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## **The Definition of Income in Studies of Budget Incidence and Income Distribution**

## **Do Empirical Studies of Budget Incidence Make Sense?**

## **Estimating Counterfactual Incomes in Studies of Budget Incidence**

(with Parthasarathi Shome)

## **The Incidence of Sales and Excise Taxes, or Where Do We Put the Transfers?**

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THE DEFINITION OF INCOME IN STUDIES OF BUDGET  
INCIDENCE AND INCOME DISTRIBUTION

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INTRODUCTION

Interest in distribution has recently revived. In developed countries there is increasing explicit concern with the size-distribution of incomes, particularly with respect to their high and low extremes. In developing economies, growth of output as the overriding goal of public policy has been subordinated to concern with the distribution of the benefits from growth, and particularly with the persistence of deep low end poverty. Since governments directly allocate anywhere from an eighth to a third of total output, increasing concern with income distribution carries with it, logically, increasing concern with the incidence of public activity in the distribution of income. As a consequence the need to estimate such incidence correctly is also increasing.

Numerous researchers have estimated aspects of budget incidence through allocation by income bracket of tax burden and, occasionally, expenditure benefit.<sup>1</sup> The logic of such allocation requires that the techniques used have certain common elements. Thus, to determine tax-burden by income level, income per family before taxes must be estimated. There is no agreement on what income would be before government budget effects or after all such budget effects have been accounted for; i.e., after reducing income by tax burdens and increasing them by benefits received from public expenditure.<sup>2</sup> Moreover studies whose focus is income distribution *per se* frequently, if not usually, ignore budget effects and define a concept of income which neither includes total taxes as a part of income nor in any way concerns itself with the benefits of government spending. Given the magnitude of public budgets, such cavalier treatment is a serious defect in much empirical work on income distribution.

<sup>1</sup>In some recent work, I approached this topic from another direction: How do those studying size distribution of income handle fiscal incidence? In 1971, we received more than four dozen empirical distributions of income. Of this total, only 13 considered any aspect of budget incidence. Nine of these 13 countries were in Latin America, and seven of these nine were primarily studies of public finances. The typical size distribution study implicitly assumes neutral budget incidence. It is noteworthy that in many of the studies of income distribution, it was impossible to determine how the concept of aggregate income was derived.

<sup>2</sup>The focus is budget incidence rather than general fiscal incidence. It assumes that the effects of government budget activity can be separated and analyzed independently of all the other effects of government policies on economic activity and hence the distribution of incomes. The continuing controversy on to what degree recent empirical work on budget incidence and income distribution, both statistical and analytical, is necessarily invalid because of a failure to generate a general equilibrium approach is not the subject of this paper. The presumption is that the actual approaches commonly used are sufficiently valid to make them worthwhile.

This confusion concerning the proper definition of income is obviously undesirable. For example, the estimated distribution of tax burden depends in part on how aggregate income is defined. Nevertheless, it is not an irresolvable matter. This paper proposes to rekindle an interest in it. Hopefully it will help lead to consensus on the best definition of income in such work. Even if we had such consensus, the multifarious problems of using actual data in estimating household and other incomes corresponding to the best definition - not to mention the still more intractable problem of estimating the locus of tax burdens and expenditure benefits—would still be with us. Nevertheless it would be a step forward if everyone at least agreed on the basic concept to be manipulated.

I use the phrase rekindle interest since, as usual, the matter is not without antecedents. In the early 1960's, there were two basic approaches in empirical studies of budget incidence. The "Adjusted National Income Approach" [2],[7] engaged in something of a debate with the "Net National Product Approach", [1],[9] but they did not arrive at an agreement. In general however analysts studying tax or budget incidence have used the invalid approach, that is defined the aggregate as national income, or used an even less defensible concept.

The most systematic use of the Adjusted National Income Approach is that of the United Nations Statistical Commission which in 1972 published draft guidelines for empirical country work in compiling data on income distribution [10]. In these guidelines, one focus is budget incidence. "Primary Income" is the basic concept of aggregate income before government effects. It is defined as total factor payments before subtracting direct taxes. In contrast, "consumption" by household is defined as total factor payments less direct taxes, plus government transfer payments and benefits from government expenditures, plus an estimate of similar flows within the private economy. The guidelines exclude indirect taxes from pre-tax income. It is argued below that this treatment invalidates the approach.

Part I of this paper discusses the Adjusted National Income Approach, and Part II the Net National Product Approach. Part III presents an analysis of the differences, and gives the author's conclusions as to the appropriate concept.

### 1. THE ADJUSTED NATIONAL INCOME APPROACH

In constructing aggregate pre-tax income (the magnitude to be divided among income brackets), the Adjusted National Income Approach uses personal income as the pivotal concept.<sup>3</sup> This magnitude is then increased by (1) those taxes which are assumed to burden factors of production directly (unshifted corporate profits tax, unshifted export taxes, backward shifted portion of the employer's social security contribution); and (2) other income (undistributed profits, capital gains); and decreased by (3) personal transfer payments. The resulting augmented magnitude is referred to by different authors as "adjusted income", or "broad income". The distinguishing feature of the concept is exclusion from aggregate income of all taxes which are believed shifted forward to consumers.

<sup>3</sup>The UN guidelines assume that there are no benefits to households from public general expenditures, such as defense and administration.

<sup>4</sup>National income concepts used are those of the U.S. Department of Commerce.

Hence it excludes all indirect business taxes. But it also excludes items such as that part of social security taxes and corporate income taxes which are assumed to be shifted forward to final consumers. The rationale for this procedure is that were taxation eliminated, the (money) income of factors, e.g., corporation shareholders, would increase only by the amount of the unshifted burden. This procedure is illustrated in Table 1, which compares components of the "broad income" concept with corresponding national accounts data. It is taken from a very careful study of U.S. budget incidence for the year 1960 [2]. The major tax components which the study assumed shifted forward to consumers are:

(a) forward shifted corporation income taxes (22.3-14.1)	8.2
(b) social security taxes not shifted back to employer (20.7-6.6)	14.1
(c) indirect business taxes	44.3
	66.6

TABLE 1  
NATIONAL ACCOUNTS AND BROAD INCOME CONCEPTS, 1960  
(billions of dollars)

<i>National Accounts</i>		<i>Broad Income Concept</i>	
351.8	Disposable income		
50.4	Personal taxes		
402.2	Personal income	Family personal income	383.7 <sup>a</sup>
36.6	Transfer payments	Personal transfer payments	26.8
8.6	Undistributed corporate profits	Undistributed corporate profits	8.6
22.3	Corporation income taxes	Unshifted portion of the corporation income tax	14.1
20.7	Social security taxes	Backward shifted portion of the employer's social security contribution	6.6
		Capital gains	11.7
417.0	National income	Broad income	398.0
44.3	Indirect business taxes		
461.3	Net national product		
504.4	Gross national product		

<sup>a</sup> Differs from personal income in excluding income received by institutional residents, military personnel overseas, and those not living with their families, and income retained by non-profit institutions and private trust, pension and welfare funds.

<sup>b</sup> Includes interest payments.

Source: National Accounts: [1], p. 66. Broad Income Concept: [2], pp. 173-175.

Items (a) and (b) are defined as part of factor incomes in national income accounting. Item (c) accounts for most of the difference between National Income and Net National Product. Although all three of these components are excluded from aggregate income before taxes in the Adjusted National Income Approach, they are included as reducing income in calculating tax incidence. Attempts are made to estimate who bears their burden in accordance with information on how different income brackets or groups use their income to purchase the relevant

taxed products. In other words, to compare incomes after estimating tax-incidence, "broad income" or "adjusted national income" in the various income brackets is reduced by "direct" taxes, defined as all taxes which burden factors of production directly, plus the amount of the estimated forward shifted tax (items (a), (b) and (c) above) "embodied" in the goods and services consumed by the various income brackets.

We are left with the paradox that magnitudes corresponding to certain taxes which are included as factor income in national accounts data - that is included in national income, defined as the sum of factor incomes - are treated as not existing in studies of tax incidence using this approach.

### *The Meaning of the National Income Concept*

To this point the argument has proceeded as though national income does provide a measure of total factor incomes. An implication of the Adjusted National Income Approach is that taxes other than indirect taxes have the same economic effects, i.e., they burden the *consumers* of products taxed. To the extent that this is true, then the distinction between NI and NNP as conventionally defined and empirically applied is not meaningful for economic analysis. In other words the "forward shifted" corporation income tax and social security tax are just as "indirect" in their incidence as an excise or sales tax. Note that neither the shifted or unshifted parts of the corporate income tax are ever received as income by the shareholders. The important distinction is that with respect to the unshifted part, elimination of the tax presumably would result in shareholder income increasing, in the unshifted amount. But in the case of the part shifted forward to the consumer, elimination would result in increased real incomes of consumers. In this view the whole notion that conventionally defined national income is equal to the sum of factor incomes is seen as misleading. It would be useful to redefine the concept to exclude *all* taxes "shifted forward to consumers". The result might be very close to the adjusted national income concept. Since we are a long way from a consensus on this point, the second best will be to recognize fully this short-coming of national income as currently defined.

If we leave to the side the treatment of capital gains, thus far the analysis leads to the conclusion that the Adjusted National Income Approach can really be regarded as an attempt to define a meaningful concept of total factor incomes, or a more valid measure of "national income", than the conventional one. As a consequence it might be more meaningful to describe this as the Corrected National Income Approach.<sup>5</sup>

## 2. THE NET NATIONAL PRODUCT APPROACH

Given a "corrected" NI concept, the question remains whether "corrected" NI is the appropriate income concept in measuring fiscal incidence. At first approximation, this appears to be the case. Corrected NI would add to factor incomes, which are the total incomes households have to spend. Nevertheless many researchers use NNP as the relevant concept. The problem here is again

<sup>5</sup>In 1964 Musgrave took the position that "net-national product at factor cost" was precisely the wrong concept, although his approach amounts to redefining that concept in a more logical and meaningful fashion ([7], p. 54).

treatment of "corrected" indirect taxes (defined to include all taxes which burden consumption). Since they are paid for out of household disposable incomes, how can they be imputed on the income side? As Bishop recognized, this appears to be "double counting" ([1], p. 383). In short, factor incomes do not sum to the market value of output, but to national income, which must be increased by indirect taxes to get output valued at market prices (NNP). Any size distribution of net final output at market prices (NNP) will therefore exceed factor payments by the "corrected" indirect taxes. Hence apparently distributing NNP means distributing "income" which factors would not earn even if taxes and public expenditures disappeared. Moreover some individuals reason that factors do not consume the entire NNP, even after assigning all benefits of public expenditures to them. Assume purchases of goods and services are burdened solely by indirect taxes.<sup>6</sup> When that burden is distributed in the process of defining income after payment of taxes, the result is after tax income less than national income by the indirect tax burden. Adding to this government outlays—assumed equal to indirect taxes—gives a magnitude less than NNP, again by the amount of indirect taxes. Making the exercise more realistic by also considering direct taxes and incomes, and the corresponding increased public expenditures, in no way affects this outcome.

Nevertheless in an earlier article addressed to this topic Bishop ([1], p. 388) defended the NNP Approach by arguing in effect that the "income base" should be NNP with

imputed items of income being allocated in proportion to some index of the assumed distribution of the benefits of the output involved. This conclusion is drawn on the assumption that it is a useful procedure to attribute the burden of all taxes and the benefits of all government expenditures to individuals or families in their individual capacities.

However, as shown above, allocation of all taxes and all benefits from public outlays is consistent with the "corrected" national income approach. To do so one need not assume a NNP concept of income.

### 3. THE ANALYSIS AND CONCLUSIONS

The analysis which follows approaches the question of the appropriate income concept in a different manner. It focuses on the difference in aggregate tax-burden implied by using the two alternative aggregate income concepts, "corrected" NI or NNP.

The analysis uses the following notation.

- FI: total factor payments
- NNP: net national product (market value)
- NI: "corrected" national income
- IT: "corrected" indirect taxes
- DT: "corrected" direct taxes
- G: government expenditures including personal transfer payments
- D: capital consumption allowances
- GNP: gross national product

<sup>6</sup>Here and after indirect taxes means "corrected" indirect taxes.

Assumptions:

- (a) All resources are fully employed.
- (b) All government revenues are taxes.
- (c) The budget is always balanced.
- (d) Indirect taxes are defined as those taxes which burden consumption.
- (e)  $FI = NI$

Given the above assumptions, since  $FI = NI$ , if we use the National Income Approach post-tax factor income will be  $FI - (IT + DT)$ . Distributing first  $FI$  and then  $FI - (IT + DT)$  by income brackets gives a measure of the tax burden on the different income groups permitting researchers to compute pre- and post-tax income inequality. This in essence is the Adjusted National Income Approach. Applying this reasoning to those studies which use NNP as the concept of income to be distributed gives the following:

- (1)  $NNP = FI + IT$
- (2)  $FI + IT - (IT + DT) = FI - DT$

Post-tax income is now larger by  $IT$  than in the national income case. In countries with no direct taxes, we end up with a post-tax distribution summing to  $NI$ ; in short a near reverse of the earlier paradox. In the same countries, the post-tax magnitude of the National Income Approach would be less than the corresponding magnitude of the NNP Approach by the value of indirect taxes. Since  $DT$  are treated the same in both approaches, the above example is relevant to the basic question of which is better.

A simple way to examine this involves use of a hypothetical example as illustrated in Table 2 below. Using NNP as the basic concept of income to be

TABLE 2  
TAX BURDEN UNDER VARIOUS INCOME CONCEPTS

Situation	I	II	III
Direct Taxes	33	20	00
Indirect Taxes	00	20	50
NNP	100	120	150
NI	100	100	100
Income after Taxes (Current Prices)	67	80	100
Income after taxes (Prices of III)	100	100	100
NNP Approach $(IT + DT)/(FI + IT)$	0.33	0.33	0.33
"Corrected" NI Approach $(IT + DT)/FI$	0.33	0.40	0.50

measured, a common measure of tax burden (taxes/NNP) gives that burden as a third of NNP for each of the three tax situations. However, use of the national-income measure (taxes/NI) results in increasing tax burden as the tax system becomes increasingly indirect.

Assume that the change in tax mix is neutral in moving from Situation I through III, in the sense that the mix and total of output remain unchanged. (The

<sup>7</sup>Throughout the paper relevant elements in the equations can refer to individual households by adding the proper subscripts. Hence  $NNP = \sum_i (FP_i + IT_i)$ .

assumption of unchanged output is unrealistic, but it is not crucial. A more realistic, i.e., complicated, example would yield similar although less obvious results.) Under these circumstances, the difference in NNP between situations III and I would be solely that prices would be 50 percent higher in III than in I.

The table implies that after tax income in I is 67, or 100 in prices of III. This also equals III's NI. By the same token NNP in I is 100, equal to 150 in III. If there were no indirect taxes, the factor incomes in III at III's price level would be equivalent to 150. In a situation where all taxes are indirect, NI already is a measure of total income after payment of taxes. More generally, the buying power of FI will be such that relative to NNP it will always equal total income after deducting indirect taxes. At the inflated prices (relative to I) of III, to get the pre-tax income concept we need to add back indirect taxes to FI to arrive at NNP. Specifically, this consists of allocating IT (all taxes which burden consumption) according to the received canons of tax incidence to the various income brackets.

This becomes even more obvious on considering a variant on the change from Situation I to III: Assume resources continue fully employed, and the tax-burden remains one third in terms of NNP. Assume one change, namely that prices remain stable, i.e., NNP continues at 100. This implies that on removal of DT and imposition of IT in the new equilibrium the tax burden is reflected in decreased factor incomes: producers—under the assumptions—will not increase prices, but must forward the IT receipts to government. As a consequence, factor incomes fall in the amount of the tax-burden or tax receipts.

Clearly the resulting national income would equal post-tax income. To estimate pre-tax income it will be necessary to distribute and add back IT among the various income brackets, according to assumptions concerning tax incidence.

All of this leads to the unequivocal conclusion that the NNP Approach is the more appropriate of the two. Use of the National Income Approach implies a total income concept before taxes which is already net of indirect taxes. Use of the NNP Approach in effect includes indirect taxes in the basic pre-tax income. Operationally the significance of this distinction is avoidance of an exaggerated measure of average tax burden.<sup>6</sup>

From another perspective, the resource claims called indirect taxes represent purchasing power for government. Corresponding to these claims payments neither are made nor can they be imputed to the factors of production. However, since the logic of budget incidence analysis requires that all output be distributed to private claimants, NNP becomes the relevant concept precisely because it exceeds factor payments or national income by IT, in other words, by the amount of such resource claims.<sup>7</sup>

This conclusion makes even more difficult the task of generating pre-tax incomes to estimate tax incidence or for other uses. Most researchers assume that indirect taxes usually reduce incomes of households consuming the taxed items. In this new argument, we see that factor incomes are already net of indirect taxes and need to be increased to what they would be, i.e., NNP, were there no indirect

<sup>6</sup>It is understood that the discussion is in terms of the basic conceptual approach. I am not arguing that one should necessarily use unadjusted NNP as the basic concept of income to be distributed. Certain alterations, e.g., inclusion of capital gains, may be desirable.

<sup>7</sup>Bishop expressed the same idea ([1], p. 388).

taxes. This involves thinking about incidence very differently from the usual approach. In other words, indirect taxes are now regarded as overwhelmingly burdening consumption, at least in empirical work on tax incidence. There is no reason to believe that the pattern of incidence of such taxes as now conceived—which is derived from patterns of consumption—would be the same pattern implicit in “restoring” factor incomes to NNP to get a conceptually more valid measure of total pre-tax income. In short, increasing the factor incomes of various income brackets by the presumed incidence of indirect taxes according to current canons of tax incidence would not be a valid procedure.

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DO EMPIRICAL STUDIES OF BUDGET  
INCIDENCE MAKE SENSE? \*

by

JACOB MEERMAN\*\*

I. INTRODUCTION

Increasing concern with distribution has led to numerous recent estimates of the incidence of aspects of public activity. In addition to the traditional focus on tax incidence, economists have turned to estimating the incidence of specific government programs, frequently within a cost benefit perspective. More generally, and most recently, there have been numerous estimates of the incidence of total public expenditures. Usually this has been carried out in a country study complemented by an estimate of overall tax incidence. Researchers have frequently combined the two types of incidence into what might be termed budget incidence.<sup>1</sup>

This broadening in perspective and analysis has also brought increased controversy concerning the meaning of incidence and how to measure it. Measuring tax incidence be it a specific tax or an entire system is increasingly viewed as a general equilibrium problem which is to say an unsolvable one (as argued below). Nevertheless, attempts to estimate incidence of entire tax systems proceed as though taxes have neither excess burden, nor other general equilibrium consequences. On the spending side, the meaning of expenditure incidence is itself in doubt. And the techniques for its measurement are regarded as even more dubious. Normally, we believe that benefits from public expenditures need not equal their resource value, while taxes always equal their resource value. The consequence of this outlook has been failure to recognize the profound symmetry between the incidence of taxes and public spending. Finally, incidence work requires comparisons between *status quo* and an imputed state or "counterfactual" such as a world without government before the tax/expenditure change. This imputation and its implications are frequently unclear.

This paper analyzes these and related difficulties and attempts to resolve them. The method used to do this involves simple algebraic formulation of the household (*HH*) budget constraint to permit its decomposition into the various kinds of incidence. (Such formulation has an advantage in that it readily translates into the accounting framework actually used in empirical country studies). The attendant analysis puts the difficulties into a different light making some of them less formidable, or showing them to be non-existent. It also results in a useful clarification of the meaning of the various measures of incidence.

Needless to say, in ground as well worked as incidence theory, very little can be offered which does not have antecedents. Much if not most of what follows has been discussed, or at least touched upon, in earlier writing.<sup>2</sup> The paper pulls together these various strands into a basic framework. It is both a summing-up, and hopefully a slight movement forward. But, unlike much of the earlier work, its point of departure is the comprehensive empirical country studies of budget-incidence, that is the attempts to measure the combined incidence of taxes and expenditures for a one year period.

## II. ANALYSIS

### *A. Clarification of Basic Concepts*

Incidence is defined as the total change in the distribution of *HH* income — including publicly provided goods and services — due to a government intervention. Notice that the change is in income, not welfare. We are, of course, primarily interested in the latter but cannot measure it. Income, however, is usually measurable and presumably correlates highly with welfare. Consequently, we work with income which is measurable as a proxy for welfare which is not.

In the paper, the basic perspective is balanced budget incidence defined as the total change in the distribution of *HH* incomes due to an increase in taxes used to finance an exactly equivalent increase in expenditure. We are also initially concerned with an extreme case, namely the movement from a world without government to one with a government financed solely by taxation with a balanced budget.<sup>3</sup>

Thus far, the discussion is straightforward. However, if we attempt to decompose balanced budget incidence into components to support analysis, we inevitably run up against a good deal of complexity and confusion. Much of this is due to the lack of interest in this issue until (literally) the last decade. In brief, "the methodology and theory of estimating benefit and expenditure incidence is largely undeveloped" [11, McLure, p. 2].

In dealing with the same problem, McLure resolves incidence on the spending side into two components, expenditure incidence (how government spending affects

in the counterfactual state 1 for the decrease (increase) experienced in state 2 because of indirect taxes.

This discussion indicates how important it is to explicitly consider the effects of taxes on relative factor and output prices in generating the state 1 that is the counterfactual incomes. The inability of the CSS to adequately deal with such changes in relative prices limits their usefulness even as short run studies, in which technology, factor endowments, aggregate employment, and saving and investment are assumed independent of budget activity.

Even if the studies are circumscribed in being explicitly short term and limited to the tax side for which the counterfactual is a comprehensive proportional personal income tax, the necessarily unconsidered relative price effects may imply substantially different results from those hitherto reported.<sup>7</sup>

#### NOTES

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<sup>1</sup> Of course changes in technology, labor supply, and so forth will also affect relative prices. Meerman's categories interact on each other.

<sup>2</sup> McLure and Thirsk [8], Ballentine and Fris [2], Vandendorpe and Friedlaender [14], Ratti and Shome [12, 13], and others.

<sup>3</sup> The case of monopoly elements in the corporate sector has also been considered by Harberger [7]. The effect of introducing monopoly is that the tax will fall on monopoly profits as well as on the ordinary return to capital. The part which falls on monopoly profits will be borne by monopolists. That part which falls on the ordinary return to capital will be distributed by a mechanism similar to the competitive case (pp. 160--162).

<sup>4</sup> And are not shifted to labor or to consumers.

<sup>5</sup> For example household incomes are treated as independent of incidence assumptions in Andic [1], Dodge [4], Franzen et al. [5], Gillespie [6].

<sup>6</sup> Dodge [4, p. 7] for example points out that government budget policies "... affect personal income indirectly by affecting the composition of output and hence changing both the relative and the absolute prices of final goods and services, and of factors of production". Theoretically a study should take these effects into consideration. To do so "...it would be necessary to calculate the level and distribution of personal incomes that would have existed in the absence of the activities of the public sector. This calculation is not feasible as the behavioral relationships on which such a calculation could be based are not available, nor, in practice, estimable".

<sup>7</sup> Browning [3] discusses this issue at some length in an *a priori* manner, and concludes that relative price effects on the product side, when using the proportional income tax as a counterfactual, are probably offsetting.

as the value to the recipients of the resource transfer made through the public expenditure. We use the definition of tax incidence as the resource transfer away from those who pay the tax. It is defined as equal to the amount of the tax. Associated with this rechanneling of resources — in our balanced budget context — we have what Musgrave refers to as Ricardian output effects, namely changes in output “due to resulting changes in technique, voluntary changes in labor supply, changes in saving and capital formation or in the efficiency of resource use” [14, Musgrave, p. 208]. In addition, there may be change in the level of unemployment. Equally important may be the changes in relative prices of both products and factors which also affect factor incomes. The net effect of all these we call *RPTO* incidence, the abbreviation for relative price, techniques and output incidence. Defining incomes broadly, *RPTO* incidence can be defined as a residual: Thus for a given *HH*, a given balanced budget change eventually settles down to a new equilibrium with an associated net change in after tax income, broadly defined. The income change less the sum of tax incidence, with negative sign, and benefit incidence must be identically equal to *RPTO* incidence. In another perspective, it appears accurate to think of benefit incidence and tax incidence as the direct benefit and burden on the households ultimately paying the resource transfer or enjoying it and the *RPTO* incidence as the associated general equilibrium effects. Conceptually, and occasionally in practice, the *RPTO* incidence of a given tax or expenditure can be analyzed independently of all other taxes and/or expenditures. This possibility is also briefly considered in the paper. These basic concepts are defined and used in the model below.

### *B. The Model and the No Government Counterfactual*

Basically, the model consists of definition and manipulation of the household budget constraint in a way which permits its decomposition into the various kinds of incidence. Many of the assumptions in the model are unrealistic. However, the generality of the conclusions does not depend on the realism of the assumptions: Increasing the realism of the model would only reinforce the conclusions.

In the model, all income in the economy is received by households and consists solely of returns to factors, physical or human. The factor labor is defined as the capitalized value of labor income.<sup>5</sup> Hence, only factors and their returns — dividends, interest, wages, *et cetera* — appear in the budget constraint. All factors are assumed privately owned, but they have no exchange value after their initial sale or allocation. (Were this not the case, the measurement of income would be greatly complicated.)

The analysis uses comparative statics. There are three equilibrium states, denoted by the first subscript of each variable. The first state refers to an economy in

equilibrium without government. The second and third states involve government. The model concerns solely these equilibrium states. Problems resulting from the movement from equilibrium to equilibrium are not considered.

There are  $\ell$  households each with its income  $Y_j$  ( $j = 1, 2, \dots, \ell$ ) based on the earnings of its factor endowments. Factors of the  $j^{\text{th}}$  household are indicated by  $A_{kj}$  ( $k = 1, 2, \dots, m$ ). Each type of factor (including capitalized labor) earns a one period return equal to  $R_k$  ( $1, 2, \dots, m$ ).

There are  $n$  private goods and services  $Q_i$  ( $i = 1, 2, \dots, n$ ) and  $n$  prices corresponding to the various  $Q_i$  designated as  $P_i$  ( $i = 1, 2, \dots, n$ ). Returns per unit of factor as well as prices of goods are identical for all households due to perfect competition in factor as well as goods markets. There are no externalities or economies of scale. Thus,  $P_i$  equals marginal cost.

Initially, the world is without government.<sup>6</sup> All outputs are completely private. There are no inter-household transfers. Thus, in this first equilibrium state, there is a budget constraint for each household  $j$ :

$$(1) \quad Y_{1j} = \sum_{i=1}^n P_{1i} Q_{1i} = \sum_{k=1}^m R_{1k} A_{1k}$$

$Q_{1i}$  is the amount of the  $i^{\text{th}}$  good purchased by the  $j^{\text{th}}$  household whether for consumption or investment. (Note that asset accumulation through investment does not affect the supply of factors available since this is only a one period model.)

Now introduce government which is funded solely from taxes, has a balanced budget and in turn finances either completely private consumption or investment goods which are furnished directly to households or a completely public good or transfers.<sup>7</sup> Thus, in the Second State, assuming equilibrium is established, we have for household  $j$ :

$$(2) \quad Y_{2j} = \sum_{i=1}^n P_{2i} Q_{2i} + \sum_{i=1}^n B_{2i}^P Q_{2i} + B_2^G G_2 \cong \sum_{k=1}^m R_{2k} A_{2k}$$

where:

$B_i^P$  = marginal value to recipient household of  $Q_i$  financed by government,  
( $i = 1, 2, \dots, n$ ). (In terms of the usual utility analysis,

$$B_i^P = MU_{Q_i} / MU_Y.)$$

$G$  = quantity or total output of public good

$B^G$  = marginal value per unit of  $G$  to household  $j$ .

$$\text{(In utility analysis } B^G = MU_G / MU_Y.)$$

A few implications of relation (2) are worth emphasizing. Consistent with our focus on income, benefits are measured in terms of value analogous to the measurement of value in markets: Just as  $P_i Q_i$  purchased by a household is taken as the total

measure of the value of  $Q_i$  to the household, so  $B_i^P Q_i$  or  $B^G G$  equals what the household would be willing to pay for government supplied  $Q_i$  or  $G$  given that their monetary income equalled  $Y_j$ . Hence, we are not attempting to integrate consumer surplus into the analysis. This is analogous to what is done in measuring tax incidence where tax burden is inevitably defined in value terms, not in terms of the total reduction in utility (consumer surplus) associated with levying the tax. In other words, the estimate of benefits from such public services "should be based upon marginal rates of substitution between the services and other (private) goods and services. This approach ... involves ignoring consumer surplus provided by infra-marginal units of the public service, just as national accounting ignores the consumer surpluses inherent in consumption of private goods".<sup>8</sup>

The analysis assumes, realistically, that government provides publicly financed (private goods) at zero cost to the households, typically rationing their use through non-market mechanisms. Consequently, the marginal value to the household of publicly financed (private good)  $Q_i$  and its public cost of production or its private cost of production are not necessarily equal. This can occur whenever household consumption of  $Q_i$  is solely through public provision. If, in addition to government allotment, a household purchases part of its consumption of  $Q_i$  privately,  $B_i^P$  will equal  $P_i$ . However, even in the latter case,  $P_i$  need not equal the marginal cost of publicly financing  $Q_i$  (defined as  $C_i^b$ ) because  $C_i^b \geq P_i$ , depending upon the relative efficiency of government finance.

Note that household income ( $Y_{2j}$ ) is measured after all government effects have been considered, and that each household consumes all of  $G_2$ . The existence of government means that household consumption plus saving is no longer identically equal to factor income.

Spending per household  $j$  from factor income in state 2 must equal

$$\sum_{i=1}^n P_{2i} \cdot Q_{2i} = \sum_{k=1}^m R_{2k} A_{2k} - \sum_{h=1}^w T_{2h}$$

where:  $T_h$  = tax or negative tax, namely transfer, ( $h = 1, 2 \dots w$ ).

Consequently, we can rewrite relation (2) as

$$(2') \quad Y_{2j} = \sum_{k=1}^m R_{2k} A_{2k} - \sum_{h=1}^w T_{2h} + \sum_{i=1}^n B_{2i}^P \cdot Q_{2i} + B_2^G G_2$$

In the typical empirical country studies of budget incidence, benefit incidence is defined as  $\sum_{i=1}^n B_i^P Q_i + B^G G$ ; tax incidence as  $\sum_{h=1}^w T_h$ ; and  $RPTO$  incidence as zero.<sup>9</sup> One crucial consequence of the latter assumption is that factor incomes in

State 2 ( $\sum_{k=1}^m R_k A_k$ ) are defined as equal to factor incomes in State 1. Since factor incomes in State 1 are defined as equaling household income ( $Y_{1j}$ ), this *leger de main* in turn permits comparing the change in incomes between the two states:  $Y_{1j}$  is simply assumed equal to  $\sum_{k=1}^m R_{2k} A_{2k}$ .

But of course *RPTO* incidence is by no means zero and it is precisely the assumption — all too often implicit — that it is which results in some of the high level of controversy concerning the empirical country studies. What is clear is that because of *RPTO* effects, we can not have a very good idea of  $Y_{1j}$ . It follows that empirical country studies of budget incidence as well as tax incidence alone, are invalid if they claim to be studies comparing our two states of the world. This conclusion is elaborated below, at first as concerns the effects of changing relative prices in the context of the Lindahl Solution; and then very briefly in terms of changes in techniques, output, and its composition.

### C. The Lindahl Solution

If in State 2 we also have solely efficient benefit taxation, such that marginal value of benefit received = tax paid (a Lindahl Solution), then Relation (2) above is an equation for household  $j$  and for the economy as a whole:<sup>10</sup>

$$(3) \quad \sum_{i=1}^n \sum_{j=1}^{\ell} P_{2ij} Q_{2ij} + \sum_{i=1}^n \sum_{j=1}^{\ell} B_{2ij}^D Q_{2ij} + \sum_{j=1}^{\ell} B_{2j}^G G_2 = \sum_{k=1}^m \sum_{j=1}^{\ell} R_{2kj} A_{2kj}$$

And for each household  $j$ :

$$(3') \quad \sum_{h=1}^w T_{2h} = \sum_{i=1}^n B_{2i}^D Q_{2i} + B_{2j} G_2$$

The belief is widespread that a Lindahl Solution to the problem of financing public expenditure is *necessarily* Pareto superior,<sup>11</sup> that is the household utility corresponding to income in the second State ( $Y_{2j}$ ) equals or exceeds that of income in the first State ( $Y_{1j}$ ). However, this belief is false because government taxing and expenditure affect relative prices, returns to assets, and/or asset endowments.

It may be useful to belabor this point. Given a constant level of prices, in empirical work, we normally assume that the larger of two incomes is more desirable because household utility is assumed to be a positive function of income. However, if relative prices associated with the two incomes are radically different — say as the consequence of substantial changes in government taxes and expenditures — a given household may prefer the lesser income with the more favorable relative prices — as has been amply demonstrated by Hicks, Slutsky and others. For this reason even a successful comparison of measured incomes in two different states of government

activity does not necessarily give unambiguous results. In terms of our Lindahl Solution, the fact that all first order conditions in both private and public sectors are met for an optimum, which is to say *inter alia* that for all households marginal value of public output equals the tax price [Equation (3')] does not mean that all households are necessarily as well off as in State 1. The Lindahl Solution is Pareto optimal, not Pareto superior.

We can make this point symbolically by going behind income to household utility. That is:

$$(4) \quad U_{2j} - U_{1j} \geq 0,$$

where  $U_j$  = utility corresponding to  $Y_j$  and subscripts 1 and 2 refer to States 1 and 2.

Pareto superiority implies  $U_{2j} - U_{1j} \geq 0$ . But as noted, this is not a necessary consequence of (3).  $U_{2j} - U_{1j} < 0$  is also possible.

The non-Pareto superiority of the Lindahl Solution by implication also reinforces our earlier conclusion that meaningful comparison of incomes between States 1 and 2 is impossible: Even were it possible to determine the  $Y_{1j}$  in some sort of *deus ex machina* fashion, we would not know what meaning to attach to it as concerns welfare (or "real income") because of the probably very substantial change in relative prices.<sup>1,2</sup>

#### D. Subsidies in Production

We can also develop equation (2') by assuming that the newly introduced government also provides subsidies in production (including completely free inputs) such as the cost of agricultural extension services or the subsidy element in loans at submarket interest rates. Thus, we revise equation (2') for household  $j$  as follows:

$$(5) \quad Y_2 = \sum_{k=1}^m R_{2k} A_{2k} + \sum_{k=1}^h S_{2f} - \sum_{h=1}^w T_{2h} + \sum_{i=1}^n B_{2i}^D Q_{2i} + B_2^G G_2$$

where we assume that there are  $r$  subsidies,  $S_f (f = 1, 2 \dots r)$ .

Subsidies in production are analytically identical to taxes with opposite signs. Recall that in the case of perfect competition, indirect taxes are passed forward to burden final output. In our model, which assumes perfect competition, so that *all* productive subsidies are available to *all* firms, productive subsidies are therefore passed forward to final output as well. (It may also be well to recall here that the concept of factor returns ( $R_i$ ) is *net* of indirect taxes and production subsidies. Thus, output price always equals total factor returns plus indirect taxes less subsidies.)

In contrast to government financed private goods ( $B_i^D Q_i$ ) such as social services, note that the benefit incidence of production subsidies — as in the case of taxes — is

defined as equal to the subsidy: A subsidy is assumed to always reduce the costs of production by the cost of the subsidy, just as an indirect tax has exactly the opposite effect. Consequently, the problem of value to consumers being different from costs, which is frequently so pressing with respect to publicly provided specific goods, does not arise in the case of production subsidies. All that has gone before concerning *RPTO* effects of taxes and expenditures is equally applicable to production subsidies.

#### *E. Effects on Techniques, Output, and Its Composition*

Thus far, the focus has been goods produced in both periods. In reality, taxes, public spending and other public activity affect saving decisions, occupational decisions, and the development of fundamental institutions. Consequently, not only do relative prices and outputs change, but also factor endowments, and technological relations that is the "very nature" of production itself. Thus, once government exists, there may be production of things like battleships, public parks, and social security systems. On the other hand, certain outputs may be repressed such as unlicensed practice of medicine, or unlimited publication of newspapers. Which outputs are repressed and which produced of course depend on the type of government.<sup>13</sup> In short, to compare the distribution of income in an economy with government to what it would be without government is a bit like comparing the locomotion of the adult frog with the progenitor tadpole. Making the equations more realistic by adding externalities in both private and public goods in no way alters this simile.

The only empirical comparisons which it may be possible to make rigorously are (i) those involving small changes or (ii) those in which  $R$ ,  $A$ ,  $P$ , and  $Q$  are independent of government budget activity.

#### *F. Small Changes: Differential Balanced Budget Incidence<sup>14</sup>*

Define a Third State occurring after a *new* government specific expenditure ( $Q_{3c}$ ) is financed by an equivalent increase in a tax ( $T_c$ ). To make things less complicated, define remaining tax incidence and benefits from other government financed outputs as unchanged and assume that there is no effect on techniques. As a consequence, we generate two or more identities. The focus is total incidence, that is on the change in income in State 3 compared to State 2. For household  $j$ , this is stated as in (6).

$$(6) \quad \Delta Y_j = \sum_{k=1}^m \Delta R_k A_{2k} + \sum_{k=1}^m R_{3k} \Delta A_k - \Delta T_c + B_{3c}^p Q_{3c}$$

Or focusing on the spending side in the Third State gives

$$(7) \quad \Delta Y_j = \sum_{i=1}^n \Delta P_i Q_{2i} + \sum_{i=1}^n P_{3i} \Delta Q_i + B_{3c}^p Q_{3c}$$

Concrete illustration is useful. Suppose the expenditure newly financed ( $Q_c$ ) is hospital care for the poor. The short term effects may be:

- (a)  $\Delta R_j$ , an increase in the wages of medical personnel and in the returns to other hospital factors, plus other possible changes in  $R$ .
- (b)  $\Delta A_j$ , an increase in employed medical personnel, plus other changes in employed assets.
- (c)  $\Delta T_c$ , an increase in tax  $c$  equal in the aggregate to the total costs of  $Q_{3c}$ .
- (d)  $B_{3c}^p Q_{3c}$ , consumption of "free" hospital care (hitherto  $Q_c$ , publicly financed, was non-existent.)
- (e)  $\Delta P_j$ , an increase in price of medical outputs, plus other changes in relative prices.
- (f)  $\Delta Q_j$ , an increase in the quantity of medical outputs (in addition to  $Q_{3c}$ ), plus other changes in outputs.

Obviously, not all effects apply to all households.

Although we assume an unchanged average price level, *relative prices have changed*. As a consequence for household  $j$ , although (6) and (7) measure the change in income at a constant price level, we cannot be certain that even where  $Y_j$  is positive, that total utility has increased. The change in relative prices may make it possible for one household to attain a higher level of utility per dollar of private spending; while in spite of substitution another household perforce moves to a lower indifference curve for a given private budget constraint. Hence, unambiguous comparison even in the case of differential balanced budget incidence is impossible.

Many will argue that for small government programs, changes in factor endowments and relative prices are likely to be small, so that calculation of the change in money income is a good estimate of the change in total utility. I would take the same position. Nevertheless, if one wants to be rigorous, then the earlier conclusion holds.

Note, however, that conceptually it is possible to measure not only total incidence  $\Delta Y_j$ , but also to break out our three components. In identities (6) and (7),  $\Delta Y_j$  is total incidence of the new tax/expenditure. The final term in both identities is benefit incidence. In identity (6), the third term on the right side is tax incidence. Finally,  $RPTO$  is most simply defined as a residual equal to  $\Delta Y_j - (B_{3c}^p Q_{3c} - \Delta T_c)$ .

### G. Tax and Benefit Incidence Compared

Using our definitions, the first and second terms on the right side of equation (6) encompass  $RPTO$  incidence. In other words, they measure the combined  $RPTO$

effects of both the increased tax ( $\Delta T_c$ ) and the new publicly financed expenditure ( $Q_c$ ). In our example, we cannot separate out the *RPTO* effects of the tax from those of the expenditure. But one can devise examples in which the sole change is a compensating change in either expenditure or tax; e.g., replacing one tax with an equally-yielding alternative. Such cases would permit calculation of either the *RPTO* incidence of the change in taxes or in expenditure separately.

In identity (6) the change in taxation affects relative prices of outputs and returns to factors and may have long-run effects on asset formation. None of these changes is assumed in studies of total tax incidence. See for example the recent study of Pechman and Okner [18] or Gillespie [6].<sup>15</sup> Such tax studies measure solely the analogue of benefit incidence with respect to taxes. Yet this unmeasured *RPTO* incidence on the tax side is important. Obviously, effects of decreased and/or re-channeled private spending on relative prices, factor endowments, and even technological change are significant. The failure to deal with these in tax studies probably means errors as grave as those on the spending side where similar effects are ignored.<sup>16</sup>

An implication of this reasoning is that, conceptually at least, we can also decompose total incidence into two symmetrical pieces of two parts each: Tax incidence *per se* (defined as equal to the total tax) and the resulting *RPTO* incidence. Benefit incidence *per se* and the *RPTO* incidence resulting from the expenditure. A certain conceptual symmetry results. We define tax and benefit incidences as reducing and increasing incomes directly. Their *RPTO* incidences are more veiled, operating through changes in relative prices in factor and product markets, as well as through changing quantity and composition of output.

One additional conclusion is suggested by the above material. An attempt to assess even the differential incidence of an existing program is apt to be extremely complex, demanding research inputs which may not be at all commensurate with the expected research benefits.

Empirical country studies of tax incidence although frequently criticized because they ignore *RPTO* effects, are nevertheless widely accepted. Similar studies of expenditures, however, have been more seriously criticized, and have less widespread acceptance than those of taxation.<sup>17</sup> Yet, one conclusion suggested by the symmetry of incidence with respect to taxes and expenditures is that if it makes sense to study tax incidence ignoring *RPTO* effects, as is commonly the case, it should make equal sense to study benefit incidence in the same fashion, as is equally commonly the case. It is possible that the greater resistance to the expenditure studies may be due to confusion of *RPTO* and benefit incidences. Just as it is possible to separate tax-incidence *per se* from the associated *RPTO* effects, so it is possible — in fact, thus far, inevitable — that study of benefit incidence occurs independently of *RPTO* analysis with respect to expenditure.

### *H. RPTO Incidence in the Short Run*

Our earlier conclusion was that the empirical country studies of budget incidence were seriously invalid if they claimed to compare the effects of budget activity between a state of the world with government and a state of the world without it. (Just what is claimed to be compared in such studies is frequently not clear.) Can we make an alternative and less defective interpretation? The answer is yes if we move from a general equilibrium to a partial equilibrium framework.

Most of the concern with incidence questions by both citizenry and decision-makers focuses on the effects of budget activity on the returns to the existing distribution of factors of production. The vector of interest is therefore  $(R, P)$ . And the relevant question is, to what degree does government budget activity so radically affect relative factor and product prices that for a given household endowment of factors, household utility corresponding to pre-tax factor returns in the two periods differ substantially.

This question is unstudied. Presumably, it is an important component of incidence in many situations. For example, when government is the major employer of certain groups, it may also increase the returns to those groups substantially above what they would be if government did not exist. Additional examples come to mind. Clearly of importance is the size of government relative to the economy, and of government demand for highly differentiated labor, or capital. By the same token, the incidence due to changes in relative prices would decline as an economy increases the diversity of production, as labor and capital increase their mobility, as production functions become increasingly variable on both the input and output sides. What these considerations suggest is that such incidence is apt to be higher in a highly dual, developing country with a large government than in an advanced economy.

Returning now to our question, the empirical country studies of budget incidence can be most usefully viewed as "short-run backwards", in which factors of production and technology are constant. Their error lies in the assumption that  $R$  and  $P$  are independent of budget activity. We do not know when this error is serious and when it is trivial.

### *I. Measuring Benefit Incidence*

Another major source of discontent with country studies of benefit incidence is the assumption that total costs equal total value. As concerns public goods this frequently is interpreted as follows:

$$(8) \quad B_j^G = a_j TC^G$$

where:  $TC^G$  = total costs of producing  $G$

$a_j$  = proportion of total income received by household  $j$ .

This of course gives the same *relative* results as the assumption that no one benefits directly from general goods — an assumption of some attraction given the character of most such expenditures as general overhead costs.<sup>18</sup> These allocation techniques have no scientific basis in fact. They can be described as pseudo quantification of philosophical positions or *a priori* assumptions as to the arguments in utility functions.<sup>19</sup> Yet the problems of allocating benefits from such goods may not be insurmountable. For example, if one's interest is improving the long-term welfare of disadvantaged groups, it makes sense to disregard such expenditures since it is unlikely that even substantial changes in their magnitude and form will have much impact on absolute welfare of the poor.<sup>20</sup>

More problematic is the frequent assumption in such studies of allocative efficiency for specific expenditure. In other words, mode of production and allocation of public outputs is such that for each household, assumed value received for any output equals corresponding cost of production. In terms of the model, this means for household  $j$  that

$$(9) \quad B_{2i}^E = \bar{C}_{2i}^b$$

where  $\bar{C}^b$  = average and marginal cost of publicly financing  $i$ .

It is obvious that the political process does not give such fine-tuned results. It is also usually impossible to empirically measure  $B_{2i}^E$ : Even if households wanted to, it probably would be virtually impossible for them to consistently value — i.e., decide what they would be willing to pay for — a school year, or park-sojourn, or clinic visit. Moreover to the extent that expenditures redistribute from wealthy to say a poor family, it may be that  $B_{2i}^E < \bar{C}_{2i}^b$ , because of the meager level of income of the poor relative to the magnitude of government programs. Nevertheless, this latter situation may be compatible with a net increase in utility for the community as a whole, to the extent that redistribution is income equalizing and marginal utility is a declining function of income. Under such circumstances, the likely associated progressive tax could reduce utility less than the spending increases it.<sup>21</sup>

Such thinking leads some to assert that aggregate government spending on average and on the margin produces at least as much "welfare" or utility as the private spending for which it substitutes. In other words, the utility of the publicly provided  $Q_i$  to the recipient household is seen as equal on average to the utility of the taxes to the household which pays for it. One conclusion from this line of reasoning is that charging the public costs of providing a benefit to a recipient, may give better results in terms of the underlying distribution of welfare across the

community than attempting to estimate the value to the recipient, as thus far assumed in the model.

But one can make a third and still weaker assumption:

$$(10) \quad U_i^b = f(Q_i), f' > 0$$

where  $U_i^b$  = total utility to the beneficiary of publicly financed good  $Q_i$ .

Since average costs per unit of output are fairly stable, it follows that utility and total costs are positively associated. If this is true, obviously, it continues fundamental to know who benefits, and to identify beneficiaries by the amount spent on their behalf. This leads to the conclusion that study of benefit incidence should be redefined. It should not attempt the impossible, namely to estimate the value of all benefits to recipients, but rather to estimate the distribution of publicly financed outputs and corresponding public costs by beneficiary. In other words, the aim should not be to measure the value of benefits received, but to measure the distribution of the costs to the community of providing those benefits.

Incidentally, this interpretation of "benefit incidence" although frequently eclipsed is not new. In 1941, Stauffacher's concern with the discrepancy between public costs and subjective evaluation of benefits led to an outcome similar to that suggested above. In his words: "The benefit approach is ... primarily concerned with ... *charging the cost* of certain services provided by the government to the group(s) which they are intended to benefit".<sup>22</sup>

Because of the way this paper is organized, the importance of measuring benefit incidence of existing programs — independently of the question of budget incidence or tax incidence — may not have been brought to the fore. More concretely, if the poor are to escape poverty through public expenditure then, measuring benefit incidence becomes a basic policy input: Intelligent activity to assist the poor requires knowledge of how well existing programs are functioning in terms of which reach the poor and which do not. Information concerning the distribution of public costs by beneficiary is a *necessary* first step in acquiring such knowledge. Consequently, whether or not we compare the actual with an *ex ante* hypothetical distribution, knowledge concerning benefit incidence is valuable per se.

Throughout this discussion we have assumed, unrealistically, either completely private or public goods. Usually it is argued that many publicly financed specific goods have positive externalities not capturable by the private producer. Hence, public finance is needed to increase output to the optimal level. Introduction of such considerations into the above argument would result in reinforcing the conclusion that the assumption of costs of public production highly associated with benefits — which now distribute more diffusely — is usually valid. But such introduction would also suggest the difficulties in treating even specific expenditures as

completely private goods. Yet, at the same time, it would reinforce the desirability of estimating on whose behalf and in what magnitude public spending proceeds. More specifically, if utility functions are interdependent, so that *on average* household *k* derives utility from the publicly financed "merit goods" consumed by household *j*, it is of value to be able to state clearly what the cost to the community is of providing the goods to *j*. Such information is a necessary condition for rational planning of public expenditures.

### III. MAIN POINTS

(1) Estimating budget incidence in terms of an economy with government and that same economy without government or minimum government is impossible.

(2) Scientific measurement of differential balanced budget incidence is impossible. Even approximate measurement is extremely difficult if *RPTO* incidence is substantial.

(3) Although it is impossible to measure benefit incidence, in general, benefit incidence and community costs will be closely associated. Consequently, we take costs, which we can measure, as a proxy for benefits. This procedure brings a useful by-product, identification of the costs incurred by the community in providing benefits to different groups. This is a necessary first step in many types of policy analysis.

(4) It is possible and worthwhile to study both tax and benefit incidence independently of *RPTO* incidence.

(5) Study of *RPTO* incidence per se is desirable. It would be useful to gauge its importance relative to that of benefit incidence.

(6) Country studies of general tax and/or public spending incidence would be improved if they discussed explicitly two necessary limitations: (i) the usual assumption that relative prices, asset endowments, and production functions are independent of budget activity; and (ii) their usual failure to consider *RPTO* incidence. It may be best to regard such studies as being of the short run "backwards" with asset endowments, production functions, and relative prices fixed.

(7) Thinking about the incidence of both taxes and public expenditures would be improved if the symmetry of the two were recognized: tax incidence, in conventional definition is analogous to benefit incidence; *RPTO* incidence with respect to taxes (largely ignored in country studies) is analogous to *RPTO* incidence with respect to expenditure (largely ignored in country studies).

(8) Because marginal utility declines with income, in many situations charging costs to recipients may be a better measure of the overall impact of budget activity on welfare than attempts to measure benefits in value terms: Even if a dollar of tax

produces a quarter of benefits, total welfare may be increased if the tax-payer is wealthy and the beneficiary poor.

#### NOTES

\* In this paper I speak solely for myself, and not for my employer.

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<sup>1</sup> This is still a very narrow perspective. Government affects income distribution fundamentally by supporting basic institutions and attendant legislation, e.g., a constitution, and less fundamentally by affecting numerous variables which in turn affect income distribution; e.g., foreign exchange rates, interest rates, treatment of business, wage and migration policy, and rate of inflation. Budget incidence, therefore, can only measure a small part of government impact on the distribution of income.

<sup>2</sup> For a review and critique of country studies of budget incidence see Bird and de Wulf [2], McLure [11], Meerman [12], de Wulf [25]. An early critique of United Kingdom measures of budget incidence was led by Peacock and Shannon [17]. Alan Prest [20] continued this attack on the U.K. measures in part by stressing the contradictory nature of the 'traditional' assumptions concerning tax incidence as also discussed in his 1955 paper. The frustrating question of the incidence of public goods has been discussed at length in Aaron and McGuire [1] and Brennan's comment plus rejoinders [4].

<sup>3</sup> The focus is solely effects from taxing and spending. Concomitant changes in the institutional framework and their impact on distribution are not considered, e.g., licensing requirements.

<sup>4</sup> [11, p.7]. McLure states that the concepts and terms expenditure and benefit incidence are from Musgrave [14, pp. 213-15]. McLure is correct in this, although it is interesting that nowhere else (including the index) does Musgrave use such language, nor does he make a distinction between expenditure and benefit incidence as such in his 1973 text. Rather he defines expenditure incidence as encompassing both benefit and McLurian expenditure incidence. See Musgrave and Musgrave [15, pp. 360-61].

<sup>5</sup> Slavery presents a real world example of this assumption.

<sup>6</sup> A world without government is an idealization. More realistically, define it as minimal government spending compatible with maintenance of sufficient order and security to permit modern economic life. Depending on circumstances, this would probably lie between 1 and 3 percent of GNP for most countries. This is close enough to zero to permit such idealization without seriously biasing analytical results.

<sup>7</sup> The restriction to private consumption or investment goods directly to households is unrealistic. It is eliminated below where the methodology is developed for considering subsidies in the form of production inputs. Public good is defined as a good "which all enjoy in common in the sense that each individual's consumption of such good leads to no subtraction from any other individual's consumption of that good" [21, Samuelson, p. 387].

<sup>8</sup> [11, McLure, p. 52]. See also Maital [p. 562], Aaron and McGuire [1, p. 909] all of whom accept this approach.

<sup>9</sup> For two good recent examples, see Gillespie [7] and Musgrave and Musgrave [15, pp. 355-77].

<sup>10</sup> Equation (3) could have been written in national accounts terms; assuming that total final output equals total factor-incomes is consistent with a Lindahl equilibrium.

<sup>11</sup> Pareto superiority exists when in moving from equilibrium State 1 to equilibrium State 2, no household's total utility diminishes and at least one increases.

<sup>12</sup> In other perspective, we have here a version of the Index Number Problem in which solely relative prices change. Use of a Laspeyre index defines the maximum amount "real" income could have fallen for any household in State 2 relative to State 1. Note that the comparison is between an actual and a hypothetical given income distribution. Whether State 2 *could* be Pareto superior, given the range of possible income distributions in State 2 is another issue. But even an actual or possible Pareto superior situation for State 2 does not mean that State 2 is unambiguously better. It may have been possible to achieve an income distribution in State 1 preferred by all to the actual or possible distribution in State 2. See Scitovsky [22]. The debate between Aaron and McGuire [1] and Brennan [4] revolved around whether, on introducing public goods, a Lindahl solution is "distributionally neutral". The outcome came close to the position presented here, namely the necessary ambiguity in comparing incomes in two states with different relative prices, even though incomes in terms of the standard numeraire remain constant.

<sup>13</sup> In terms of the model only a subset of the  $n$  possible  $Q_i$  will be produced in any given state.

<sup>14</sup> Defined as the combined incidence of a tax and the expenditure it finances.

<sup>15</sup> The Pechman/Okner study is also of interest in avoiding many of the problems discussed above. They did this by eschewing comparison of the *status quo* with a hypothetical zero government but used as their "counterfactual" a hypothetical proportional income tax equal to total taxes.

<sup>16</sup> Although *RPTO* effects are always neglected in the empirical country studies, in a wide variety of other work they are the focus of attention. See Break [3]. But the results of such work have not been of a kind to permit their application in the country studies.

<sup>17</sup> See the references to the general critiques in note 2.

<sup>18</sup> For an analysis of some of the problems in allocating benefits from general goods see Shoup [23, pp. 66ff] Aaron and McGuire [1], Brennan [4], Meerman [13].

<sup>19</sup> See Aaron and McGuire [1].

<sup>20</sup> Another alternative is to regard the services from outlays for internal and external security as a peculiar general intermediate good whose benefits cannot be allocated by households. See Kuznets [9, p. 156] where he argues that such goods are "the cost of membership in our business civilization".

<sup>21</sup> As illustrated by the case in which the poor family prefers a block grant equal to the cost of the government service received, e.g., subsidized housing. Such subsidized housing need not be inferior to the *ex-ante* situation. To give a new twist to the Kaldor compensation criterion, in the above example if the poor could transfer utility, they might be more than willing to fully compensate the loss of utility to those who finance the housing subsidy.

<sup>22</sup> See also the discussion in Cartler [5, pp. 11-13], Musgrave et al [16, pp. 282-84] and the cryptic remark of Gillespie [6, p. 176].

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**Summary:** *Do Empirical Studies of Budget Incidence Make Sense?* - This paper attempts to reduce the controversy concerning statistical studies of the incidence of taxes and public expenditure. The analysis is based on an algebraic formulation of the household budget constraint permitting comparisons under various states of the world. Incidence is so defined as to include general equilibrium effects of taxes and expenditures, namely changes in relative prices, technological change, and the outputs of various goods and services, (RPTO incidence). The paper shows that the

empirical country studies wrongly assume that RPTO incidence is zero. Economists have been more willing to ignore RPTO incidence in aggregate tax studies than in the analysis of incidence of public expenditures notwithstanding the symmetry between the two: The statistical studies exclude RPTO considerations, in analyzing both tax and benefit incidence but should include them in both cases. In fact, such studies are really "short run backwards," in that RPTO incidence is implicitly assumed constant in the backwards comparison of the actual distribution of tax burdens and expenditure benefits among households with the hypothetical situation of zero government. The paper also shows that a Lindahl solution to production of public goods although Pareto optimal may not be Pareto superior. The paper also considers the assumptions used to distribute benefits of public expenditures across households. The studies inevitably assume that the recipient's valuation of such benefits equals their public costs. This is improbable, for example, where the cost is high and the recipient's income is low as may be the case with poor children in secondary schools. However we can make a virtue of necessity. The researcher should drop all pretense of measuring benefits and allocate costs to beneficiaries. This will be useful to policy makers who need to know where the spending goes. It may also give a better measure of the overall impact of budget activity on welfare than attempts to measure the value of benefits.

**Résumé:** *Les études empiriques de l'incidence budgétaire ont-elles un sens?* – Cet article tente d'apaiser la controverse sur les études statistiques relatives à l'incidence des impôts et des dépenses publiques. L'analyse est fondée sur une formulation algébrique de la contrainte relative à la gestion budgétaire permettant des comparaisons en différents pays dans le monde. L'incidence est définie de façon à inclure les effets d'équilibre général des impôts et des dépenses, à savoir modifications dans les prix relatifs, évolution technologique et productions de divers biens et services (incidence RPTO). L'article montre que les recherches empiriques par pays posent à tort comme hypothèse que l'incidence RPTO est nulle. Les économistes ont eu davantage tendance à ignorer l'incidence RPTO dans les recherches en matière d'impôts que dans l'analyse de l'incidence des dépenses publiques, malgré la symétrie entre les deux: les études statistiques négligent le RPTO en analysant l'incidence à la fois des impôts et des avantages, alors qu'elles devraient les inclure dans les deux cas. En fait, de telles études sont réellement "en arrière à court terme", en ce sens que l'incidence RPTO est implicitement supposée constante dans la comparaison "enarrière" de la distribution réelle des charges fiscales et des avantages des dépenses entre les ménages, avec une situation hypothétique d'un gouvernement inexistant. L'étude montre aussi qu'une solution de Lindahl pour la production de biens publics, bien que respectant l'optimum parétien, n'est pas supérieure à celle de Pareto. L'article traite également les hypothèses relatives à la distribution des avantages des dépenses publiques entre les ménages. Les études posent inévitablement en hypothèse que la valeur de tels avantages pour qui les reçoit équivaut à leurs coûts publics. Or, ceci est improbable, par exemple quand le coût est élevé et que le revenu du bénéficiaire est bas, comme c'est le cas pour les enfants pauvres dans les écoles secondaires. Cependant, on peut faire d'une nécessité une vertu. Le chercheur devrait renoncer à la prétention de mesurer les avantages et de répartir les coûts entre les bénéficiaires. Ce serait pourtant utile pour les décideurs politiques qui ont besoin de savoir la destination des dépenses. Cela peut aussi donner une meilleure évaluation de l'effet global de l'activité budgétaire sur le bien-être que les tentatives faites pour mesurer la valeur des avantages.

**Zusammenfassung:** *Sind empirische Studien über Budgetinzidenz sinnvoll?* – Dieser Artikel versucht, die Kontroverse um statistische Untersuchungen der Inzidenz von Steuern und öffentlichen Ausgaben abzubauen. Die Analyse basiert auf einer algebraischen Formulierung der Budgetnebenbedingung, die Vergleiche zwischen verschiedenen Staaten der Welt zuläßt. Die Inzidenz ist so definiert, daß sie allgemeine Gleichgewichtseffekte von Steuern und Ausgaben, insbesondere Änderungen der relativen Preise, technologische Veränderungen und die Produktion verschiedener Güter und Dienstleistungen (RPTO-Inzidenz) einschließt. Der Artikel zeigt, daß die empirischen Länderstudien fälschlicherweise eine RPTO-Inzidenz von Null annehmen. Wirtschaftswissenschaftler sind eher bereit, die RPTO-Inzidenz in Steueruntersuchungen unberücksichtigt zu lassen als bei Analysen der Inzidenz öffentlicher Ausgaben ungeachtet der Symmetrie zwischen den beiden: Statistische Untersuchungen schließen RPTO bei der Analyse der Steuer- und Nutzeninzidenz aus, sollten sie jedoch in beiden Fällen berücksichtigen. Tatsächlich sind solche Untersuchungen wirklich "kurzfristig rückwärts gewandt", insofern als die RPTO-Inzidenz implizit als konstant in dem "rückwärts" orientierten Vergleich der gegenwärtigen Distribution von Steuerlasten und Ausgabennutzen zwischen Haushalten unter der hypothetischen Situation einer Null-Regierung. Der Artikel zeigt ebenfalls, daß eine Lindahl-Lösung für die Produktion öffentlicher Güter, auch wenn sie Pareto-optimal ist, nicht unbedingt der Paretos-Lösung überlegen ist. Darüberhinaus werden die Annahmen untersucht, unter denen die Nutzen öffentlicher Ausgaben auf die Haushalte verteilt werden. Die Untersuchungen gehen zwangsläufig davon aus, daß die Bewertung des Empfängers solcher Nutzen mit den öffentlichen Kosten gleichzusetzen ist. Dies ist z.B. dort unwahrscheinlich, wo die Kosten hoch und die Empfängereinkommen niedrig sind, wie es bei armen Kindern in höheren Schulen der Fall sein kann. Aus der Notwendigkeit läßt sich jedoch eine Tugend machen. Der Wissenschaftler sollte auf eine Messung der Nutzen verzichten und die Kosten unter den Begünstigten aufteilen. Dies wäre für die Politiker von Nutzen, die über die Verwendung der Gelder informiert sein müssen. Dies ließe auch eine bessere Bewertung der Gesamtwirkung budgetärer Maßnahmen auf die Wohlfahrt zu als Versuche, Nutzen zu bewerten.

# ESTIMATING COUNTERFACTUAL INCOMES IN STUDIES OF BUDGET INCIDENCE

by

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## I. INTRODUCTION

In a recent issue of this journal Meerman asks, "Do Empirical Studies of Budget Incidence Make Sense?" He answers that although sensible, their usefulness is much constrained because they are short run "backwards" in that they implicitly assume *ceteris paribus* conditions for relative prices, technology, labor supply, level of unemployment, savings, and investment in making the incidence estimates [9, p. 298]. Meerman sums these together under the heading of RPTO incidence (relative prices, technology, output).

Perhaps the most serious and most vitiating of these *ceteris paribus* conditions is that for relative prices.<sup>1</sup> In addition, the failure of these studies to, in any way, indicate the effects of government budget activity on savings and investment is also a very serious limitation. It is noteworthy that these problems are to some degree dealt with in the Harberger Model [7] and in its development.<sup>2</sup> In what follows we wish first to show how results from the Harberger Model can be used in conjunction with the Meerman approach to suggest some of the error in the comprehensive statistical studies because of assuming fixed relative prices. In other words, Meerman somewhat overstates his case. To some degree relative price changes for factors of production — principally capital and labor — can be taken into consideration in the comprehensive statistical studies. Second, by correcting and elaborating on Meerman's model, we wish to point out two additional errors in the comprehensive statistical studies because of the fact that if taxes are in part (or in total) indirect, total factor incomes (or in Meerman's model the household budget constraints) necessarily sum to less than total output.

## II. IMPLICATIONS OF THE HARBERGER MODEL

In Section II(B) of his paper, Meerman points out that in the comprehensive

statistical studies of incidence, a "counterfactual" or a hypothetical, before-tax position (state 1) is defined and then compared with the observed post-tax position (state 2), to obtain a measure of incidence. He goes on to show how RPTO incidence is implicitly assumed to be zero in these short run studies and how the counterfactual household income,  $Y_1$ , is simply taken to be equal to the observed value of the total factor incomes,  $\sum_{k=1}^m R_{2k} A_{2k}$ , where  $R_k$  is the per unit return to

the  $k^{th}$  factor, and  $A_k$  is its quantity.

In his original article Harberger used as the counterfactual — Meerman's state 1 — a perfectly competitive US economy with Cobb-Douglas production functions, fixed technology, fixed supply of factors and no corporate income tax. He also assumed expenditure neutrality: Government expenditure from the tax was to exactly mimic the former expenditure of the private resources now taxed away. Harberger compared labor and capital incomes in counterfactual state 1 with what they were in actual state 2, principally by permitting relative factor prices to vary. A sufficiently long run analysis allowing for intersectoral factor movements to be completed, together with the assumption of perfect competition, implies that capital earns the same net return in all uses. Consequently Harberger's state 2 had a higher gross rate of return per unit of capital in the more highly taxed corporate sector than in the non-corporate sector.

We illustrate Harberger's case by the following example using Meerman's notation. Let us focus only on the returns ( $R_K$ ) and quantities ( $A_K$ ) of capital in the corporate and non-corporate sectors. Then let  $R_{gK} A_{gK}$  be the *net* income of capital in the  $i^{th}$  sector ( $i = \text{corporate, } C; \text{ and non-corporate, } NC$ ) for the  $g^{th}$  state ( $g = \text{before-tax, } 1; \text{ and after-tax, } 2$ ). Then

$$(1) \quad R_{1K}^C A_{1K}^C + R_{1K}^{NC} A_{1K}^{NC} = R_{1K} A_{1K}$$

After the tax is imposed and equilibrium has been achieved in state 2, the gross income of total capital can be defined as

$$(2) \quad R_{2K} A_{2K} + S = R_{2K}^{NC} A_{2K}^{NC} + R_{2K}^C A_{2K}^C + S$$

where  $R_{2K}^{NC} A_{2K}^{NC}$  is the post-tax income of non-corporate capital, and  $(R_{2K}^C A_{2K}^C + S)$  is the gross income of corporate capital, of which  $S$  is the tax on corporate capital. In the unsophisticated approach to corporate tax incidence it is assumed that

$$(3) \quad R_{1K}^C A_{1K}^C - R_{2K}^C A_{2K}^C = S$$

that is, the entire tax appears to be "borne" by corporate capital. But, as explained

below in the simple Harbergerian example elaborated in Table 1, in reality the net per unit return to capital in both sectors is depressed.

It is in the nature of Cobb-Douglas production functions that factor shares of total income remain constant at all input prices. In our example, constant composition and price of final output is implicitly assumed. Consequently — as illustrated in Table 1 — aggregate gross returns to non-corporate and corporate capital remain constant at 400 and 200 respectively. In Table 1, the tax on income from corporate capital is 25%. Since the gross return remains 400, the net return must fall to 300, with the proceeds from the tax equaling 100. We now have clearly in mind what is needed to calculate the post-tax positions shown in Table 1. (Table 1 refers to capital income only since labor incomes in both sectors will remain the same in pro-tax and post-tax positions.)

In the post-tax situation,  $R_{2K}^C$  is taken as the *net* price of capital and  $A_{2K}^C$  is the quantity of capital in the corporate sector. Then net income in the corporate sector must be equal to 300, or

$$(4) \quad R_{2K}^C A_{2K}^C = 300$$

Given that the total amount of capital is 600, we can write  $(600 - A_{2K}^C)$  as the amount of capital in the non-corporate sector. For equilibrium,  $R_{2K}^C$  has to be the net price of capital in both sectors. Thus, since the income of capital in the non-corporate sector is 200, we have

$$(5) \quad R_{2K}^C (600 - A_{2K}^C) = 200$$

Solving equations (4) and (5) we have  $R_{2K}^C = 5/6$  and  $A_{2K}^C = 360$ . The post-tax quantity of capital in the non-corporate sector is then  $(600 - 360) = 240$ . And the gross return per unit of capital in the corporate sector  $\frac{R_{2K}^C}{(1-t)}$ , where  $t$  is the tax rate (25%). Thus it is equal to  $\frac{5/6}{1-.25} = 10/9$ .

It is now obvious that in economies similar to that assumed here, in order to get to the counterfactual capital income,  $R_{1K}A_{1K}$ , that is  $(400 \cdot 200)$ , one should simply add the gross income of capital in the corporate sector (400) to the income of capital in the non-corporate sector (200). Labor income in state 2 can be simply added on to this since it is not affected by the tax, and thus the total income for counterfactual,  $R_1 A_1$ , is obtained.<sup>3</sup>

This outcome has implications for the comprehensive statistical studies (CSS). Consider two households in state 2 (from the world of Table 1). Household *A* has income from corporate capital only. Household *B* has income from non-corporate

TABLE 1  
Capital Income, Quantity And Price  
In Pre-Tax And Post-Tax Positions

<i>State 1 (Before Tax)</i>		
<i>Income</i>	<i>Quantity</i>	<i>Price</i>
$R_{1K}^C A_{1K}^C = 400$	$A_{1K}^C = 400$	$A_{1K}^C = 1$
$R_{1K}^{NC} A_{1K}^{NC} = 200$	$A_{1K}^{NC} = 200$	$R_{1K}^{NC} = 1$
<i>State 2 (After Tax)</i>		
(Assuming Cobb-Douglas Production Functions, and a 25% Tax on Corporate Capital Income, Equal to 100)		
<i>Income</i>	<i>Quantity</i>	<i>Price</i>
$R_{2K}^C A_{2K}^C + S = 400$ (gross)	$A_{2K}^C = 360$	$R_{2K}^C = 10/9$ (gross)
$R_{2K}^C A_{2K}^C = 300$ (net)		$R_{2K}^C = 5/6$ (net)
$R_{2K}^{NC} A_{2K}^{NC} = 200$	$A_{2K}^{NC} = 240$	$R_{2K}^{NC} = 5/6$

capital and no other source. Both households own 40 units of capital. They live in our simple Harbergerian Cobb-Douglas world, where legally “only” corporate income is taxed and at 25 percent. We indicate their state 1 and state 2 incomes in Table 2 below.

TABLE 2  
Incomes of Two Households in State 1 and State 2

Household	Source of Capital	Quantity	Income			
			Gross	Net	State 2	State 1
A	Corporate capital	40	(10/9)(40) = 44.44	(5/6)(40) = 33.33	33.33	40
B	Non-corporate capital	40	(5/6)(40) = 33.33	(5/6)(40) = 33.33	33.33	40

The Harberger Cobb-Douglas approach makes the proper measure of income in state 1 and state 2 obvious — under competitive assumptions. Yet in many of the CSS, the approach used appears to have been defective. Such studies frequently answer the question, what would incomes be in state 1, that is were there no government, by simply taking gross factor incomes as they are in state 2, even though the studies assume that taxes on part of capital actually burden all capital in part or in total. In terms of the example above, this means taking total income for household *A* in state 1 as 44.44, since at first glance this is what factor income would be were there no government. Consequently, this approach exaggerates counterfactual income of corporate capital owners, if corporate taxes are above the average of capital taxation.<sup>4</sup> In addition relative tax burden of the corporate capitalists is estimated as somewhat too low; counterfactual incomes are too low for capitalist households with low corporate income, while their estimated burdens from capital taxes are too high.

Pechman and Okner [11] — we believe — avoid this error, although it is not completely clear that this is the case, since they do not provide detail on just how they “restore” corporate income taxes to households. Musgrave et al [10] may have added the entire corporate income tax back to corporate capital shareholders in building their counterfactual for a US study of budget incidence for 1968. To wit: “. . . proper treatment of the corporation tax calls for imputation of total corporate source income to shareholders ” (Musgrave et al [10, p. 301]). If they did do this it would not be consistent with their six tax shifting assumptions for the corporate income tax, none of which assumes that the tax burdens solely owners of corporate shares. In general in most studies no attempt is made to adjust counterfactual income to be consistent with incidence assumptions.<sup>5</sup>

We should also emphasize that some investigators are very much aware of the effects of government tax and expenditures on relative prices.<sup>6</sup> But it has hitherto been widely believed that it is impossible to in any way come to grips with the problem. This is not completely the case, as suggested by the work on the Harberger model as well as the discussion on indirect taxation below. We do have a beginning in dealing with the more general issues of the impact of taxes on counterfactual incomes. But the spending side is, alas, largely *terra incognita*.

### III. THE EFFECTS OF INDIRECT TAXES

In Section II(C) of his paper, Meerman makes an implicit and unwarranted assumption to the effect that all taxes are direct. He states the Lindahl solution, his equation (3), as total output equals total factor income, or

$$(6) \quad \sum_{i=1}^n \sum_{j=1}^l P_{2ij} Q_{2ij} + \sum_{i=1}^n \sum_{j=1}^l B_{2ij}^p Q_{2ij} + \sum_{j=1}^l B_{2j}^g G_2 = \sum_{k=1}^m \sum_{j=1}^l R_{2kj} A_{2kj}$$

where  $P_{2ij}$  and  $Q_{2ij}$  are the price and quantity respectively, in state 2, of the  $i^{\text{th}}$  commodity purchased by the  $j^{\text{th}}$  household,  $B_{2ij}^p$  is the marginal value to recipient household  $j$  of the private commodity  $i$ , in state 2, provided through government provision;  $B_{2j}^g$  is the corresponding marginal value of the public good ( $G$ );  $G_2$  is the amount of the public good, and  $\sum_{k=1}^m \sum_{j=1}^l R_{2kj} A_{2kj}$  is total factor income.

This equality will hold only if all taxes are direct. For if taxes are in part or in total indirect, the left-hand-side of the equation (total output) must be greater than the right-hand-side (total factor income) by the amount of indirect taxes. Thus the above statement of the Lindahl solution is valid if and only if all taxes are direct so that there is no wedge between total output and total factor incomes. Of course whether or not indirect taxes exist, in no way affects Meerman's conclusion that a Lindahl solution is not necessarily Pareto superior.

This failure to be explicit about the directness or indirectness of taxation suggests another aspect of the problem of what is the proper concept of total household income for state 1. As noted, if in state 2 all taxes are indirect, then, even ignoring RPTO incidence, for all households combined, the sum of factor incomes is less than total output or NNP by the amount of indirect taxes. In other words if  $Y_{2j}$  is the income of the  $j^{\text{th}}$  household in state 2,  $X$  is the average indirect tax per private good, and the variance in  $X$  is independent of the distribution of incomes, then if we have a Lindahl solution or we take a national accounts perspective we have the following for each household  $j$ :

$$(7) \quad Y_{2j} = \sum_{k=1}^m R_{2k} A_{2k} + X \left( \sum_{i=1}^n Q_{2i} \right)$$

Under these circumstances to get a proper measure of  $Y_{1j}$  we need to impute — somehow — to each household its change in income on the assumption of complete remission of indirect taxes. (The resources corresponding to the sum of all such

changes will necessarily be  $(X) \sum_{i=1}^n \sum_{j=1}^l Q_{2ij}$ ). Many researchers have ignored

this problem and taken as their counterfactual simple factor incomes in economies with considerable indirect taxation. Even the more sophisticated researchers, who put these resources into the indirect taxes would be distributed in state 1 in proportion to the distribution of factor incomes and that changes in relative product prices are neutral (Pechman and Okner [11]; Musgrave [10], and Browning [3]). In brief, the CSS ignore RPTO incidence, and they also fail to consider the most obvious aspect of RPTO incidence, namely how to adjust household incomes

private incomes) and benefit incidence (who receives the benefits of government services)" [11, McLure, p.2]. In McLure's thinking, total incidence can therefore be decomposed into: "The burden (and benefits) of taxes used to finance public activity, the benefits of public services, and the redistribution of income resulting from changes in relative factor rewards and product prices induced by the shift of purchasing power from the private to the public sector. For convenience, we can refer to these three effects as tax, benefit and expenditure incidence, respectively"<sup>4</sup>

Earlier versions of this paper attempt to use both this basic tripartite decomposition of incidence as well as the terms benefit and expenditure incidence. Although logically there was no problem, the result was continuing confusion of readers not to mention incendiary red herrings. Three difficulties were basic:

(1) The distinction is made between expenditure incidence as consisting of impacts on private incomes — in Musgrave's language "changes in the distribution of income disposable for private use" [14, Musgrave, p. 214] — and benefit incidence as "the benefits derived from public services". Clearly, however, the benefits from public services have private income equivalents. In a common definition of income, transfer payments, rent allowances, and public medical care received free or at subsidy can be regarded as private income by their recipients. Musgrave and McLure really define income rather rigorously as solely returns to factors of production *and* on the spending side solely the goods and services which those returns can purchase.

(2) It is very common, among economists, to use "expenditure incidence" to refer to benefit incidence alone or to benefit incidence plus McLure / Musgravian expenditure incidence. And it is difficult to fault people for using the terms in such an apparently straightforward and common sense fashion. But it does lead to unnecessary confusion, and a great deal of explanation.

(3) Finally, because of the common definition of tax incidence as equal to the amount of the tax, the phrase "expenditure incidence" as used by Musgrave and McLure may carry something of an implication that only an expenditure has effects on relative prices, on techniques, and on the volume of output. We realize, of course, that taxes have similar effects. More generally, we realize that by and large increases in taxes and expenditures go hand in hand, i.e., over the long run budgets have to be (nearly) balanced. Consequently, it is probably useful to think of incremental taxes *and* their associated incremental expenditures together making explicit the fact that the resulting effects on tax/expenditure on relative product and factor prices as well as the volume and composition of output are closely associated.

Where this leads us for the analysis at hand is to (i) development of a model in terms of balanced budget incidence, as the situation which most corresponds to the real world; (ii) to keeping the McLure Musgrave tripartite decomposition of incidence but to putting it into new bottles. Specifically, we define benefit incidence

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**Summary:** *Estimating Counterfactual Incomes in Studies of Budget Incidence.* — In his article "Do Empirical Studies of Budget Incidence Make Sense?" [9] Jacob Meerman argued that one of the most serious shortcomings in such studies was the failure to in any way consider the effects of government activity on relative factor and output prices. But Meerman overstated his case. This paper shows how the effect of the corporate income tax on relative returns to factor incomes is dealt with in the Harberger Model. In the process the paper shows how use of the Harberger Model could deal with some common errors in the empirical statistical studies. The paper also deals with a minor error in Meerman's article: His demonstration that a Lindahl-solution to taxes and public production is Pareto optimal but not necessarily Pareto superior, implicitly involved the notion that all taxation is direct. It is obvious, however, that the conclusion also holds in economies with indirect taxation. The paper then takes off from this point to discuss some rarely considered problems arising from the fact that in economies with indirect taxes, total factor incomes are less than total incomes. Many studies simply err in generating the

counterfactual incomes of a before-government world without including indirect taxes. Those few studies that do incorporate the wedge of indirect taxes, back into factor incomes, do so in an unsatisfactory manner.

**Résumé:** *Estimation de revenus "counterfactual" dans les études d'incidence budgétaire.* — Dans son article "Do Empirical Studies of Budget Incidence Make Sense?" [9], Jacob Meerman affirme que l'une des déficiences les plus importantes de ces études est l'absence de prise en considération des effets de l'activité gouvernementale sur les prix relatifs des facteurs et de l'output. Mais Meerman a exagéré son cas. Cet article montre comment l'effet de l'impôt sur les sociétés sur les rendements relatifs de revenus des facteurs est traité dans le modèle de Harberger. Au cours de cet article, nous montrons comment l'utilisation du modèle de Harberger pourrait éviter certaines erreurs communes dans les études statistiques empiriques. L'article présent traite également d'une erreur mineure dans l'article de Meerman: sa démonstration qu'une solution du type Lindahl aux problèmes des taxes et de la production publique est optimale au sens de Pareto, mais pas nécessairement supérieure au sens de Pareto, fait appel implicitement à la notion que toute taxation est directe. Il est cependant évident que cette conclusion vaut également pour des économies avec taxation indirecte. L'article présent part ensuite de cette conclusion pour discuter certains problèmes, rarement considérés, résultant du fait que dans des économies avec taxes indirectes, les revenus des facteurs totaux sont moindres que les revenus totaux. De nombreuses études s'égarent en engendrant les revenus "counterfactual" d'un monde d'avant-gouvernement sans inclure les impôts indirects. Les quelques études qui incorporent la part des taxes indirectes dans les revenus de facteurs, le font de manière peu satisfaisante.

**Zusammenfassung:** *Eine Schätzung der „counterfactual“-Einkommen in Untersuchungen über die Budgetinzidenz.* — In seinem Artikel "Do Empirical Studies of Budget Incidence Make Sense?" [9] argumentierte Jacob Meerman, daß einer der schwerwiegendsten Mängel solcher Untersuchungen darin bestehe, daß die Effekte von Staatsaktivitäten auf relative Faktor- und Outputpreise unberücksichtigt bleiben. Aber Meerman überbewertete seine Argumentation. Dieser Artikel zeigt, wie die Effekte einer Körperschaftssteuer auf relative Faktorerträge im Harberger-Modell abgehandelt werden. Im weiteren Verlauf wird gezeigt, wie man bei Anwendung des Harberger-Modells mit einigen allgemeinen Fehlern bei empirischen statistischen Untersuchungen fertig werden könnte. Diese Untersuchung befaßt sich ebenfalls mit einem geringfügigen Fehler in Meermans Artikel: Sein Nachweis, daß eine Lindahl-Lösung für Steuern und öffentliche Produktion pareto-optimal, aber nicht unbedingt pareto-superior sei, impliziert die Bedingung, daß jede Besteuerung direkt sei. Diese Schlußfolgerung ist offenkundig in Wirtschaften mit indirekter Besteuerung gültig. Der Artikel nimmt dies zum Anlaß, einige kaum beachtete Probleme zu diskutieren, die sich daraus ergeben, daß in Wirtschaften mit indirekten Steuern die gesamten Faktoreinkommen geringer sind als die Gesamteinkommen. Viele Untersuchungen gehen einfach fehl, wenn sie "counterfactual"-Einkommen in einer Volkswirtschaft ohne Staatssektor berechnen, ohne indirekte Steuern einzubeziehen. In den wenigen Untersuchungen, in denen die Wirkungen indirekter Steuern auf Faktoreinkommen einbezogen werden, geschieht dies auf unbefriedigende Weise.

## Confirmations and Contradictions

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### The Incidence of Sales and Excise Taxes, or Where Do We Put the Transfers?

Jacob Meerman

*World Bank*

Whether sales and excise taxes are regressive or progressive depends on how the question is asked. If tax incidence is measured in the context of a comprehensive study of both taxes and benefits, they are likely to be regressive. If one uses differential incidence analysis in the manner of Edgar Browning (1978), they are likely to be progressive. As discussed below, of crucial importance in such an analysis is the implicit or explicit definition of what incomes would be were there no taxes. So-called counterfactual income is the crux of the problem.

The measurement of tax incidence involves an estimate of what incomes would be were there no taxes to compare against actual incomes, after taxes have been paid. Such estimation immediately runs up against the difficulty that taxes finance public spending which also affects the distribution of incomes in many ways. Various techniques have been developed to deal with this difficulty. One of these has been the neutrality assumption, which in its earliest form simply provided a way to ignore public spending by assuming that the government spent in the same way as those who paid the taxes would have spent (Harberger 1962, p. 224). The assumption has undergone a certain development, but it remains essentially as it was in the beginning (Pechman and Okner 1974, p. 29).

In contrast, studies of budget incidence which attempt to estimate both tax incidence and the distribution of benefits from public spending do not have this problem. In such studies the attempt is, or

In this paper I speak solely for myself and not for my employer, the World Bank. I would like to thank Charles McLure for helpful comments on a previous draft.

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should be, to estimate what household incomes would be were there neither taxes nor public spending. Such counterfactual primary incomes are then reduced by taxes and increased by benefits to arrive at a postgovernment distribution.<sup>1</sup>

Another solution to the problem presented by public spending is to define incomes as they would be were government spending unchanged but financed through a proportional income tax, in other words, a comprehensive differential incidence approach. Pechman and Okner (1974, p. 29) used this approach, which they described thus: "The question it [the study] attempts to answer is—How does the distribution of disposable incomes of households under the present tax system differ from what it would be if the . . . taxes they pay were collected through a proportional income tax with the same yield?" This proportional income tax approach in tax incidence studies deals with the problem of the incidence of public spending in a superior way, because it assumes *ceteris paribus* conditions for everything on the spending side and assumes that a "neutral" counterfactual tax system is substituted for the actual one.<sup>2</sup>

In using this approach, Pechman and Okner include in their income base certain cash transfers to households. Therefore, these are necessarily included in the counterfactual which they use, implicitly, as the basis for comparing household incomes. In brief, certain cash transfers are included as part of household incomes both in the before-government-exists situation (the counterfactual) and the after-taxes-are-paid situation (actual). It is important to note that in comprehensive country statistical studies of budget incidence—which estimate both tax and benefit incidence—such an inclusion of certain cash transfers as part of counterfactual income would not be correct.<sup>3</sup> In such studies cash transfers are a benefit and, therefore, are included solely as part of income after government benefits are added to it. Pechman and Okner are cutting into the income streams to take their measurement and develop a counterfactual at a point that gives

<sup>1</sup> One of the major adjustments to actual incomes is to increase them by the amount of indirect taxes. Were governments eliminated, their "bleeding" of the income stream through indirect taxes would cease, and real incomes would increase from the total national income to net national product.

<sup>2</sup> Each tax is examined and contrasted with the equivalent proportional income tax. The results are summed to give the incidence of all taxes combined. The counterfactual comes closest to neutrality in the short run in which factor supplies are inelastic. But even short-run neutrality is not attained insofar as the demand for leisure is a function of wages. Musgrave and others first used this technique in 1951, according to Pechman and Okner (1974, p. 24, n. 14).

<sup>3</sup> This point is discussed below. For a review and critique of such studies see McClure (1972), de Wulf (1975), and Meerman (1978). A finding common to such studies, and of relevance to this paper, is that usually government expenditure—including transfers—redistributes far more in favor of the poor than tax systems.

neither incomes as they would be were there no government nor incomes as they are after all government effects are taken into consideration. But there is nothing wrong with this approach given their basic point of departure and their approach based on differential incidence.

In a recent article in the *Journal of Political Economy*, Browning (1978) took the Pechman and Okner approach and data to develop an analysis which reverses the conventional wisdom concerning the incidence of indirect taxes. Browning was able to conclude that excise and sales taxes are progressive under the very reasonable assumption that transfer payments are independent of such taxes.<sup>4</sup> He reasoned that, since excise and sales taxes force a wedge between final output prices and factor costs, they reduce factor payments by the amount of the wedge which becomes government resources. Real transfer income in effect escapes such taxes, with or without inflation.<sup>5</sup> Since transfer income is a negative function of factor incomes and accounts for a substantial part of total incomes, the outcome is highly progressive excise and sales taxes. This conclusion is warranted as long as the discussion is in the context of differential tax incidence and incomes are as defined by Pechman and Okner (1974) in their study (and Browning's). Under such terms Browning's assertion that the entire U.S. tax system is more progressive than Pechman and Okner conclude can be considered valid.

But Browning's outcome is very dependent on the pattern of government spending. If transfer payments distribute in proportion to what pretax income would be, the conventional wisdom of regressive excise and sales taxes holds even if transfers are included in the income base. More generally, if we use the Browning approach, the regressivity or progressivity of indirect taxes depends on how the government spends the resources it collects.

This conclusion is illustrated in table 1. Assume a world with one rich household and one poor one. In situation A, there are no taxes and NNP (net national product) equals NI (national income). In situation B, excise and sales taxes reduce factor incomes by a ninth. (There is no inflation.) The taxes finance solely transfers which distribute in proportion to factor income. Thus the incidence of sales taxes and excises is proportional. Since the income base is factor incomes plus transfers, the tax burden for all is 10 percent. Not until situation C do we get the Browning outcome, in which the taxes are strongly progressive. In C all the taxes collected are transferred to the poor.

<sup>4</sup>E.g., if similar taxes were increased substantially, say a value-added tax implemented, Congress would increase welfare payments to offset their effects.

<sup>5</sup>In contrast, Pechman and Okner (1974) had the cash transfers bear a proportional share of the burden of excise and sales taxes.

TABLE 1  
COMPARATIVE TAX BURDENS USING BROWNING'S APPROACH  
IN A TWO-HOUSEHOLD WORLD

SITUATION	RICH HOUSEHOLD				POOR HOUSEHOLD				NNP	NI	BROWNING'S INCOME AGGREGATE*
	Factor Income	Transfers	Taxes	Tax Ratio*	Factor Income	Transfers	Taxes	Tax Ratio*			
A	90	...	...	...	18	...	...	...	108	108	108
B	80	10	10	.10	16	2	2	.10	108	96	120
C	80	...	10	.111	16	12	2	.067	108	96	120

\* Income base is pregovernment factor income plus transfers.

TABLE 2  
FISCAL INCIDENCE USING COMPREHENSIVE APPROACH  
IN A TWO-HOUSEHOLD WORLD

	Rich	Poor	NI	Income Aggregate or NNP
Income, pregovernment	90	18	108	108
Income after tax payment	80	16	...	...
Tax burden	11%	11%	...	...
Income after receipt of benefits (transfers)	80	28	96	108
Net fiscal incidence	-11%	56%	...	...
Net benefit incidence	0%	67%	...	...

Since à la Browning these transfers are included in the income base, while the indirect taxes burden solely factor income, the outcome is a tax ratio for the rich of 11.1 percent and 6.7 percent for the poor.

In the comprehensive studies of budget incidence, transfers would be moved to the postgovernment distribution, and incomes would total to NNP. Consequently the outcome would be as shown in table 2.

In table 1, there is no problem in finding out what incomes would be in the pregovernment counterfactual (situation A). In actual incidence work, what incomes would settle down to—that is, counterfactual incomes—were sales and excises eliminated is unknown. Browning's solution was to increase all factor incomes in equal proportion so that the aggregate increase would equal the total value of excise and sales taxes. This is the approach used in table 1. To get to the counterfactual situation A from situation C it was necessary to increase all factor incomes by one-eighth, that is, by total taxes, to arrive at the aggregate equal to NNP. This illustrates the fact that counterfactual or pregovernment income itself depends on the incidence assumptions.<sup>6</sup>

A basic implication of the comprehensive approach is that the incidence of excise and sales taxes may or may not be regressive. They burden factor incomes, which are made to sum to total incomes in generating the counterfactual pregovernment income used in the comprehensive statistical studies. But they also burden incomes according to the degree of purchase of items taxed and the change in relative product prices of those items due to the taxes. The combined

<sup>6</sup> In Pechman and Okner (1974), as well as the work on the corporation income tax inspired by the Harberger model, pregovernment incomes do indeed vary according to incidence assumptions. Most statistical studies, however, err on this point (see Meerman 1974, pp. 521-22).

effect of production and consumption burdens is not clear. Browning, for example, makes the unusual argument that the "net effects on real income resulting from changes in relative prices" are close to zero (1978, pp. 660-65). In the comprehensive studies (if the Browning approach is used, in which all factor incomes are increased in equal proportion by an amount equal to the total value of excise and sales taxes), this outcome would mean that sales and excise taxes are proportional.

A fundamental consequence of the Browning approach is an income aggregate which may depart substantially from NNP. (In table 1, the Browning income aggregate exceeded NNP by 11.1 percent.) Pechman and Okner included only cash transfers in incomes. These accounted for less than 5 percent of the aggregate. Browning broadens the concept of transfers to transfers in kind, such as benefits from education and medical care. These account for 20 percent of his income aggregate.<sup>7</sup> Consequently he ends with very progressive sales and excise taxes because, as noted earlier, transfer income is a negative function of factor income. Browning also ends with an income total which necessarily far exceeds total output (NNP). In terms of the comprehensive budget studies, his income concept is misdefined: Benefits are part of postgovernment income, not the pregovernment counterfactual.<sup>8</sup>

One could, therefore, criticize Browning by asserting that the income concept is invalid. The logic of national income accounting requires that household incomes sum to aggregate output. Hitherto incomes equal to NNP (or national income) have always been assumed in tax incidence work. In moving out of the national accounts framework, Browning has made a radical departure from earlier work. Yet it is also true that if one is interested in differential incidence analysis, as is often the case in policy discussion, Browning's approach is useful. Benefits are part of household incomes, and cash benefits, at least, are taxed when spent. To conclude, the incidence of excise and sales taxes depends on how you ask the question.<sup>9</sup>

<sup>7</sup> Browning implicitly assumes that household recipients value benefits in kind at their resource costs. Of course, they do not. He is, therefore, aggregating resource costs and incomes. His aggregate would be better described as quasi income.

<sup>8</sup> Browning has all the elements needed for a comprehensive budget incidence analysis of the United States for 1977. I used his data to do just this and ended with the lowest income quintile increasing its income by 53 percent as the combined result of taxes and public spending. The highest quintile's income was reduced by 15 percent. Details available on request.

<sup>9</sup> Charles McLure (1979, p. 114) expressed a similar conclusion in his comment on Browning's paper: ". . . perhaps we should consider his [Browning's] estimates to be reasonable alternatives to the conventional estimates rather than unique replacements."

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