COST-BENEFIT ANALYSIS FOR INVESTMENT DECISIONS, CHAPTER 14:

THE SHADOW PRICE OF GOVERNMENT FUNDS, DISTRIBUTIONAL WEIGHTS, AND BASIC NEEDS EXTERNALITIES

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ABSTRACT

There is always a question, in cost-benefit work, about how far to go in incorporating additional externalities into a formal system of professional analysis. One consideration is the importance of the class of externalities in question; the alternative consideration is the degree of uncertainty that surrounds any estimate of the size of the externality. This chapter addresses three such externalities that have been widely discussed in the literature, but usually not applied in practice. Of the three the shadow price of government funds is likely to be the most important in terms of its impact on the design of public sector projects.

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CHAPTER 14
THE SHADOW PRICE OF GOVERNMENT FUNDS, DISTRIBUTIONAL WEIGHTS, AND BASIC NEEDS EXTERNALITIES

14.1 Introduction

There is always a question, in cost-benefit work, about how far to go in incorporating additional externalities into a formal system of professional analysis. One consideration is the importance of the class of externalities in question; the alternative consideration is the degree of uncertainty that surrounds any estimate of the size of the externality. Thus even important externalities (such as those dealing with national defense) can be too difficult to quantify for them to be incorporated directly into a cost-benefit analysis. In such cases the best advice is to calculate the net present value of the project using standard cost-benefit analysis, and present the policymakers with a statement like "This project has a net economic cost (in present value terms) of $3.5 billion. This does not incorporate its national defense benefit. Your decision, sirs, concerns whether the cost of $3.5 billion is worth incurring, as the price for achieving the national defense benefits of this project." A similar approach would very likely apply to projects dealing with offsetting some of the forces leading to long-term climate change and to many (though not likely all) cases of projects that deal with air or water pollution.

Our judgment in this matter is simple. When our information about the size of an item is so uncertain that some valuations, well within the plausible range, would make the project acceptable, while others, also well inside the plausible range, would lead to its rejection, then the final call in that project is not within the purview of professional cost-benefit analysis.

Of course, the constant challenge facing the profession is that of developing analytical and research techniques that will constantly narrow the ranges of uncertainty that we have to deal with. Thus, there have been impressive advances developing methods of quantifying the value of travel time (by commuters and others), and the amenity value of local parks and other neighborhood improvements. And we certainly can expect additional advances that will further

narrow the margins of uncertainty that apply in different fields. But at the same time we can be confident that in many major areas, the level of uncertainty will continue to be high for a long time to come. Our advice here focuses on the key word, professionalism. We should incorporate into our analysis whatever we can claim to be based on solid professional results and judgments, and leave to others those items on which we have no serious professional expertise.

In the cases of some externalities there may be a sort of middle ground. There are cases where an externality of a given type can be summarized in one or a few key parameters, which themselves can then be fitted quite easily into our professional cost-benefit framework. In this chapter we will consider three candidates that fall in this category: a) the shadow price of government funds, b) the distributional weights that might be applied to the benefits and costs of different groups, and c) the premia that might be attached to the successive steps of increased fulfillment of the basic needs of disadvantaged members of a society.

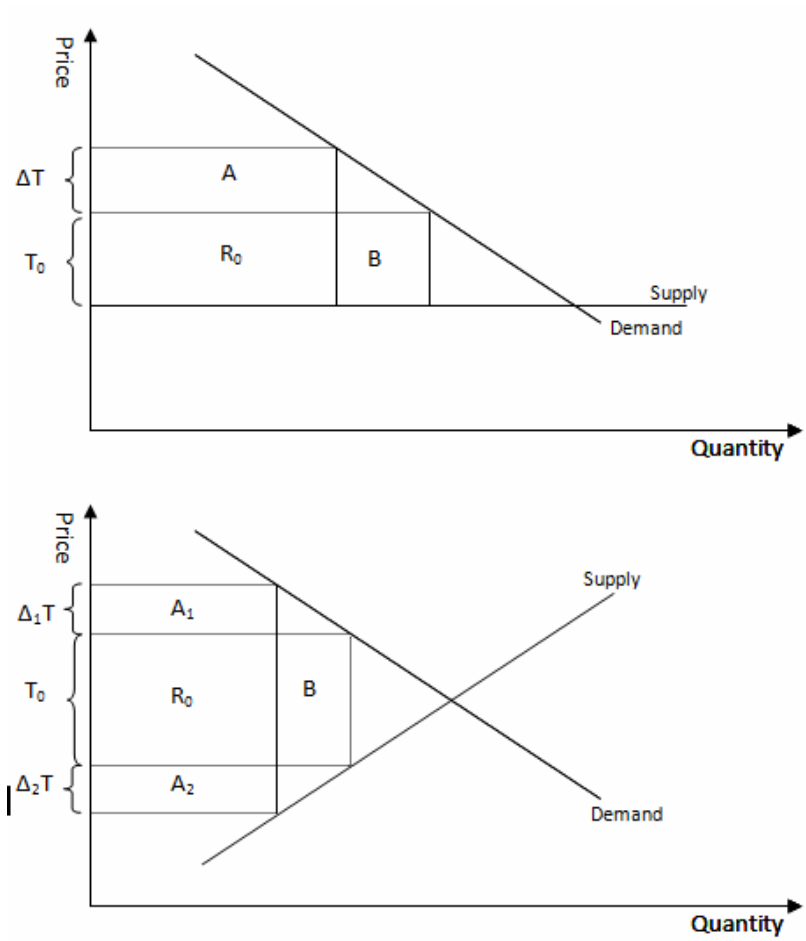
14.2 The Shadow Price of Government Funds

Cost-benefit analysis has traditionally been carried out on the assumption that the funds involved were being sourced in the capital market. And indeed, this is the assumption made in this Book (see Chapter 8 on the economic opportunity cost of capital). This assumption is easy to rationalize when the projects involved yield their full benefits in the form of cash accruing to the public treasury (e.g., an electricity or potable water project, with electricity rates and water charges set on the basis of economic principles). However, how does one deal with public projects that yield no revenue in the form of cash? In such cases the standard assumption of getting the money from the capital market seems to lead to a debt which then grows year after year, compounded at a rate equal to the economic opportunity cost of capital. If the latter rate is 10% (in real terms) that means a project for an ordinary highway (not a toll road) that cost $20 million, would compound to a debt of $40 million after 7 years, $80 million after 14 years, $160 million after 21 years, and $320 million after 28 years. If the economic cost of capital were 7%, the debt would reach $40 million after 10 years and $320 million after 40 years. In light of these

numbers, it is pretty clear that "something should be done" to tie up this loose end in the cost-benefit framework.

The answer is quite straightforward and logical. Somewhere, somehow, the framework should make provision for such debts to be paid. And the natural source for paying them should be taxes. This would require no adjustment if getting extra dollars via the tax route implied an economic opportunity cost of one dollar for every additional dollar raised. However, this is far from being the case in reality. Figure 14.1 shows why. In the upper panel, the tax T_0 originally yields revenue of R_0. When this tax is raised to $T_0+\Delta T$, revenue goes up by A-B. There is also an increment to efficiency cost, which can be approximated by B. Thus the extra efficiency cost, per dollar of additional tax revenue, is B/(A-B). In the lower panel we have an upward sloping supply curve. The rate now goes up from T_0 to $(T_0+\Delta_1 T+\Delta_2 T)$, and tax revenue goes up by $A_1 + A_2 - B$. Efficiency cost per dollar of extra revenue is in this case $B/(A_1+A_2-B)$.

Figure 14.1



For small changes in the tax rate the increment of efficiency cost is $-\tau(\partial q/\partial t)dt$, and the increment to tax revenue is $qdt + t(\partial q/\partial t)dt$. The ratio of these is simply $-e_{qt}/(1+e_{qt})$ where e_{qt} is the elasticity of quantity with respect to the tax rate, and is a negative number. Thus if e_{qt} is -.20, the marginal cost of extra revenue is 25 cents [= .20/(1-.20)] per dollar. If e_{qt} is -.25, this marginal cost is 33 1/3 cents [=.25/(1-.25)] per dollar. And if e_{qt} is -1/3, then the marginal cost of extra tax dollars is 50 cents [= .333/(1-.333)] per dollar.

The expression for the marginal economic opportunity cost of extra tax revenue is simple enough. The problem is that this number is likely to be different for every single tax in the system. Indeed, for complicated taxes like the personal income tax, there are literally hundreds of

different adjustments that could be made to the tax law, each of which would carry a different efficiency cost per extra dollar of revenue. We see no way of predicting what form the next change in tax law will take, hence no way to select from among all the possible ways, a particular one which we would want to call the "standard" way of raising extra tax revenue.

Now we face a problem. We do not want to choose a standard route for raising extra revenue, yet if we do nothing, we are implicitly assuming that the marginal efficiency cost of extra tax revenue is zero. This, of course, is also unacceptable.

Our solution is for the country's project evaluation (cost-benefit) authority to make that choice. Our recommendation is for the choice to lean toward the conservative side, so that the chance of its marginal cost of tax revenue being too high would be smaller than the chance of its being too low. In order to have a specific number to deal with, we will use a marginal cost of funds equal to 1.20, which implies an elasticity of the tax base (quantity) with respect to the tax rate of -1/6 (see above). We should also note that when this assumption is applied to real-world cases, the tax-base elasticity should incorporate increases in evasion as tax rates are raised, as well as the simple substitution of other items for the taxed item. Moreover, real-world efficiency costs of taxation should be defined to include the incremental costs of administration and compliance that are induced when a given tax rate is raised.[1]

14.3 Distributional Weights

In discussions of issues of how public policy should treat different groups of citizens, a particular approach, that of distributional weights, has enjoyed some degree of prominence. This approach applies different weights to the benefits and costs perceived by different groups of participants in the economy. Normally, higher weights apply to the poor and disadvantaged, lower weights to wealthier groups. The idea of such weights is appealing to most people, because they

[1]Some empirical results for the efficiency costs of tax on labor income are Dahlby (Canada), 1.38; Futm & Lacross (Quebec), 1.39-1.53; Jorgenson & Yun (U.S.), 1.35-1.40; Gruber & Saez (U.S.), 1.28; Klever & Kremer (U.K), 1.26, (Italy) 1.72, (Germany) 1.85; Hansen & Stuart (Sweden), 1.69. See, e.g., Dahlby, B., *The Marginal Cost of*

instinctively feel that an incremental dollar going to a richer person should be thought of as being less valuable, from the point of view of society as a whole, than the same dollar going to a poorer person. Sometimes this idea is embodied by the concept of a representative utility function, in which the marginal utility of extra money is calculated to decline as people's income or wealth increases.

Traditional applied welfare economics did not incorporate distributional weights; even while recognizing the likelihood that each individual's or family's marginal utility of income may decline as income or wealth increases. It did not take any complex analysis to get to this point. Actually, it followed directly from the choice of a numeraire in which real economic values were expressed. The standard numeraire for most real-world applications is either the consumer price index or the GDP deflator of the country under study. Thus, real economic magnitudes are either expressed in "consumer baskets" or in "producer baskets". When economic costs and benefits are expressed in terms of one or the other of these two numeraires, the translation from individual utility into units of the numeraire basket is implicitly made at the individual level. Individual A's utility is translated into numeraire baskets using A's marginal utility of the basket. B's translation occurs using B's marginal utility of the basket, etc., etc. for all the relevant individuals. There is no need for utility units even to be comparable across individuals, in order for this process to work.

Distributional weights can still be introduced into this framework, not being thought of as measures of the utility of each relevant individual, but instead as reflections of a societal decision of the importance of incremental purchasing power, as it flows into or out of the hands of particular individuals and groups. This way of framing the concept helps to avoid what was a particularly gnawing problem, when the weights were interpreted as directly measuring utility. That problem is most easily illustrated by a case of constant supply price, of, say, construction labor. The constant supply price means zero producer surplus is generated as additional labor is hired for a public project, yet the families involved may indeed increase their cash income by

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Theory and Applications, Cambridge: Massachusetts Institute of Technology Press, (2008). Typically, studies such as those cited above have no allowance for evasion or for costs of administration.

part or all of the cash wages paid out by the government. Actual practice would normally assign these cash wages, adjusted by the relevant distributional weight as a benefit, and consider the supply price of the labor (its cash wage) as an economic cost. This is not correct if the relevant "base" for the distributional weight is the utility gain linked to the increased employment. But it is justifiable if the relevant base is the purchasing power in the hands of the workers or their families.[2]

In our opinion, the principal weakness of the distributional weights approach derives not from the idea of these weights as such, but rather from the patterns of weights that have typically been assumed in the expositions and applications that appear in the economics literature. To make our point very briefly: modest differences in weights do not cause serious problems, but large differences in weights do indeed entail such problems.

Any actual or implicit transfer of purchasing power from richer (low weighted) persons to poorer (higher weighted) persons can be thought of as an implicit approbation of economic waste, in an amount whose magnitude is governed by the size of the differences between the weight of the "donor" and the weight of the recipient. Thus, a project or other operation which reduces the income of A by 1,000 would have a weighted cost of 500 if A had a distributional weight of 1/2. If that project also caused the income of B to increase by 300, there would be a weighted benefit of 600, if B had a weight of 2. We could thus have:

Efficiency Benefits (measured without regard to distribution)	3,000
Efficiency Costs (measured without regard to distribution)	3,700
Efficiency NPV	-700
Distributional Externalities (weighted cost of A is 500, vs. unweighted cost of 1,000)	+500
Distributional Externalities (weighted benefit of B is 600, vs. unweighted benefit of 300)	+300

[2] This treatment helps to partially bridge the gap between the distributional weights approach on the one hand and that of basic needs externalities on the other (see below for an exposition of the basic needs approach).

Distributional NPV	+800
Weighted NPV of Project	+100
Unweighted NPV of Project	-700

The assertion of a distributional (or any other) externality really means a willingness to accept (if need be) a net loss in efficiency terms, of up to the full size of that externality. Of course it does not require but nonetheless invites such an efficiency loss. Put another way, distributional considerations do not modify a decision on a project if efficiency considerations alone would lead to the same answer. Thus, to the extent that a distributional externality has an impact on the result, it necessarily must be operating to offset an efficiency cost, up to the full size of the externality.

This line of thinking has extremely powerful implications. Let us simply consider two groups, those (A) with distributional weights less than 1/2, and those (B) with weights greater than 2. Clearly it would "pay", in the sense of being acceptable from society's point of view, to undertake every independent project or program that brings about transfers from group A to group B, so long as the efficiency cost linked to that project was less than 3/4 of its budget. Hearing this usually bothers listeners and their instinctive reaction is to ask, can't we get the same transfer at much lower cost than that? If a lower cost is indeed possible, the answer is to narrow the range -- say, by taking from those with weights less than 2/3 and transferring to those with weights greater than 1.5. Under this rule, the weighted cost of taking 900 from group A would be 600, and the weighted benefit of giving 400 to group B would be 600. Thus an efficiency cost of up to 500 (= 5/9 of the amount taken from the "donors") would be "invited" by the scheme.

Following these general lines, which are implied by a distributional weights approach, would typically lead to huge transfers, so that in the end hardly anybody was left with incomes under a lower bound, and hardly anybody was left with incomes above an upper bound. The exceptions would probably be upper-income individuals from whom taking money would be very expensive in efficiency terms (e.g., high earners who would simply quit and move to another country in

response to a given scheme of transfer). But those who would simply reduce their effort modestly, or who would actually increase their effort in response to a fall in their net take-home income, would be easy targets for a "taking".

The Achilles heal of a distributional weights approach arises when large differences in weights are associated with differences in income that appear to most people to be within a quite "normal" range. We do not see such a problem if all we do is give the bottom decile a weight of 1.3, the second decile a weight of 1.2, and the third decile a weight of 1.1, leaving everybody else with a weight of 1.0. But the optimal tax literature is full of applications in which the distributional weights are inversely proportional to income. In such a case one might have a weight of 1.0 applying to family income of $60,000, a weight of 2 applying to an income of $30,000 and a weight of 1/2 applying when income was $120,000. Here a transfer from somebody with an income slightly above $120,000 to somebody with an income slightly below $30,000 would be OK, so long as its efficiency cost did not exceed 3/4 of the amount "taken". If good diligence then uncovered ways of taking and transferring that "only" had efficiency costs of 5/9 of the amount taken, then most incomes above $90,000 would one way or another be taken, and most people starting below $40,000 would have their incomes supplemented up to that point.

It isn't that a distributional weights framework can be used, say, only for the purpose of setting an income tax schedule, and then be just put to one side and forgotten about, as it were, when evaluating other taxes, tariffs, agricultural price schemes, price controls, and rationing schemes, quite generally, and, of course the whole range of public expenditures (on both current and capital accounts). No, the spirit of cost-benefit analysis is that we apply it to each and every decision that comes along, in a context in which prevailing distortions are as a first approximation taken as given.

Weights that are inversely proportional to income "invite" too many transfers, and too costly transfers, for most people to accept. Inverse proportionality implies a weighting scheme in which the elasticity of the weight with respect to the income level of the subject is -1. Most of the examples in the tax literature deal with assumed elasticities in the range of -1/2 to -2. The case of

an elasticity of -2 is even more exaggerated than that of -1. An elasticity of -1/2 would be more generous. Here the weight of 1/2 would apply to incomes of $240,000, and the weight of 2 would apply to incomes less than $15,000, but as between these limits efficiency losses of up to 3/4 of the amount "taken" from the upper-income group would still be acceptable under a weighted cost-benefit test.

Pursuing the implications of exponential weighting patterns with elasticities in the indicated range leads to implied distributions of after-tax income that are far narrower than we observe in reality, and quite beyond what most people would regard as plausible. But distributional weights where the highest weight is, say 1 1/2 or even 2 times the lowest would be much less vulnerable to this sort of critique.

14.4 Basic Needs Externalities

Our thinking in terms of basic needs got started during a period (1970s and early 1980s) when the terms distributional weights and basic needs externalities were widely used, often being treated as alternative labels for the same general approach. We reacted against this, particularly since at that time our own vision of the distributional weights was the classical one, in which the focus was directly on the utility level of each relevant economic agent. We thought quite naturally of the example from economics texts and classrooms, which shows that if the utility of a recipient is the objective, then the most efficient way to enhance that utility is by giving money, which that person can then use to buy whatever bundle of goods and services (from among those thus rendered affordable) brings the greatest satisfaction. We noted, however, that the great bulk of transfers carried out by the public sector (worldwide, looking at all countries) turn out to be effectuated <u>in kind</u> rather than in cash. This led us to conclude that some motivation other than the pure utility of the recipients must be involved.

This led us to focus on the idea that the objective of many transfer operations is the welfare, not the utility of the recipients -- welfare being defined by someone other than the recipients themselves. This could be thought of as the voters, or the tax-payers, or their legislative

representatives, or just the government. The implicit thing is that the recipients' welfare is being defined by someone else, with that someone, in one sense or another trying to represent the tastes or judgments of "society".

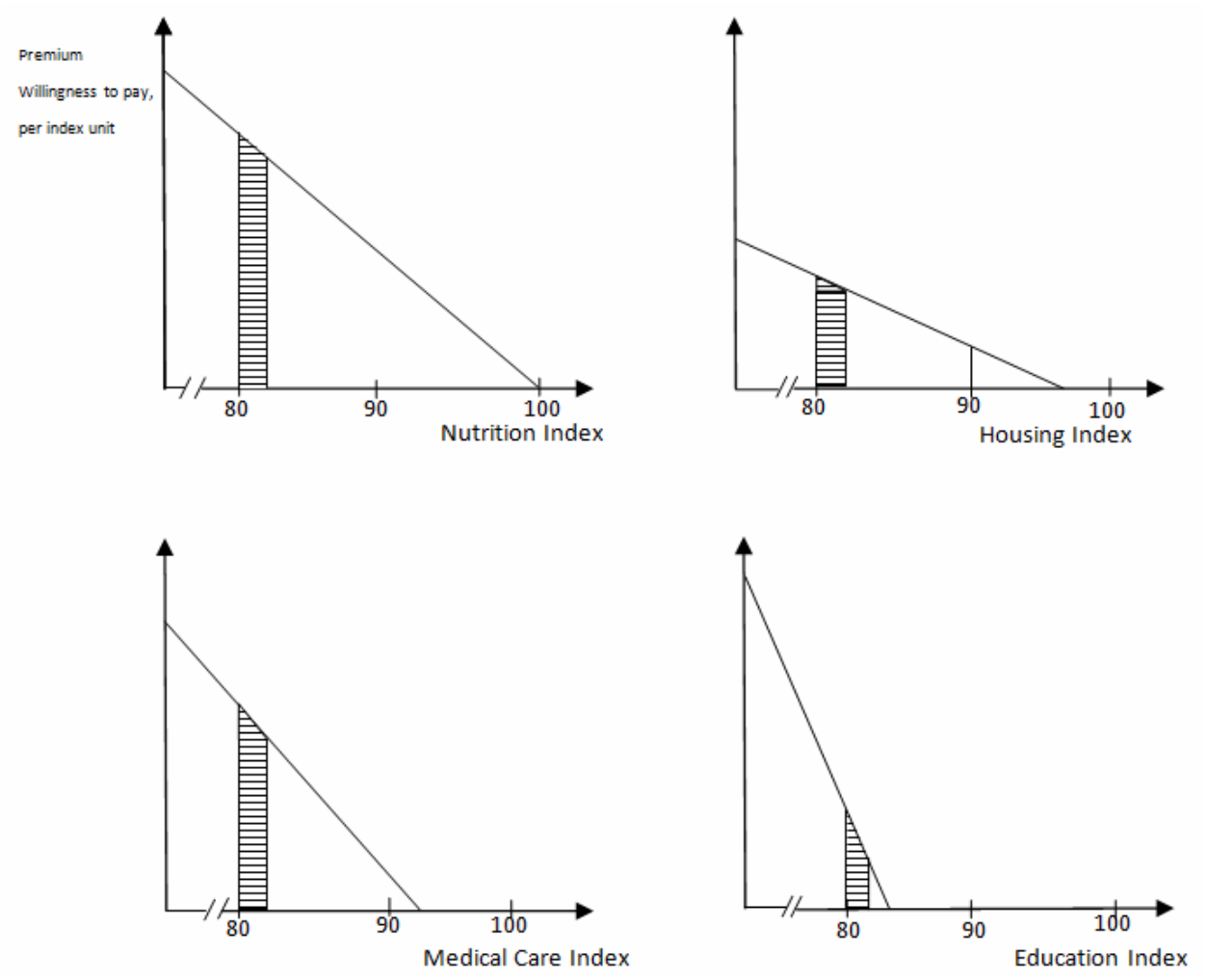
No transfer program is more widespread, across the entire world, than free primary education. Yet this is invariably, so far as we know, delivered in kind. Governments do not give, say $1,000 per pupil to each child's parents, saying that they can use that money to pay for a year's education for their son or daughter, but they can also use it for a daughter's dowry, or to take a trip. No, educational transfers are delivered in kind. Voucher schemes, which are still quite rare, give parents money which they can freely use, but only to pay for their child's education. The freedom of choice is restricted to the educational realm, where in our opinion it meets an important basic need.

It is quite similar with respect to public programs for other basic needs. Medical care is quite clearly delivered in kind. So too is housing. Nutrition, yet another basic need, is sometimes delivered via soup kitchens or similar establishments (in which case it is clearly in kind), but sometimes delivered via subsidized prices or via food stamps. These latter cases differ from those of education and medical care, in that they are more readily subject to abuse by the recipients. In the U.S., for example, food stamps are often accepted by retailers in payment for non-food items. More blatantly, they are quite openly sold for cash in many places. If such evasion of the labeled intent of the subsidy is widespread, it effectively nullifies the basic needs justification, and turns the policy into one that is better supported by distributional weights arguments. We believe, however, that the basic needs motivations for food and housing programs are only partially frustrated. And we also believe that, to the extent that food stamps are sold, and subsidized quarters are rented out to non-family members (with the proceeds then being used for general purposes, unlinked to basic needs), most citizens and taxpayers who support these programs become quite annoyed, so much so that if they felt that these evasive measures were widespread, they would probably no longer favor the programs.

The basic needs approach, then, says that "society" is willing to pay a premium in order to more fully meet the basic needs of disadvantaged people -- to leave them more adequately fed, and with improved housing facilities, and better cared for medically, and/or with their children better educated. This premium reflects a willingness to pay more than the normal price, to bear more than the normal cost, to deliver elements that add to the fulfillment of the basic needs of the disadvantaged. Put another way, and as a direct reflection of what was said concerning the distributional weights approach, "society" is willing to put up with certain amounts of extra cost, or of economic inefficiency, if this makes possible the fulfillment of some unmet basic needs. The size of the premium assigned for a given basic need, and the definition of the base to which that premium applies, defines the precise tradeoff involved -- i.e., how much society is willing to pay for what specific sign of improvement.

Let us start with a rather idealized picture -- one that best displays the underlying rationale for basic needs externalities. This would be similar to using an idealized standard utility function, or a continuously declining relationship giving distributional weights as a function of real income, in a distributional weights approach. The counterpart in a basic needs setting is a function in which the horizontal axis measures an index of nutrition, of medical care, of housing or of education, and the vertical axis displays the premium that "society" is willing to pay for each successive increment of that index (see Figure 14.2).

Figure 14.2


Premium
Willingness to pay,
per index unit
80
90
100
Nutrition Index
80
90
100
Housing Index
80
90
100
Medical Care Index
80
90
100
Education Index

The figure reveals several points. First, society may have different attitudes with respect to different basic needs. These are expressed (with linear curves) in the two intercepts. Both intercepts are highest, in Figure 14.2 for nutrition. In this case, society is willing to pay more for a 1-point gain in the nutrition index than for a similar gain in any other index at the same level, and is willing to keep paying up to an index level 100 (which we might take to be the national per capita median level). The education picture reveals a high willingness to pay at low levels of the index, but a willingness that disappears long before the median level is reached. This might reflect a situation in which the society places a high value on universal primary education, but is unwilling (or unable) to pay premia for secondary and higher education. To display the differences in another way, the shaded bars in the four graphs indicate the amount "society" would be willing to pay to lift one individual from index level 80 to index level 82, for each of the four basic needs categories. It clearly shows how substantial differences or priority can exist among the categories.

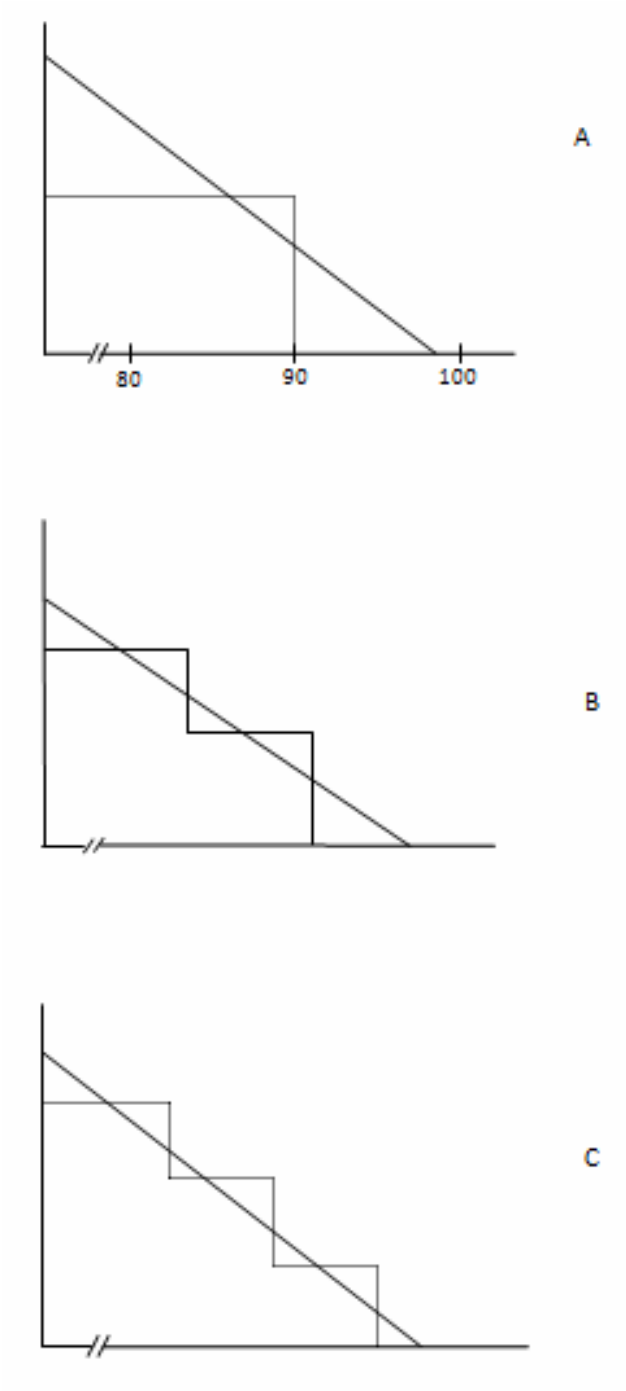
We feel that the framework shown in Figure 14.2 is important in laying the groundwork for a basic needs approach. Few would argue that the move from index level 90 to 92 should be valued as highly by society as the move from level 80 to 82. It is also quite reasonable that the "true" premiums representing society's true willingness to pay, should decline continuously with each additional step of fulfilling a given basic need.[3]

Figure 14.3 illustrates how the idealized vision of Figure 14.2 can be modified as one tries to get practical. Depending on the circumstances, one might simply have a single premium (panel A)

[3]Economists have a technical concept of a public good, whose benefits are available to the public at large. A's enjoyment of the national parks, for example, is not diminished by B and C also enjoying them (at least up to a given point of congestion). Thus their individual utilities can be summed in reaching society's valuation of the parks. In the same way, many members of society are in fact willing to pay to reduce the incidence of malnutrition and disease among poor children (and poor people generally). A society's total willingness to pay, under this concept, would be the sum of those of all that society's members, some of whom, of course, could have zero willingness to pay. Dealing with basic needs via public sector actions as against (or in addition to) private charity is motivated by the fact that many people's willingness to pay is very likely to be contingent on others also paying. They are willing to pay as long as others do also. We present this discussion of public goods as a link to economic theory. However, the basic needs approach can alternatively be thought of as simply reflecting a country's policy, without seeking deeper roots for its justification.

applying to all basic needs improvements up to a point. Or one could simply distinguish between two (panel B), or three (panel C) levels, reflecting declining premia as needs are more fully met.

Figure 14.3



We feel that it is worthwhile for people to think in these terms, because doing so really helps them to understand their own values. Most people instinctively respond positively to the question, "Should food be exempted from a sales or value added tax?" Yet they tend to modify that view when they think of expensive meals in luxury restaurants, or gourmet foods bought in upscale stores. Many would end up preferring to tax most foods, and to explicitly, subsidize a few items (rice, beans, fresh vegetables, milk) that are important or valuable components of the diets of the poor. Trying to quantify basic needs according to an index gets people to think seriously about details such as this, and thus ends up with a pattern of premia that better reflects the society's preferences and values.

However, it is certainly possible to implement a basic needs approach without the concept of an index. Thus one can be willing to incur greater costs (say, up to 50% above the national average) to bring about good results in primary schools in poor neighborhoods. Or one could simply not consider as costs the standard amounts spent giving prenatal care to poor mothers, or necessary shots and vaccines for poor children.

The big picture, so far as the basic needs framework is concerned, is that most societies are not ready to give the tuition money to the parents, and then let them choose to spend it on something other than educating their children. It is exactly similar, of course, for societies' outlays on medical care, public housing and nutrition-oriented programs. In short, most societies are paternalistic in the way they provide and distribute public services. It is this element that points to a system built on basic needs externalities rather than distributional weights.

14.5 Basic Needs Externalities (Type B) Linked to Income

The gap between the basic needs approach and that of distributional weights may be substantial at a philosophical level, but may be quite easy to bridge at a practical level. The bridge consists of recognizing that individuals' or families' basic needs are progressively better met as one moves from the first to the second, then from the second to the third, then from the third to the

fourth deciles in the income distribution. Furthermore, it is often the case that a project will have the effect of actually lifting significant numbers of families to higher income levels in this fashion. This is quite commonly true for projects that involve incorporating workers into the so-called formal or modern sector of the economy, when otherwise those workers would be in the much lower-paid informal or traditional sector. When workers make this sort of transition their family incomes may jump, say from the first to the third decile. Quite rationally, then, and without any particular government or other external stimulus, the families will move to a better diet, take better medical precautions, fix the roof or windows or floors of their home, and raise the school-leaving age and grade of their kids. In short, they move forward in better meeting all four categories of basic needs.

One simple but also quite crude way of incorporating such considerations into a cost-benefit framework would be to assign a premium of, say, 40% to extra income within the first decile, or 30% to extra income within the second decile, of 20% to extra income within the third, and of 10% to extra income within the fourth decile. This could certainly be justified on basic needs grounds, but the analyst would find it hard to answer the question of precisely what is being paid for.

A better approach would be to operate with the average family budgets (in the project's region) of people in the successive deciles of the income distribution. Then, at least, one could detail how much more they are spending on food, housing, medical care, etc., and assign basic needs premia to these added expenditures. It would be still better to get into the specifics of what these added expenditures typically go to buy, and assign greater premia, say, to potable water than to curtains, and greater premia to extending the school-leaving age of the kids than to making extra trips back to the family's native village.

Sometimes the assignment of a basic needs premium to a particular item will be straightforward. For example, installing running water and plumbing in a house might warrant a premium equal to all or nearly all of its standard full costs. But other things might be more tricky to value. For example, in most countries public education is free, at least up to a certain grade level. The fact

that it is free is already a reflection of the society's willingness to pay, and keeping the kids in school longer may as a result not include any obvious extra educational expenditures in the family budget. Yet one might want to recognize a basic needs externality in the case where a new job in the formal sector causes a family's children to stay in school longer.

To illustrate, consider a case where a formal sector project is expected to lift 1,000 families from the first to the third deciles of income. We do not know who they are at the moment of analyzing the projects. So we go to a recent census or sample survey in order to find the distribution of children of households in each decile. We should at least be able to get what fraction of each decile's kids are in school at each age. So 1,000 families in the first decile would have 20 kids in the 9th grade, while 1,000 in the 3rd decile might have 50 kids in that grade. Making such calculations across all grades, one could estimate ΔN_g, the increase in the number of kids in grade g that we can expect as a consequence of the income improvement of the 1,000 families. We should also be able to estimate the approximate <u>cost</u> (borne by the state) of a student year at each grade level. If we call this cost C_g, we can then think of a basic needs premium that should apply to poor children reaching that grade level. That premium could be a general one Π^*, in which case the total education externality would be $\Pi^*\Sigma C_g \Delta N_g$. Or it could be a premium Π_g that varies with grade level, in which case the total education externality would be $\Sigma \Pi_g C_g \Delta N_g$. This number, in turn, need not necessarily be calculated for each project, but may simply serve as one component of a broad income premium that applies to the transition from the first to the third decile of the income distribution.

Appendix 14A

Distributive Weights versus Basic Needs Externality

The third postulate of underlying principles of applied welfare economics is that a dollar is valued at a dollar regardless of whether the benefit of the dollar accrues to a demander or a supplier, or to a high-income or a low-income individual. However, an extra dollar given to a very poor person will most likely increase that person's welfare more than that would a dollar be given to a very rich person because the marginal utility of income for the former is much higher than the latter. The analysis in project evaluation is therefore going beyond economic efficiency to determine which project will increase welfare by taking into account who receives the benefits and who pays the costs on equity ground. As pointed in this chapter, two different approaches -- distributed weights and basic needs externality -- have been undertaken to address this issues and they are explained below.

The distributed weights approach is to use weights to entail multiplication of the net welfare gains or net welfare losses of particular groups by specific factors. Most of the literature has focused on income and/wealth as the criterion, that is to assign different weights to incomes (and expenses) received (and expended) by different income groups in the stakeholder analysis of a project. The presumption is that the higher the income of an individual (or spending unit), the lower will be the distributional weight to be applied in order to reflect the lower marginal utility of an extra dollar to a rich man than that of the same dollar to a poor man. That is to ensure that a project's impact on welfare of the society is truly reflected in changes in incomes (or expenses) received (or paid) by individuals affected by the project.

The above notion is based on the concept of diminishing marginal utility of consumption. The more one individual consumes a particular good the less utility he gets by consuming additional unit of that good. The same logic applies to the general consumption a person consumes. Since the difference between consumption and income is savings, at margin the marginal utility of a dollar saved should be the same as the marginal utility of a dollar consumed. Thus, the marginal

utility of one dollar of income should be equal to the marginal utility of one dollar spent on consumption.

Suppose that the marginal utility of income for a specific income group, k, at the income level of Y_k that has a per capita consumption level of C_k can be expressed as:

$$MU_k = C_k^{-n} = Y_k^{-n}$$

where n stands for a utility parameter that is equal to or greater than zero. This implies that the marginal utility of income (or consumption) declines as income (or consumption) increases. The distributional weights assigned for the kth income group in society (d_k) can then be calculated by the ratio of the marginal utility of income (or consumption) of this group to the marginal utility of income (or consumption) for the average income level of the society:

$$d_k = MU_k/MU = (Y/Y_k)^n$$

where Y stands for the average per capita income in society.

Presumably, d is determined by the relative income level of each income group to the average income level in society as a whole (Y/Y_k) as well as the utility parameter (n). For illustrative purposes, suppose a beneficiary of a project is in the income group at annual income of $1,000 while the national average income is $2,000. The distributed weight for this beneficiary would be:

$$d = (2000/1000)^n = 2^n$$

The magnitude of d also depends on the value of n. If n = 0.5, then the beneficiary with annual income of $1,000 will have the benefits of one dollar measured by a factor of 1.41. Another beneficiary with much lower annual income at $500 will have the benefits of each dollar weighted by a factor of 2.00. On the other hand, for a beneficiary with a highly skilled worker

whose annual income is $5,000, the benefits of an extra dollar generated from this project will be measured by a factor 0.63. Therefore, the smaller the income level of a specific income group, the greater the distributed weight is assigned to the additional welfare gain received by the group and vice versa.

In the case of the utility parameter, if n = 0, all d are equal to 1. This implies that one extra dollar received by any income groups of the society will be valued equally as a dollar. If n = 1, d will be assigned as the ratio of the average per capita income in society to the per capita income of the income group k. If n = 2, d is equal to power 2 of the above relative income ratio. This implies that a drastic declining marginal utility of income in society will be prevailing in society. The magnitudes of distributional weights are therefore dependent upon the perception of the government, policy makers or project analysts. Some people are inclined to link it to the existing progressive income tax schedule which, to some extent, reflects the marginal value of income to citizens or taxpayers.

Despite theoretical justification for practical applications, a great deal of difficulty is found that there is little basis for consensus concerning the underlying economic and noneconomic values involved in determining the distributed weights associated with income of individuals or families, especially we don't know what types of goods or services are purchased for consumption. The government or project analysts will have a hard time revealing the true preference scheme of individuals affected by the project in question. This will not be the case for the basic needs externality approach. As the weighting system can produce very wide disparities in weights for the rich and the poor, the ultimate selection from alternative investments can be swung from one option to another purely pending upon the weights being applied. However, some economists still prefer to use a rough justice for the weight scheme than not to use any justice at all because of concerns regarding diminishing marginal utility of income.[4]

[4] See, e.g., Little, I.M.D. and Mirrlees, *Project Appraisal and Planning for Developing Countries*, London: Heinemann Educational Books Ltd, (1974);, Squire, L. and van der Tak H., *Economic Analysis of Projects*, Baltimore: John Hopkins University, (1975); Schwartz, H. and Berney, R., *Social and Economic Dimensions of Project Evaluation, Inter-American Development Bank*, Washington D.C., (1977); Johansson-Stenman, O.,

The second approach, basic needs externalities, is based on the idea that citizens and taxpayers look for specific and concrete results when public funds are channeled into "helping others".[5] They are not interested in having their money used to gratify the recipients; instead they want to see it used in such a way as to advance the welfare of the recipients when they perceive that welfare. They argue that to consider social concerns for less fortunate members of society, an additional welfare can be accounted for if better educated, better care medically, better fed nutrient, and better housed are provided to these members. It is the altruism that is more closely linked to the basic needs of individuals rather than to their self-perception of their welfare.

Conceptually, the basic needs externalities of a project can be measured by setting a cutoff level above which no basic needs externality is deemed to exist as well as a maximum amount of inefficiency that the government or policy makers are willing to accept. First, cutoff levels for the attribution of any basic needs externality will be the typical consumption level of a particular percentile of the distribution of family, which is presumably to vary with the type of basic needs and the country in question. Second, in practice the government, policy makers or project analysts would have to decide that for the lowest percentiles of households, a basic needs externality of 30%, for example, of the normal cost of additional nutrients would be assigned. This percentage would decline to zero at the cutoff point. Thirty percent in this case is the maximum allowable externality that is also the maximum amount of excess cost the society would be accepting some inefficiency for meeting basic needs. This acceptance, presumably influenced by economic situations and the government objectives, would be tempered by the placing of explicit and conscious limits on the extra costs to be incurred on this account.

It is important to point out that the basic needs externality preserves the third postulate of principles underlying applied welfare economics. The additional positive externality is measured

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"Distributional Weights in Cost-Benefit Analysis – Should we Forget about Them?", *Land Economics*, Vol. 81, No. 3, (August 2005).

and assigned to the disadvantaged members of society according to the government or policy makers because the improvement of their education, health, nutrition and housing takes place and they are placed clearly alongside other externalities like air and water pollution, traffic congestion, etc.[6] This is fitted well as part of distortions into the framework of $\sum D_i \Delta X_i$ in the tradition of applied welfare economics. On the other hand, the use of distributed weights entails the rejection of the third postulate of applied welfare economics. The acceptance or rejection of an alternative investment option may hinge on subjective choice of distributed weights assigned to incomes in society by bureaucracies or project analysts.

[5] See Harberger, A.C., "On the Use of Distributional Weights in Social Cost-Benefit Analysis', *Journal of political Economy*, Vol. 86, No. 2, (1978); Harberger, A.C., "Basic needs versus distributional weights in cost-benefit Analysis", *Economic Development and Cultural Change*, (1984).

[6] Harberger, A.C., "Reflections on Social Project Evaluation", Paper prepared for *Pioneers in Development*, Vol. II, Washington D.C.: World Bank, (1985).

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