(7a)

Addendum to

TOWARD AN OPERATIONAL APPROACH TO SOCIAL COST BENEFIT ANALYSIS

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A second special problem presented by the use of a social time preference approach concerns how the current expenditures of the public sector should be treated. This problem is dealt with in an important paper by Sjaastad and Wisecarver.[1] They make the point that budgetary funds are "fungible" (that is, can readily be shifted) between current expenditures and capital outlays. What is meant here is simply that a government can borrow money to make incremental current expenditure or to cover a shortfall in current taxes. Also, in a situation where one cuts back on current outlays, or where tax revenues increase (for whatever reason) one highly plausible use of the marginal proceeds is to reduce the size of the current deficit or to pay off debt.

In fact, it can easily be argued that this is what actually occurs, day to day, month to month, quarter to quarter, etc. in most countries. At budget time, projections are made for all of the various expenditure and revenue categories, the totals are summed and the projected deficit or surplus is found. The budget itself usually contemplates the specific borrowing needed to finance a deficit or the pattern of debt amortization to reflect a surplus. But what occurs when, as virtually always happens, the actual totals turn out to be different from what was anticipated in the

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[1] See L. A. Sjaastad and D. Wisecarver, "The Social Cost of Public Finance," Journal of Political Economy (June 1977).

budget document? Certainly the most common response is to recur to additional debt to cover a deficit larger than planned (or to allow a smaller than planned deficit to be reflected in a smaller net increase in debt). And this is likely to be the outcome regardless of whether the unplanned increase in the deficit stems from an unexpected increase in current outlays (e.g., teachers' salaries rise as a result of a strike; more policemen are hired to cope with a crime wave; more street maintenance becomes necessary after a flood) or from a cost overrun on one or more capital investment projects.

Two important points are being made in the preceding paragraph. One is that borrowing in the capital market is the typical short-run source that covers an unexpected (increase in the) deficit, and reduced borrowing is the typical short run result of any unexpected surplus or of any situation in which the actual deficit is lower than the budgeted one. The second point is that in this regard it makes no difference whether the unexpected deficit (or surplus) comes from an increase (decrease) in the current expenditures or in the capital outlays of the government. That is to say, capital and current expenditures are <u>fungible</u> in this regard.

If, therefore, when we borrow 100, we give up future earnings (social benefits) of 15 per year in perpetuity, this happens regardless of whether we are borrowing to finance current expenditures or to cover investment outlays. If we use a social rate of time preference approach, with a rate of 5 percent, we have in both cases incurred a social cost whose present value is 300 [=(15) ÷(.05)]. In this way, the use of the social time preference approach would imply that current outlays should not be justified <u>unless</u> they promise a present value of current benefits equal (in the example) to 3 times their cost. That is to say, the shadow price of investible funds should also be taken as the shadow price of the marginal funds used for current government expenditures.

Some readers may think that the above picture is distorted by my considering that any act of borrowing can be dealt with as if it were a permanent increase in debt. Actually, this is the simplest, "cleanest" way to deal with debt problems in the present context (as well as many others). The key is that just as any increment in debt is thought of as being rolled over forever, so too any decrement in debt is thought of also as being permanent. Thus a one year loan of 100 that is truly paid off (i.e., not rolled over or otherwise supplanted by new debt) would in the social rate of time preference approach have a social cost of 300 in the year when the borrowing took place and would generate a social benefit of 300 in the subsequent year when it was paid off. Its opportunity cost would be 15 for one year. I prefer to think of 15 as representing an opportunity cost of investible funds of 15 percent times the actual outlays of 100. One can in this case equally well think of it as 5 percent times the opportunity cost of 300.

Even though the two procedures look the same, they have different implications as to the treatment of current outlays. If the social opportunity cost of capital market funds (here 15 percent) is used as the social discount rate, this is compatible with considering the social cost of 100 of actual funds to be 100, regardless of whether the funds go for current or capital expenditures. It would have to face the challenge of producing social benefits of 100 if it were a current project, or social benefits whose present value (at 15 percent) was 100 if it were a capital project.

In contrast, using the social time preference rate requires us to consider the social cost of 100 of actual funds to be 300, again regardless of whether the funds were to go for current or capital expenditures. This is the point made above, and one the force of whose implications has not been widely appreciated. Raise taxes of 100 today, and use the money to pay off debt or reduce the current deficit, and you will save future costs whose present value is 300. Cut any current expenditure to pay off debt and you equally save 300 in present value of future costs. These implications present a huge challenge to those who would defend the marginal rate of social time preference as the relevant discount rate for social project evaluation.

APPENDIX I

A SIMPLE METHODOLOGY FOR MEASURING THE SOCIAL RATE OF RETURN TO PRIVATE INVESTMENT

This methodology is based on the national accounts of a country, though it could in principle be applied to any individual enterprise, and to any set of enterprises (industry, sector, sample, etc.) for which the corresponding data are available. The basis of the methodology is to estimate separately, in real terms, the return allocable to capital, and the total amount of capital to which it applies. The rate of return to capital in any period is simply the ratio of the two.

Estimating the Return to Capital

The private return to capital includes (a) profits, (b) interest, and (c) rents. The social return is measured as these items plus the taxes that in one sense or another are paid on them. These would include (i) corporation taxes and other levies that directly strike the income of enterprises; (ii) property taxes on the land, buildings and other assets used in the process of production; (iii) capital's share of the value added taxes paid on the value added of the entity (enterprise, industry, sector, total private sector) in question; (iv) capital's share of other indirect taxes paid as a consequence of transforming raw materials and purchased components into the final products of the enterprise. For the purpose of estimating the total return to capital in the entity in any given period, we would simply take for that period the sum of the private returns [(a) + (b) + (c)] plus the relevant taxes [(i) + (ii) + (iii) + iv)]. These would be measured in current prices of the period, but before any work was done using data for two or more periods, they would have to be deflated by a general deflator (the GDP deflator if possible, the consumer price index otherwise). For technical reasons is it probably better to use undeflated data initially and to do one's own deflating by a single common, well-known general deflator, rather than pick up values from the national accounts expressed, say, in prices of 1970. This is because different procedures are used in the national accounts of different countries; oftentimes profits arising from changes in the relative prices of factors and products would not be reflected if the deflated national accounts data were directly used. This occurs when the accounts are measured taking each period's quantities multiplied by base year prices.

There are some subtleties involved in various elements of the above computation. In the first place, one must recall that personal income taxes are generally paid "out of" the earnings received in the marketplace. With progressive rates, people receiving the same bank interest or profit on shares will pay different taxes depending on their respective marginal tax rates. For this measurement we want to take the private rate of return as gross of personal income tax, as this is the rate that broadly tends to be equalized in the market. Thus we measure (a), (b), and (c) gross of personal income tax, but net of other taxes when we measure the private return to capital. To these we add [(i) + (ii) + (iii) + (iv)] to get the social return.

When it comes to the measurement of profits, one must somehow explicitly deal with the income of unincorporated enterprises. Usually the available data do not break this down fully into "income accruing to capital" and "income accruing to labor." That is, the reward to the labor of entrepreneurs and their families is typically mixed in with profits in most national-accounts breakdowns of national income by source. Up to now the only workable solution has been to apply some reasonable fraction (based on the most knowledgable and reliable sources one can find) in order to separate the income of unincorporated enterprises into one part attributable to labor and another part to capital. For most LDCs it appears that capital's share would probably be around one half, or perhaps a little more, for the unincorporated sector taken as a whole.

With respect to taxes in general, as represented in (i) through (iv), these should definitely be offset by such subsidies or other "incentives" as may apply under each category.

Taxes like the corporation income tax and the property tax strike, in principle, the income from capital (i.e., introduce a wedge between its gross-of-tax productivity and its net-of-tax return). Such taxes should be included in their entirety in moving from the private to the social return to capital.

Value added taxes, on the other hand, strike only the additional value generated by each activity. These taxes in principle fall on the contributions of both labor and capital to the productive process. If the national accounts give both the contribution of a sector to national income or product and the wages and salaries paid to labor, capital's share of the value added tax can be estimated by multiplying total value added by the fraction that capital's contribution bears to the total contribution of labor and capital in that sector.

Indirect taxes on the final product of an activity are different from value added taxes in the sense that they strike the entire value of the product, not just the value added by labor and capital in the activity in question. But in a sense a tax on an automobile is not a tax on the steel, iron, glass, copper, aluminum, rubber and plastics that compose it. These, on the whole, will have the same world prices in the presence or absence of a tax on car production (especially in a developing country). Hence the tax on car production should be allocated as if all of it fell on the labor and capital used to transform the component materials into a finished car. The full proceeds of the tax should be split between labor and capital in the same way as a value added tax would be, with capital being allocated "its share" as set out in the preceding paragraph.

By the same token, taxes on the inputs into an activity should not be taken as falling on capital and labor in that activity, but should be assigned to the activities from which they emerge. Thus a tax on glass would be allocated to the labor and capital in the glass-making industry, not to that in the automobile and the construction industries (which are the principal users of glass).

Estimating the Capital Stock

To estimate the private-sector capital stock of a country one begins by assembling a time series on gross private investment. This series should be deflated, so that it is expressed in terms of prices of the same base year used for the deflated data on the return to capital.

Where possible the data on gross private investment should be broken down into categories that are expected to have different rates of depreciation (in real terms). One common breakdown that is frequently used is a threefold one covering buildings (with a low rate of real depreciation), machinery and equipment (with an intermediate rate), and inventories (with no depreciation at all).

Once a selection of categories has been made (a choice which obviously is conditioned on the way the available data are broken down), the gross investment data should then be arrayed, starting with the most recent available data, and proceeding backwards in time.

If straight line depreciation is used, and the depreciation rate for machinery and equipment is 10 percent per year, the stock of machinery and equipment at the beginning of this year will be 100 percent of last year's real investment in machinery and equipment, 90 percent of that of year before last, 80 percent of that of the year before that, and so on, until we reach zero percent.

For buildings, with straight line depreciation, a depreciation rate like 2 percent is usually appropriate. In this case, we apply to investments of past years, starting with last year and going back, factors like 1.00, 0.98, 0.96. 0.94, etc. In such cases, it is likely to be true that the data series for very early years are not available. If so, one must find some reasonable way of extrapolating backward in time the series on real investment. Usually this is not difficult to do. Typically, if the investment series in question has been growing over time, the extrapolation process turns out not to introduce significant errors in the estimation of the capital stock for recent years.

Many authors have found it more convenient to use declining balance (exponential) depreciation patterns in building up figures on the capital stock. In this case the rate for each kind of asset will have to be higher than the corresponding straight line rate in order to approximate the same useful life. (For example, at a straight line rate of depreciation of 10 percent, an asset starting at 100 will have a depreciated value of 50 after five years and of zero after ten. In contrast, with exponential depreciation at 15 percent it would have a value of 45 after five years and of 20 after ten.) If a 15 percent rate of declining balance depreciation is used for machinery and equipment, last year's investment will be multiplied by 1.0, that of the year before last by 0.85, that of the previous year by $(0.85)^2$ etc. In this case one estimates an initial stock of capital (of the type in question) by using the relation $I_t = (\gamma + \delta)K_{t-1}$, where γ is the growth rate of the capital stock and δ the rate of exponential depreciation (here 15 percent) assumed for the type of asset in question. To get an initial stock of capital one should go back to a period near where the data set begins and choose, say, three consecutive years during what appear to be reasonably normal times--say, 1961, 1962, 1963. Take the average real investment for these years, and assume that this is the "normal" investment for the middle year (here 1962). Then, apply the assumption that, because the period was reasonably normal, the capital stock was growing at approximately the same rate as gross domestic product. This enables one to use the rate of growth of GDP around 1961-63 as an estimate of γ. Suppose this rate was 5 percent per year, and that the average investment in machinery and equipment over the three years was 100. Then we would have $(\gamma + \delta) = (.05 + .15) = .20$, and we would estimate K_{1961} as being $100 \div (.20) = 500$.

From this point the capital stock can be carried forward using the formula $K_t = (1-\delta)K_{t-1} + I_t$. If actual investment for 1962 were 115, we would have $K_{1962} = [(.85) \times 500] + 115 = 540$. If, then, actual investment in 1963 were 95 we would get $K_{1963} = [(.85)540] + 95 = 554$. Following the same procedure, the capital stock for subsequent years can be constructed.

For <u>inventories</u>, which of course are not subject to depreciation, the most convenient procedure is to assume that inventories are proportional to output. Each year the national accounts provide data on net investment in inventories. These net investment figures should first be expressed in real terms, then summed over a rather long period, starting from a time when economic conditions were judged to be reasonably close to normal, and ending with a similar period. Consider, for example, the period 1960-1978. If the accumulated net real inventory investment over this period 1961-78 amounted to 800, and if real GDP were 3500 in 1978 and 1900 in 1960, the inventory/GDP ratio would be 0.5. Supposing that 1960 was also the first year for which the relevant data were available, the end-1960 inventory figure would then be 1900 x 0.5 = 950. A time series for subsequent years would then be generated by adding to the initial figure, each subsequent year's net investment beginning with that for 1961.

Some Special Problems

Land and land rents create a problem because, when capital stock figures are built up from basic data on investment, they do not include the value of land, while the national accounts figures on the earnings from capital do include rents from land. Either of two procedures is acceptable: a) make separate estimates of the value of land (expressed in money of the same purchasing power as is used in the calculation of the stock of reproducible capital) and add the resulting annual figures to those for the stock of reproducible capital, or b) make separate estimates of the income attributable to land, and subtract this income from the national accounts data on the income from capital. In the first case, the estimated rate of return would cover all types of capital, while in the second case it would cover only reproducible capital.

Of the two approaches b) lends itself more readily to simple application, for all that is entailed is to estimate the probable incidence of land rents in two critical segments of the economy--"agriculture and livestock" and real estate (the provision of housing services). Rough approximations would be that a quarter to a third of the value added (contribution to national product) of agriculture and livestock represents the actual or implicit rental value of the land involved, and that perhaps a tenth of the value added in the real estate (provision of housing services) sector is appropriately attributable to land. Before calculating the rate of return to capital, then, one would deduct these components from the numerator, yielding a ratio that contained only the value of reproducible capital in the denominator, and only the income therefrom in the numerator.

The real estate (provision of housing services) industry can present problems when rents are controlled at artificially low levels. Usually in such circumstances there are severe "shortages" of housing in many areas, so that market rents are far from measuring the true value of the services involved. In such cases it may be prudent to exclude this entire sector from the estimation of the social opportunity cost of capital. This can only be done, however, when the investment data are carried in such a form that residential construction is separated from other construction. When this is the case one simply leaves the residential housing stock out of the denominator of the rate of return ratio, and leaves the real estate (provision of housing services) sector out of the numerator.

Public sector enterprises can create problems similar to those posed by the real estate sector. The first question to address in this connection is how the national accounts data are assembled. If these data do not separate private from public investment, little can be done but to follow the methodology already presented, mingling the private steel industry with the public sector steel industry, the private cement plants with the public ones, etc. In this case it would take a major statistical enterprise to separate the two, and the first-approximation estimate of the social opportunity cost of capital pretty much has to take the data as they come. The problems that arise here frequently concern the data on income from capital. While the national accounts may include investments in public sector enterprises, the profits of these enterprises may simply end up as a component of public sector saving (or dissaving). In this case it is appropriate to seek independent data on the profits of the public enterprises whose investment is included in the estimation of the capital stock, and include them (after deflating in order to express them in real terms) in the numerator of the rate-of-return ratio.