impossibility result even with cardinal utilities (Sen 1970, pp.123-130;

DeMeyer and Plott 1971).

On the other hand, there is a long tradition in economics in regarding interpersonal cardinal utilities as impossible at least in practice, or even conceptually meaningless and scientifically inadmissible (see, eg, Kolm 1993). As Robbins (1938) put it, each mind is totally inscrutable to any other mind, making interpersonal comparisons of utility mere value judgments without any scientific status. I have argued elsewhere that interpersonally comparisons of utility are not value judgments but subjective judgments of fact and that economists are more capable in making those judgments of fact closely related to their field of study (Ng 1972). I also argue (Ng 1992a) that such views (apparently held by the majority of economists) on the conceptually impossibility of interpersonal comparisons of utility are based on the existence of souls (while a majority of economists, I believe, are philosophical materialists who don't believe in the existence of souls). I argue that individual utilities are not only cardinal and interpersonally comparable, but there are also practicable (though imperfect) ways to measure and compare utilities (Ng 1975, 1979/1983, 1985, 1992b). However, I freely admit that the practical difficulties associated with cardinal utility measurement and comparison are orders of magnitude higher than those for ordinal preferences (which still exist and are significant, though ignored by most economists).

Either we regard interpersonal cardinal utilities as impossible in principle or in practice, a paradox is created as they are needed for making social choice. In the next section, a method is proposed that to a very large extent, resolves the paradox of interpersonal cardinal utility.

2. The Proposed Solution

2.1 Using Unweighted Aggregate Costs/Benefits or A Dollar is a Dollar

The proposal to solve the paradox is simply using individual willingness to pay to obtain information on intensities of preferences and using unweighted aggregate willingness to pay in making social choice, plus the appropriate redistribution of total purchasing power to address the issue of equality. This frees us from having to obtain information on cardinal utilities and to compare them interpersonally, except in the decision on the appropriate redistribution of total purchasing power. Before justifying this solution, a number of clarifications are needed. (Some of these touches on some technical concepts; general readers may want to skip the rest of this section at least on first reading. However, expert readers will find these clarifications important.)

A. There are some ambiguities and controversies associated with the measure of the willingness to pay and the issue whether willingness to pay (CV or compensating variation in income) or willingness to accept (EV or equivalent variation) (in lieu of something) should be the appropriate measure. This is related to the problems in the measurement of consumer surplus. I have discussed and resolved the issue elsewhere (Ng 1979/1983, Chapter 4 and Appendix 4A). Basically, I argue that the differences between the various measures are usually minor and negligible in comparison to the inaccuracies of data collection and hence can be ignored in practice. Where the differences are large, I propose a better measure than either CV or EV called marginal dollar equivalent, defined as the number of times the relevant gain or loss is equivalent to that of a marginal dollar.[2]

B. Where external effects are important, the willingness to pay of the individuals directly involved may not be sufficient. The willingness to pay of the externally affected

individuals has also to be included. Similarly, where factors such as second best interconnections are relevant, they have to be appropriately taken into account. These efficiency issues do not change the principle of willingness to pay, they just require the principle to be applied more broadly.

C. Where ignorance of the individuals concerned are involved, the issue becomes more controversial. Personally, I believe that ignorance with minor effects should be just ignored, partly to save administrative costs and partly because the violation of free individual choice has indirect costs (for being inimical to freedom). However, where ignorance results in big losses, individual willingness to pay may have to be overruled or revised. Thus, we have such cases like the prohibition of certain addictive drugs, the fluoridation of water, and subsidised milk for school children.[3]

D. Even accepting the use of willingness to pay as the measure of intensity of preferences at the level of the individual, the acceptability of using ***aggregate*** (ie, over a number of individuals) willingness to pay is still controversial, ***even if*** the issue of equality or distribution is ignored. This is so because, as shown by Boadway (1974) and Blackorby and Donaldson (1990), a positive aggregate willingness to pay (CV) need not ensure that the gainers can overcompensate the losers even given the feasibility of lump sum transfers. This difficulty is discussed in Ng (1979/1983, pp. 96-98). Basically, it is argued that this difficulty is due to a change in relative prices as compensation takes place, possibly making aggregate willingness to pay not perfectly accurate as it is based on unchanged prices. Where changes in relative prices are not huge, as is true for most specific projects or measures, the inaccuracy involved is negligible. While aggregate willingness to pay does not correspond perfectly with a potential Pareto improvement, it corresponds closely for

most cases.

2.2 The Justification

The justification for using the unweighted (maximum) willingness to pay as a measure of the preference intensity of any individual (called "a dollar is a dollar" principle for brevity) is based on the following two arguments. First, abstracting away certain difficulties mentioned in the previous section, the amount an individual is willing to pay to obtain certain item reflects their intensity of preferences. The more intense is my preference for a certain performance, the higher is my maximum willingness to pay for it. This is less controversial.

Secondly, the reason we can use the ***unweighted*** willingness to pay is based on the argument that it is more efficient to do so and achieve whatever degree of redistribution desired through the general tax/transfer system.[4] This point needs more elaboration.

The main reason people may be against the principle of a dollar is a dollar is that a dollar to the poor or the more needy meets more urgent needs than a dollar to the rich. In fact, I agree with this belief and am in favour of helping the poor (provided the costs of doing so are not excessive). However, unless such factors as ignorance, external effects are concerned (making, for example, helping the poor by providing subsidised education and health care efficient), it is more efficient to help the poor through the general tax/transfer system instead of overriding the principle of a dollar is a dollar in specific items, such as using distributional weights in cost-benefit analysis, using first-come-first-served in allocating car parking spaces. A counter-argument to this is that the tax/transfer system involves excess costs in the form of disincentive effects (the problem of administrative, compliance, and policing costs is discussed in Ng 1984). It is thus believed that it is better

to achieve part of the redistribution through the progressive tax/transfer system, and partly through specific equality-oriented measures such as subsidising goods consumed disproportionately by the poor and using distributional weights in cost-benefit analysis. However, this counter-argument (held by most economists, including myself before I analysed the problem carefully) ignores the fact that the use of such specific purely-equality oriented policies has the same disincentive effects as the tax/transfer system, but also has additional efficiency costs by distorting choice.

It is tempting for an economist to think that, since the substantial redistributive tax/transfer system has significant (larger than marginal) disincentive effects at the margin, it is better to shift some of the redistributive burden to specific items such as taxing/subsidising items consumed disproportionately by the rich/poor. Though some ***marginal*** efficiency costs of distorting choice are created, they are thought to be smaller than the reduction in disincentive effects due to relying less on the progressive tax/transfer system. This belief is incorrect. The reason is that, assuming rational individuals, the disincentive effects are in accordance to the total system of tax/transfer, taxes/subsidies, plus all other redistributive and preferential measures, instead of having a separate and independent increasing marginal disincentive effects schedule for each of the separate measures. A rational person, in their work/leisure choice, do not just ask how much post-tax income they can earn, but also have a rough idea the utility they can get from consuming goods and services purchased from the income. They are trading off the utility of leisure with the utility from work (which consists of the utility from consuming the higher income and the positive or negative utility of work itself). Moreover, the utility of consuming the higher income is affected by whatever specific redistributive or preferential measures are in place. Thus, the preferential treatment against the rich in government expenditure and

other areas will ***add on*** to the progressive tax/transfer system to determine the total disincentive effects. Hence, even if only a marginal amount of specific equality-oriented measures are used, the disincentive effects involved are not just marginal. Thus, for the same degree of equality in real income (utility) achieved, the same degree of disincentive effects is incurred whether we use only the tax/transfer system or use a combination of it and some specific purely equality-oriented system. But the latter alternative has the additional efficiency costs of distorting choice, and is thus inferior.

In Ng (1984), the following proposition is proved.

Proposition A (A Dollar is a Dollar): For any alternative (designated A) using a system (designated a) of purely equality-oriented preferential treatment between the rich and the poor, there exists another alternative, B, which does not use preferential treatment, that makes no one worse off, achieves the same degree of equality (of real income, or utility) and raises more government revenue, which could be used to make everyone better off.

Under alternative B, a more (than alternative A) progressive tax/transfer system may have to be used. By definition, progressivity in the tax/transfer system is not classified as "preferential treatment" here. In Ng (1984), I also argue that complications such as administrative costs, political constraints, ignorance of benefits distribution, etc, either strengthen the proposition or do not affect the main thrust significantly.

In fact, proposition A can be generalised to any efficiency-inconsistent alternative A, not just an equality-oriented preferential treatment. The proof of the proposition is exactly unaltered if the preferential treatment is not equality-oriented but inequality-

oriented. Instead of counting a dollar to the poor as worth *less* than a dollar to the rich in cost-benefit analysis, it is better to tax the rich less and tax the poor more (or subsidise them less). Similarly, an alternative based on random treatment, one based on tradition, etc, can all be shown to be inferior to some alternative *B* defined to compensate for the gains and losses in dismantling the efficiency-inconsistent methods used. Then, ignoring issues of practical difficulties, individual ignorance, irrationality, and procedural preferences (on the last item, see Ng 1988), alternative *B* must be Pareto superior.

However, the ***existence*** of alternative *B* does not necessarily mean that it can be identified and implemented. If system *a* is ***designed*** to take account of second-best considerations, then system *b* can also be so designed. But system *a* may only be consistent with second-best considerations by ***chance*** rather than by design. In addition, the informational costs of designing a system consistent with the second-best considerations may be prohibitive.[5] Then we may not be able to identify system *b*. Thus, while alternative *B* may exist, it may not be feasible to implement. Thus, if we wish to strengthen Proposition 1 to be one about the existence of a ***feasible*** superior alternative *B*, it would apply only in a probabilistic sense. That it (the strengthened proposition) still applies in a probabilistic sense is due to the theory of third best. Just as it may be consistent with second-best considerations, system *a* may also be opposite to the requirement of second best. The theory of third best (see Ng 1977) can then be used to show that the expected gain is negative. Hence, as far as the second-best consideration is concerned, the use of system *a* involves negative expected gains. Essentially, random divergence from the first best is as likely to be inconsistent as to be consistent with the requirement of second best. Due to the expected concavity in the relevant objective function, the gain when it is consistent is less than the loss when it is inconsistent. So the expected gain is negative.

(See Ng 1979/1983, Ch.9 and Ng 1984 for more detailed demonstration of this.)

The half-a-century old argument of Little (1951) may be briefly discussed at this juncture. Basically, Little argues that one cannot say that a direct tax (on income) is better than an indirect tax (on some goods) on the ground that the former taxes all goods at the same rate. The reason is that there is another good, leisure, which is also untaxed under direct taxation. Taking the simple case of just two non-leisure goods (see the top half of Figure 1), an indirect tax on one of the goods causes a wedge (between relative costs and benefits, or more precisely, between MRS and MRT) between that good (good 1) and the other good (good 2) as well as between that good and leisure. A direct tax causes a wedge between good 1 and leisure and between good 2 and leisure. Hence, no conclusion can be made on the desirability of direct versus indirect taxes without specific information on the interrelationships between the various goods and leisure. While this argument is formally correct in a certain sense, it is misleading in its conclusion. Thus, it is certainly true that an indirect tax on half of the (non-leisure) goods may be less distorting than a direct tax (equivalent to a uniform tax on all non-leisure goods) of equal revenue, *if* the former happens to concentrate on goods more complementary to leisure. However, if the former is just a random half, then it may be taken to be worse than the direct tax, at least in terms of average expectation. To see this, first consider a case where all goods are of equal degree of complementarity/substitutability to leisure. An indirect tax on half of the goods is then inferior to a direct tax of equivalent revenue. On the other hand, if (the first) half of the goods is more complementary to leisure than the other half, while an indirect tax on the first half is more efficient than the direct tax, this efficiency gain is less than the efficiency loss when the second half is taxed instead. (Both points are illustrated in specific mathematical examples in Appendix A.)

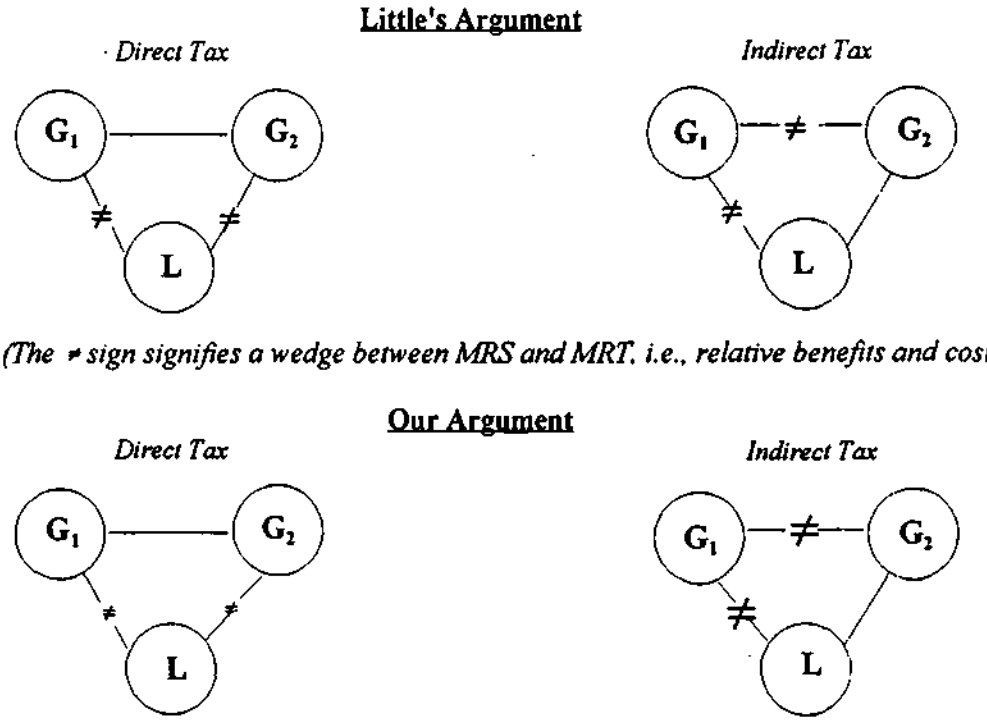

Figure 1

In terms of the "wedge" argument of Little, we may say that, while a direct tax (of say 10%) drives a moderate wedge between both goods and leisure, an indirect tax on half of the goods (typically in excess of 20% to yield the same amount of revenue) drives a much bigger wedge between the taxed and untaxed goods, and between the taxed goods and leisure. (See Figure 1.) It is thus inferior to the direct tax at least in terms of expected value. If the goods taxed are randomly selected with respect to their complementarities to leisure, this bigger wedge between the taxed goods and leisure already induce, in terms of expected value, as big a disincentive effect (as the case of the direct tax). In addition, there is a distortion effect on individual choice between goods. Thus, in spite of Little's argument, a direct tax is better than an indirect tax not designed to take advantage of second-best considerations (complementarities with leisure). Our argument here is consistent with the general view in public finance that, other things being equal, a broader

tax is a better tax.

Equality-oriented policies and other non-efficiency-oriented policies in the real world are, as far as I am aware, without exception, not based on the second-best consideration. Due to the non-taxability of leisure, goods highly complementary to leisure should be taxed more on the grounds of second best. Due to the higher income tax rates on the rich, the second-best consideration may suggest imposing taxes on the rich even higher than on others for the same leisure-complementary goods, and imposing higher taxes on leisure-complementary goods that are predominantly consumed by the rich. It may thus be thought that higher taxes on luxuries (defined as goods consumed mainly by the rich) may be justified on efficiency grounds. However, it is equally true that goods highly substitutary to leisure should be subsidised (or at least taxed less). Hence, due to the higher income tax rates on the rich, the second-best consideration also suggests giving ***more*** subsidies to the rich than others for the same leisure-substitutary goods, and giving higher subsidies on leisure-substitutary goods that are predominantly consumed by the rich. Thus, luxuries as such do not justify higher taxes. (The proposal to impose high taxes on "diamond goods" which are valued for their values is a separate matter of pure efficiency; see Ng 1987.)

In practice, it is also informationally, politically, and administratively impossible to design and implement specific taxes/subsidies and other specific economic measures in accordance to the requirement of second best. This requires full information of the interrelationships of all relevant sectors in the economy. It may be informationally feasible to take account of the more important interrelationships. But political considerations may make it infeasible. For example, the political feasibility of giving higher subsidies on leisure-

substitutary goods predominantly consumed by the rich is certainly suspect. In addition, the adoption of the principle of a dollar is a dollar will save substantial administrative costs and achieve much simplicity. Its political feasibility, though certainly better than the second-best policies of subsidising the rich more than others for the same leisure-substitutary goods, has yet to be fostered through a long process of education, starting with the understanding of the argument of this paper by economists.

3 Economists Should Be in Favour of Reversed Weighting!

At the risk of repetition, it should be emphasised that our argument for using ***unweighted*** sum of willingness to pay or for treating a dollar as a dollar is ***not*** based on valuing a dollar to the poor as worth no more than a dollar to the rich. In fact, personally, I value the former as worth much more than the latter. If manna were to fall from heaven (and regarded as once only, or at least as unrelated to income), I would certainly hope that they fall to the poor. However, if we adopt as a policy of treating a dollar to the poor as worth more than a dollar to the rich, this will create disincentive effects and hence is inferior to using the tax/transfer system to reduce inequality instead. I am not against the attempt to reduce inequality, just against using inefficient method to do so.

It is true that governments may not actively and optimally pursue distributive justice through income taxes and transfers. However, in the long run, some degrees of distributive balance are maintained. Even if this does not lead to an optimal trade-off between equality and efficiency, it is incorrect to ignore that some degree of balance is being maintained. As far as I know, all those in favour of using distributional weights or inequality-averse criteria

effectively ignore any degree of such a balance, or, at least they have not shown their awareness of the implication of such a balance on the appropriate distributional weights. Of course, they are aware of the existence of such a balance. However, this balance implies that the distributional weights should be less unequal (eg, a dollar to the poor counted as only $1.20 instead of $2) than the case in the absence of any balance. In the presence of an optimal balance, no weights (or only equal weights) should be used. In the presence of an excessive balance (ie, equality pursued at excessively high incentive costs), the distributional weights should be reversed (ie, more weights to the rich than to the poor). Nevertheless, no advocate (as far as I know) of distributional weights or inequality-adverse criteria has explicitly shown an awareness in this respect. Many people probably believe that the distributional weights should be proportional to the social marginal utility of a dollar. However, this can only be justified if the use of distributional weights have no disincentive effects (which are efficiency costs over and above their direct distortive costs). I strongly suspect that many of those in favour of distributional weights simply ignore these disincentive effects.

It is possible that, despite some degree of balance between equality and efficiency, an economist may regard the balance as being far too inadequate. They may think that much more equality should be achieved despite the inefficiency costs involved. While this is certainly possible, the reverse case that an economist may believe that too much efficiency costs are being incurred to achieve equality should be even more likely, or at least as likely. As a group, economists are unlikely to be more equality-inclined than either politicians, bureaucrats, or voters generally whose inclinations influence government policies. Secondly, economists are more aware of the efficiency costs of pursuing equality, including administrative, compliance, policing, and disincentive costs. Thus, one should expect more

economists to find the actual trade-off between equality and efficiency being excessively in favour of equality than the other way round. So, one should expect more economists in favour of using reversed distributional weights than those in favour of using the normal distributional weights. However, to my knowledge, not a single economist has come out in favour of reversed weighting. In fact, the most radical in this respect is probably Posner (1981), a lawyer, who is in favour of wealth maximisation. (My argument of treating a dollar as a dollar differs from Posner's as I allow for the achievement of equality through taxes/transfers beyond wealth maximisation.) These considerations support my suspicion that many economists in favour of distributional weights simply ignore the disincentive effects involved, not just because they are more egalitarian.

What about those minority of economists who are genuinely more egalitarian than the prevailing policy? In my view, they, as economists, should not be in favour of using distributional weights and purely equality-oriented policies. However, as citizens, they should campaign to move government policies towards more equality (preferably by using more efficient methods), while the majority of their fellow economists, as citizens, should campaign for less equality if, as I argue about, they view the equality-efficiency trade-off as having been pursued to an excess.

4. Economics vs Politics

It is noted above that the proposition of a dollar is a dollar can be generalised to show the Pareto inferiority of any efficiency-inconsistent alternative *A*, not just an equality-oriented one. Interpreting this generalization widely, the principle of a dollar is a dollar can be

applied to areas outside the traditional confines of economics. Then, what prevents the application of the simple efficiency principle from being used in political issues like the election of a president or members of a parliament, where the principle of one person one vote seems to be universally accepted?

It is tempting for one to believe that the answer lies in the need to limit the power of the rich. Using the simple efficiency principle of "a dollar is a dollar" would allow the rich too much power in political decisions. This answer is incomplete, to say the least. The main point can be explained simply. If we limit the range in which the market or efficiency principle apply, we need to have more inequality in income distribution to maintain the same degree of incentives since the range of things income can be spent on has been reduced. Thus, if the same degree of incentives is to be maintained, the poor cannot be made better off. In fact, every income group will be made a little worse off due to the inefficiency of restricting the working of the market. On the other hand, if we are prepared to reduce the degree of incentives in order to make the poor better off, we could do this more efficiently by just making the tax/transfer system more progressive, without restricting the working of the market. This point is shown more precisely in a simple mathematical example available from the author, showing that the random restriction of the range of market operation makes both the rich and the poor worse off.

In fact, the point can be seen without the mathematical example. To see it more clearly, abstract from the effects of changes in relative prices (which could go either way) by considering a case of fixed earning abilities and fixed prices (as could be facilitated by constant returns, small country, etc). Starting from a situation where some of the goods (private, no external effects) are not subject to market allocation but are supplied in fixed

amounts by the government to everyone (possibly equally), dismantle the government provision and allow these goods to be allocated in the market. The savings of the government from not having to provide these goods are then used to pay each individual, with each individual getting the worth of the previously allocated amounts of these goods in money and free to buy whatever quantities desired. Then obviously no individual can be worse off as she can buy the previously allocated quantities if so desired. (It is assumed that the transaction costs of market allocation are not higher than that of government allocation.) Those choosing to buy different combinations (including buying more or less of some or all goods) of these goods are made better off.

The market economy can be shown to function perfectly efficiently in the sense of Pareto optimality mainly under the assumptions of perfect competition, adequate information by the market participants, and the absence of external effects. Thus, possible reasons for government intervention or even replacing the market include objective beyond Pareto efficiency on the one hand and certain serious violations of the above assumptions (called "market failures" below) on the other. In my view, a valid objective beyond Pareto efficiency is distributional equality. (See Ng 1988, 1990 for arguments on the unacceptability of many other proposed objectives.) However, as argued above, the objective of equality may justify a progressive tax/transfer system but does not justify specific efficiency-inconsistent measures. It is true that this argument assumes the feasibility of the appropriate tax/transfer system. Where such a system is politically or administratively infeasible or subject to very important uncertainty in its effects (Kelsey 1988), it may be efficient to supplement the tax/transfer system with other specific equality-oriented measures, including commodity taxes (Cremer and Gahvari 1995). While such a possibility cannot be completely ruled out, problems of administrative costs and political difficulties

are likely to be more serious for the specific equality-oriented measures, as argued in Ng (1984, pp.1040-1041). Thus, we have to look to market failures for valid reasons for replacing the market.

Different degrees of market failures prevail all over the place, most requiring no or only limited intervention instead of supplanting the market altogether. Thus, the existence of some market failures is not enough; we have to look for very substantial, even overwhelming, extent of market failures. I do not think we can find this with respect to market power and ignorance. The wealthiest person may be able to wield many times more influence than an average person if willingness to pay is taken into account, but in most countries, no single person earns a substantial fraction of the GNP. While substantial ignorance is involved in political voting, it is not substantially alleviated by going for the one-person-one-vote solution. This leaves external effects as the possible source of substantial market failure.

Three distinct types of external effects may be associated with political decisions. First, political decisions taken may externally affect people beyond the jurisdiction and people in the future. This external effects has little to do with the issue here, since the choice of either one-person-one-vote or willingness-to-pay has negligible effects on these external effects. Secondly, political decisions, being concerned with public issues, involve the public-good external effect. Both the choice (usually in elections) of public officials and the decisions of the public officials on public issues (including law and order, other regulations, provision of public goods) are related to the public-good problems, including that of free riding. Thus, if we allow voters actually able to pay money to express their willingness to pay, most of them may pay nothing, preferring to free-ride. However, this

problem only makes the willingness-to-pay principle difficult to put into effect, it does not make the principle undesirable. If we have more sophisticated method of inducing self-interested voters to express their true willingness to pay, such as the use of the Vickrey-Clarke-Groves incentive-compatible mechanism on a carefully selected sample of voters (Ng 1979/1983, Sec. 8.3), the free-riding problem could be overcome. Thus, I see the next external effect as the most important stumbling block to the use of the efficiency principle in political decisions.

The third type of external effects associated with political decisions is less similar to the normal external effects familiar in economics; it may even be controversial to describe it as an external effect. The functioning of a modern society, including its economy, requires political stability, the maintenance of law and order, and preferably also a high degree of social cohesion. These elements may also be desirable for the psychological well-being of individuals in the society. These desirable elements are fostered by a political system using the one-person-one-vote principle in its political process instead of the willingness-to-pay principle, except for a society where the majority of its citizens are as good economists as you (ie, the likely readers of this article) and me, and this is well nigh impossible, at least in the foreseeable future. The use of the efficiency principle in political process is likely (if not certainly) to generate feelings of apathy, antagonism, and the like against the government, the wealthy, and law and order among the poorer classes and those in the political fringe. This will increase the difficulties or costs of maintaining law and order and will likely reduce stability and cohesion. Thus, the exercising of the preference intensities through the willingness to pay in traditionally political sphere, especially by the rich, may be said to entail important external costs. In most cases, this consideration makes the use of one-person-one-vote principle optimal in the political process despite the

existence of the normal inefficiency associated with supplanting the market. This is the most important factor, as far as I can see, explaining the separation of political and economic spheres. However, since this factor depends on the attitude of the people, as this attitude changes with time and with the understanding of economics, the optimal sphere of economics will gradually expand. Nevertheless, knowing the difficulty of teaching basic economic principles even to university students, I am not at all optimistic about the speed of this expansion and about the ultimate conquest.

APPENDIX A

The Superiority of Income Tax: Two Illustrative Example

In this appendix, we present two specific examples to illustrate our argument. For mathematical simplicity, we consider only two individuals with the same utility function but different earning abilities, three goods (including leisure), and a specific preferential treatment in the form of a differential tax/subsidy on a particular good. Example 1 shows that, for the case of a Cobb-Douglas utility function (where the two goods do not have differential degrees of complementarity with leisure), a differential tax on a good may be replaced by a more progressive income tax while making both individuals better off and also increasing government revenue. Example 2 shows that, if good X is more complementary to leisure, a differential tax on it may improve matters. But this is justified on efficiency grounds. Moreover, if the differential tax is imposed on good Y instead, matters are made far worse. Since both examples refer to specific functions and values, they do not of course constitute a general proof.

Example 1

For simplicity, let the common utility function be Cobb-Douglas with specific numerical parameters,

(B1) $U = L^{\frac{1}{2}} X^{\frac{1}{4}} Y^{\frac{1}{4}}$

where L = leisure, X and Y are the amounts of the two goods consumed. The fact that the powers add up to unity is of no consequence (apart from computational simplicity) since if they don't, we can always maximise U^r such that the normalised objective function has

powers adding up to one.

Again for simplicity, assume that L can be transformed into X or Y linearly so that we may choose units to make the transformation ratios equal to unity for the poor person P and equal to a constant w for the rich person R. Assume a linear income tax with constant marginal tax rate T but increasing average tax if I, the amount of guaranteed income, is positive. (As in Atkinson, 1973.) Permitting a general tax schedule would in fact give us more scope for using income tax alone to achieve our objective. But the resulting mathematics is too complicated.

Now consider the criterion of applying the preferential treatment. The degree of preferential treatment cannot be person-specific. Otherwise we could just use a system of lump-sum taxes/subsidies. One way is to relate it directly to income. But it is mathematically simpler and conceptually richer to relate it to the consumption of a particular good, say X. With the given utility function (1), R will consume more X at the same price (unity). Preferential treatment of P versus R can be achieved by subsidising the first few units of X consumed and taxing the latter units. Suppose the subsidy is 50% and the tax is 95%. The dividing line between subsidy and taxation $\left(\bar{X} = 6\right)$ is chosen such that P will consume less than $\bar{X}$ despite the subsidy and R will consume more than $\bar{X}$ despite that tax. This simplifies the mathematics but requires that w is sufficiently larger than unity (abstracting away from non-labour income). It can then be seen that P will maximise (1) subject to

$$\text{(B2)} \qquad \frac{1}{2}X + Y = I + (1 - T)\left(\bar{L} - L\right)$$

where $\bar{L}$ is the given amount of time (the same for both persons). R will maximise (1)

subject to

(B3) $$3 + 1.95(X - 6) + Y = I + (1 - T)w\left(\bar{L} - L\right)$$

where 3 is the amount he pays for the first 6 units of X which are being subsidised. From the firsc-order conditions (second-order conditions are obviously satisfied for this simple problem) and the constraint equations, the following may be derived. (Subscripts P and R indicate the respective persons.)

(B4) $$X_P = (1 - T)L_P,\ Y_P = (1 - T)\frac{L_P}{2},\ L_P = \frac{\bar{L}}{2} + \frac{I}{2}(1 - T)$$

(B5) $$X_R = (1 - T)\frac{wL_R}{3.9},\ Y_R = (1 - T)\frac{wL_R}{2},\ L_R = \frac{\bar{L}}{2} + \frac{(I + 8.7)}{2w(1 - T)}$$

Taking specific values $\bar{L} = 12$, $I = 1$, $T = ¼$, $w = 8$, we have

(B6) $$L_P = 6.\dot{6},\ X_P = 5,\ Y_P = 2.5,\ U_P = 4.855$$

(B7) $$L_R = 6.8083,\ X_R = 10.474,\ Y_R = 20.425,\ U_R = 9.979$$

Net government revenue G equals taxes minus subsidies and can be calculated to be

(B8)

$$G = \left(\bar{L} - L_P\right)T + w\left(\bar{L} - L_R\right)T - 2I - 3 + 0.95\left(X_R - 6\right) - \frac{X_P}{2} = 8.467$$

Now we want to delete the differential tax/subsidy on X and devise a new income tax $\bar{X}$ schedule such that both P and R will be made better off and G will increase. Since the deletion of the differential tax/subsidy on X itself will make P worse off and R better off,

we have to reduce the income tax on P and may increase that on R. This can be achieved with a common linear income tax schedule by increasing I and T, since R has higher income. The problem is to find some specific combination that will do the trick.

After the deletion of the differential tax/subsidy on X, the budget constraint for both individuals is

(B9) $$X + Y = I + (1 - T)w(\bar{L} - L)$$

where $w = 1$ for P. The following applies to both R and P.

(B10) $$X = Y = (1 - T)\frac{wL}{2},\ L = \frac{\bar{L}}{2} + \frac{I}{2w}1 - T$$

With the deletion of the differential tax/subsidy on X, let us increase the guaranteed income I from 1 to 4 and increase the marginal tax rate T from 0.25 to 0.38. Substituting these values into (10) and (1), we have

(B11) $$L_P = 9.226,\ X_P = Y_P = 2.86,\ U_P = 5.14$$

(B12) $$L_R = 6.403,\ X_R = Y_R = 15.88,\ U_R = 10.084$$

Comparing (11) and (12) with (6) and (7), we observe that P/R reduces/increases his consumption of X as may be expected (due to the deletion of the differential subsidy/tax). Due to the increases in I and T, P also reduces his hours of work (his leisure L_p increases). However, despite the increases in I and T, R increases his hours of work (L_R decreases). While increases in I and T have disincentive effect, the former differential

tax/subsidy on X also has a disincentive effect. Its removal thus tends to balance (in this case overbalance) the disincentive effects of the increase in I and T. Restriction to a linear income tax prevents us from devising a tax schedule that would make P work as hard as before. This shortcoming can be overcome if we are using a general tax schedule. But more importantly, in comparing (11) and (12) with (6) and (7), we see that U_P increases from 4.855 to 5.14 and U_R increases from 9.979 to 10.084. Both persons are made better off by replacing the differential tax/subsidy with a more progressive income tax schedule.[6] The new government net revenue can also be calculated

$$G = (L - L_P)T + w(L - L_R)T - 2I = 10.07 \tag{B13}$$

which is a significant increase from 8.467 (see Eq. 8).

We have thus shown that, by replacing the above differential tax/subsidy on X with an appropriately more progressive income tax, we can make everyone better off and also increase the government revenue. The reasons for this positive result is that the differential tax/subsidy does not only have disincentive effects as does a more progressive income tax, it also involves further distortion by artificially changing the prices of X. It is thus better replaced by a pure income tax system. It is true that, with the need to raise government revenue by income taxes (or other non-lumpsum taxes), we are in a second-best world. A change in the price of X from its first-best value may then not necessarily be a bad thing. (See the next example.) But we would need information on the interrelationships in the economy (such as complementarities with leisure) to decide which good and to what extent to tax/subsidise. Moreover, this departure from first-best values is justified on second-best grounds, not on equality grounds .

Some readers may wonder that perhaps the tax rate of 95% on X (in excess of 6

units) is too excessive in the sense that a marginal reduction in tax rate will actually increase government tax revenue from X. If so, this may be the reason why we can make both individuals better off and also increase government revenue by reducing the tax rate on X. However, this is ***not*** the case. The rather odd figure of 95% is in fact selected to ensure that the marginal revenue of a higher tax rate is still positive, as can be checked. Moreover, we do not just reduce the tax rate on X, we eliminate it altogether. The increase in government revenue is made possible by increasing the marginal income tax rate. The increase in utilities of both individuals is made possible by eliminating the differential tax/subsidy which is not only redistributive but also distortive.

Example 2

Now consider a case where the common utility function is such that X is much more complementary to leisure than Y.

(B14) $$U = L^{1/4} X^{1/4} + \frac{1}{2} Y^{1/2}$$

The initial situation involves no differential tax/subsidy so that both individuals maximise (14) subject to (9), where $w = 1$ for P and $w = 4$ for R. With $I = 12$, $I = 4$, $T = 0.5$ (at this rate, G still increases with T), we have

(B15)
$$L_P = 7.387961248\,,\ X_P = 3.69398062\,,\ Y_P = 2.612038748\,,\ U_P = 3.093714242$$

(B16)
$$L_R = 4.100505063\,,\ X_R = 8.201010126\,,\ Y_R = 11.59797975\,,\ U_R = 4.11089953$$

(B17) $$G = 10.10500926$$

Now let us impose a tax of 1.1% on the consumption of X over 5 units. P consumes

less than 5 units within the relevant ranges of parametric values. His budget constraint (9) thus remains unchanged. R's budget constraint is now

(B18) $$1.011X - 0.055 + Y = I + (1 - T)w(\bar{L} - L)$$

With the imposition of the 1.1% tax on X, we also reduce T from 0.5 to 0.4985 and reduce I from 4 to 3.994. We now have

(B19)
$L_P = 7.371816535$, $X_P = 3.696965992$, $Y_P = 2.618068011$, $U_P = 3.093858043$

(B20)
$L_R = 4.094050174$, $X_R = 8.12330826$, $Y_R = 11.69567071$, $U_R = 4.11138549$

(B21) $$G = 10.1179698$$

Comparing (18)-(20) with (14)-(16), we see that both individuals are made marginally better off and government revenue increases marginally with the change (a differential tax on X and a reduction in the marginal income tax rate). The reason we get this result in contrast to Example 1 is that X is now much more complementary to leisure than Y. A small tax on X with the accompanying reduction in marginal income tax rate encourages both individuals to work more. The tax on X serves as a second-best corrective to the income tax. It can thus be justified on efficiency ground. A system of purely equality-type preferential treatment does not take account of second-best considerations and hence, instead of imposing the differential tax on X, it could just as well involve a differential tax on Y instead. If a differential tax of a similar amount (1.1%) as above were

imposed on Y (in excess of 5 units), with $I = 3.994$, $T = 0.4985$ as above, we have

(B22)

$$L_R = 4.1219528,\ X_R = 8.268637317,\ Y_R = 11.45769076,\ U_R = 4.108668106$$

(B23) $$G = 10.09901018$$

Comparing (21) with (15), it can be seen that, instead of encouraging R to work more, the tax on Y (even with the reduction in T and I) in fact makes him work less. His utility is also reduced by more than four times his increase in utility in the case of a tax on X (see Eq. 19). Moreover, comparing (22) with (16), we see that government revenue also decreases. It is true that P, whose equilibrium remains at (18), is marginally better off. But if G is to remain at its initial value and R is not to be made significantly worse off, tax rates would have to be rearranged such that P has to be made worse off as well. It may be added that we are able to obtain these results despite the fact that Y is only (Edgeworth) independent of leisure in the utility function (14). If Y were in fact substitutary to leisure, the tax on Y would be even more undesirable.

Notes

1. Arrow only shows the impossibility of a complete social ordering. However, Sen 1969 shows the impossibility of a social decision function based on individual orderings by adding a compellingly reasonable condition

2. In my 1979/83 treatment, I did not discuss the big differences between willingness to pay and willingness to accept due to the unwillingness of many people to actually pay for something they believe they are "entitled" to or other similar problems. (See, for example, Milgrom 1993; Mitchell & Carson 1989.) For such cases, there are added practical difficulties to discover people's real willingness to pay as a reflection of their preferences for the items as such untainted by the objections or ill-feelings associated with payment. This difficulty of the intertwining of two different types of preferences/dispreferences is similar to the intrusion of factors such as regret, anxiety, excitement, etc, into the process or outcomes of choices involving risk, making the application of the expected utility theory difficult in those cases. However, in both cases, the principles involved are not invalidated.

3. See Ng 1979/83, Appendix 10 A.3, on the grounds for such merit and demerit goods.

4. As real tax liabilities depend on non-income characteristics such as age, marital status, home-ownership, etc, the evaluation of effective income tax progressivity may not be simple. However, see Hayes, Lambert & Slottje 1995 for an algorithm to evaluate effective income tax progression.

5. Second-best taxation-pricing rules are typically very complicated, even if only the efficiency consideration is taken into account. For the literature on optimal taxation, see Mirrlees (1976, 1981); Sandmo (1976). Conditions making second-best considerations ineffective are rather stringent, for example, separability in the utility function (see Atkinson and Stiglitz, 1976; compare Bergstrom and Cornes, 1983).

6. It is more important to observe the effects on utility levels than those on labour supplies. Due to the presence of income effects, a distortive tax may in fact increase labour supply

but it must reduce utility. While the gross disincentive effect of income tax may be zero or even negative, the net (of income effect) disincentive effect must be positive.

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