



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search  
<http://ageconsearch.umn.edu>  
[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

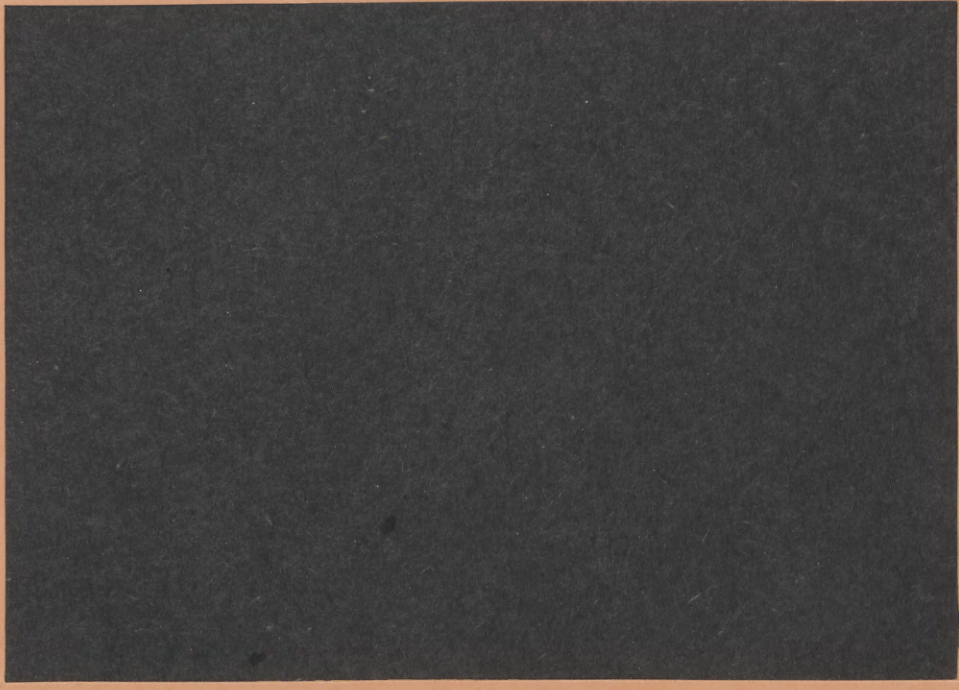
WARWICK

DP 9

GIANNINI FOUNDATION OF  
AGRICULTURAL ECONOMICS  
LIBRARY

WITHDRAWN  
1982

DEVELOPMENT ECONOMICS RESEARCH CENTRE  
UNIVERSITY OF WARWICK



Department of Economics  
University of Warwick  
Coventry CV4 7AL  
England

TAX BURDEN ANALYSIS : CRITIQUE AND REFORMULATION\*

Walter Newlyn

Discussion Paper No. 9

October 1981

\* I am indebted to Denis Sargan (London School of Economics) and to Nicholas Stern (University of Warwick) for comments on the presentation in a previous draft but they are not implicated in my conclusions of proposals.

This paper sets out a criticism of standard economic tax incidence analysis of the distributional effects of an existing tax system. Section I summarises the theory of economic tax incidence and the methodology of its application to existing tax systems and exemplifies this. Section II demonstrates the distortion necessarily involved in the standard methodology. In Section III it is argued that the concept used is inappropriate and an alternative approach is proposed. Section IV specifies an appropriate synthesis of the two approaches.

### I. Tax Incidence Theory and its Application

The following summary of the principle features of tax incidence theory is based on the classic text of fiscal theory and practice by R.A. Musgrave and P.B. Musgrave (1976) hereafter cited as Musgrave. The theory, based on propositions derived from general equilibrium theory, is directed to determining the economic incidence as distinct from the legal incidence of different types of taxes. The introduction of a tax into the equilibrium situation assumed to precede it will, on impact, reduce the real wealth of the economic agent on whom the legal liability falls. In accordance with economic theory, the economic agents subject to the tax are assumed to make such adjustments as are possible to minimize the impact burden. To the extent that they do so, the burden will be shifted to other economic agents via their sources of funds (incomes) or uses of funds (expenditure).

The economic incidence is the locus of the tax after all adjustments have been made and equilibrium restored in the post-tax situation. For some taxes the ultimate locus may coincide with the legal locus of impact. Adjustments made to shift the burden will have, in



Musgrave's terminology, primary effects which are 'most strategic' in determining the distribution of the burden by income groups and secondary effects which are not likely to exert a systematic effect on distribution.

Whether or not a tax is shifted its effect on distribution will derive from any change made in relative income and relative prices. The ultimate burden of all taxes must fall on persons not on institutions.

It is clear that the theory applies to the impact effect of the imposition of a new tax with the shifts taking place in the appropriate time dimension. The appropriate policy-related application is in the context of decisions as to implementation of potential changes by addition or substitution in the existing tax system or for monitoring the effect of actual current changes. The application of the theory has however been extended to the analysis of the economic incidence of the total tax system as structured at the time of the analysis. For this purpose two methods have been used: absolute economic incidence and differential economic incidence. The absolute method simulates the impact effect of each tax seriatim, applying appropriate shift factors to those taxes which are assumed to shift. Since these estimates are then combined, the procedure is equivalent to the simulation of the current impact of the entire tax system, implicitly assuming a no-tax situation as the comparative static base. The differential method simulates the substitution of a distributionally neutral tax for each actual tax seriatim and either sums the resulting distributional differential for each tax or repeats the procedure for the entire tax system. Because of the predominant use of the absolute incidence method in practice, Musgrave's example of this is cited in some detail.

Musgrave assumes a standard 'bench-mark' set of incidence assumptions as follows:

<u>Tax</u>	<u>Incidence</u>
Individual Income Tax	Income Tax payers
Corporation Income Tax	{ Half Consumption Half Capital Incomes
Excise and Sales Tax	Consumption
Property Taxes	
Owner occupied housing	Owner
Rented housing	Tenant
Business property	{ Half consumers Half Capital Income
Payroll Tax	
Employer	Consumers
Employee	Employees

The results derived from these assumptions are reported in ten income brackets in terms of tax per cent of family income. More relevant to revealing the well-recognised defect in economic incidence analysis is the report of the results for four selected income brackets of nine plausible variations to the bench-mark which illustrate the sensitivity of the results to the incidence assumptions. The variations are four in respect of the corporation income tax, four in respect of the property tax and one in respect of the payroll tax. No variation is specified for the assumption that excise and sales taxes burden consumers.

This appears to conflict with the tradition of allocating the burden of selective excise taxes between producers and consumers on the basis of the relationship between demand and supply elasticities. Musgrave overrides that analysis by application of his distinction between primary and secondary effects. Any effect on factor incomes will be restricted

to the relative decrease in those of the factors used intensively in the production of the taxed products between which and income level there is no a priori reason to assume a correlation. Hence Musgrave's conclusion that 'the pattern of the burden distribution over income level tends to be dominated by the distribution of consumers' expenditures on the taxed products'. (Musgrave 1976, p. 433) But this is inconsistent with the dictum that all taxes must be distributed and the assumption applies only in the special case in which the supply elasticity is infinite (reflecting constant costs) except when demand is completely inelastic.

The maximum deviation between the estimates is obtained by combining the most progressive variant of each tax in one total and the most regressive in another total. These totals are shown below together with the bench-mark results, as percentages of the mean family incomes in four selected ascending income brackets.

Number in full set:	1	2	9	10
Most progressive:	26.1	30.8	39.0	63.2
Bench-mark:	30.5	33.9	31.6	35.9
Most regressive:	31.4	35.6	25.6	26.9

These figures show the high sensitivity of the results to the assumptions made and this is recognised by the authors who describe their results as involving 'somewhat heroic procedures'. The one which is peculiar to the absolute incidence method is the impossibility of separating the distribution effects of the change in aggregate demand, or the stabilisation measures taken to offset it, from the distributional effects of the impact of each tax, even if they could be treated as having an effect seriatim.

The use of the differential method avoids the aggregate demand problem but is no less vulnerable to choice of incidence assumption. Two studies using this method will be briefly described to illustrate differing technology and differing ways of dealing with the absence of unique solutions to the problem of tax shifting.

The first study (J.A. Pechman and B.A. Okner, 1974) applies to the tax system of the United States and computes the tax incidence at the household level from survey data covering 72,000 families. Results from eight variants of the incidence assumptions are reported, the most progressive of which estimates the tax rate at the lowest income level at 25 per cent against 38 per cent using the least progressive variant. At the other end of the income range the estimates are 48 per cent and 30 per cent. No argument is made for any particular variant.

The second study (J. Whally, 1977) relates to the tax system of the United Kingdom and uses an econometric model with specific internally generated parameter values to calculate the distributional impact by substitution of a uniform sales tax. Only one set of incidence assumptions is used but with three different sets of parameter values. Of the three sets of results obtained the author entitles one 'Best Guess Parameterization'.

Although the differential method differs from the absolute method assumption of a no-tax base, the procedure for calculating the incidence of each tax is identical. There is no procedural difference between substituting total actual taxes for a distributionally neutral tax and substituting total actual taxes for no taxes. It is therefore



appropriate, in respect of the procedure for estimating the impact effect on distribution, to class both methods together as the standard methodology for economic tax incidence. To emphasise its function the term Total Tax Impact (TTI) will be used.

A final element in TTI methodology relates to the income concept used as the denominator in calculating the effective tax rates. Frequently tax incidence studies draw upon data in sample surveys in which the income concept will generally be personal income comprising personal factor income plus personal transfer income. This will need to be adjusted by the addition of the undistributed element in corporation profits and direct taxes paid by corporations to get total factor income before direct tax. A further addition of total indirect taxes will be required to get factor incomes at market prices and thus in a completely pre-tax form. These adjustments are entirely free from any implication as to incidence. The contrary is true of the income concept used in the standard methodology in which adjustments are made to the Standard National Accounting aggregates in order to reflect the particular incidence assumptions of each study. In the Peachman/Okner study the income magnitudes had to be adjusted for all variants except the one in which the incidence assumptions corresponded with the national accounts.

The standard format for the application of TTI methodology is the integration of the corporate sector into the household sector by attributing pre-tax profits to the owners of the capital identified as dividend recipients.

The essential characteristics of TTI methodology can be summarized as follows. In the absence of definitive evidence, a judgement is made as to what extent each type of tax is likely to be shifted from its legal incidence using a hypothetical no-tax situation as the comparative static reference base. Appropriate shift factors are then applied to the total of each tax assumed to be shifted, to simulate the primary effects of responses to the impact of the imposition of each tax which determine the economic incidence in the post-tax equilibrium. Secondary effects are either ignored or assumed not to have significant distributional effects.

#### Erratum

Page 7. After line 9, insert:

"Alternatively econometric general equilibrium models are used for this procedure."

- (i) the sensitivity of the results to the judgement of the choice of incidence assumption;
- (ii) the non-plausibility of the assumption made about macro effects in the absolute incidence procedure;
- (iii) the fact that the distribution of income upon which the impact of tax is simulated already reflects the distributional effects of the existing tax structure on incomes and prices;
- (iv) failure, implicit in the static nature of the methodology, to distinguish between short and long adjustment periods;
- (v) instances of inconsistent incidence assumptions.

In none of these criticisms of the defects in the methodology

The essential characteristics of TTI methodology can be summarized as follows. In the absence of definitive evidence, a judgement is made as to what extent each type of tax is likely to be shifted from its legal incidence using a hypothetical no-tax situation as the comparative static reference base. Appropriate shift factors are then applied to the total of each tax assumed to be shifted, to simulate the primary effects of responses to the impact of the imposition of each tax which determine the economic incidence in the post-tax equilibrium. Secondary effects are either ignored or assumed not to have significant distributional effects. As a complement, the relevant national accounting aggregates are adjusted to simulate the pre-tax levels implicit in the shifts postulated. Criticisms of the methodology have been made but it is not necessary for the present purpose to document them. It will be sufficient to summarize the major defects which are widely recognised:

- (i) the sensitivity of the results to the judgement of the choice of incidence assumption;
- (ii) the non-plausibility of the assumption made about macro effects in the absolute incidence procedure;
- (iii) the fact that the distribution of income upon which the impact of tax is simulated already reflects the distributional effects of the existing tax structure on incomes and prices;
- (iv) failure, implicit in the static nature of the methodology, to distinguish between short and long adjustment periods;
- (v) instances of inconsistent incidence assumptions.

In none of these criticisms of the defects in the methodology

is there any implication that the methodology itself is an invalid application of tax incidence theory which, even in the absence of the above defects, must necessarily involve much greater distortion. It is to the demonstration of this more basic criticism that the next section is directed by confronting the methodology with the time dimension.

## II. Confrontation of TTI Methodology with Time

Unlike Pallas Athena who sprang fully armed from the head of Zeus at some point in time in Greek mythology, tax systems do not spring into existence on the first day of the tax year in which a tax incidence study is undertaken. Tax systems develop over time and the TTI simulation of instant emergence could only be valid if it were identical with actual tax behaviour over time of which it would constitute the summation. The first element in the critique is to demonstrate the non-validity of this historic justification.

In order to demonstrate the extreme case of non-validity, a dynamic scenario is assumed which, for simplicity, restricts the range of tax types but is consistent with TTI in assuming general equilibrium.

Consider an economy with no government sector which is enjoying equilibrium growth with all the conditions for that state of bliss satisfied. Into this optimal state, a government intrudes and imposes an income tax on corporations at a fixed rate, the revenue elasticity of which to GNP is unity. Figure 1 (page 10) shows the effect, ceteris paribus, of this over time on the basis of a purely illustrative assumption that half of the tax increases corporate prices and half reduces corporate

wages. Linear growth is assumed for diagrammatic simplicity.

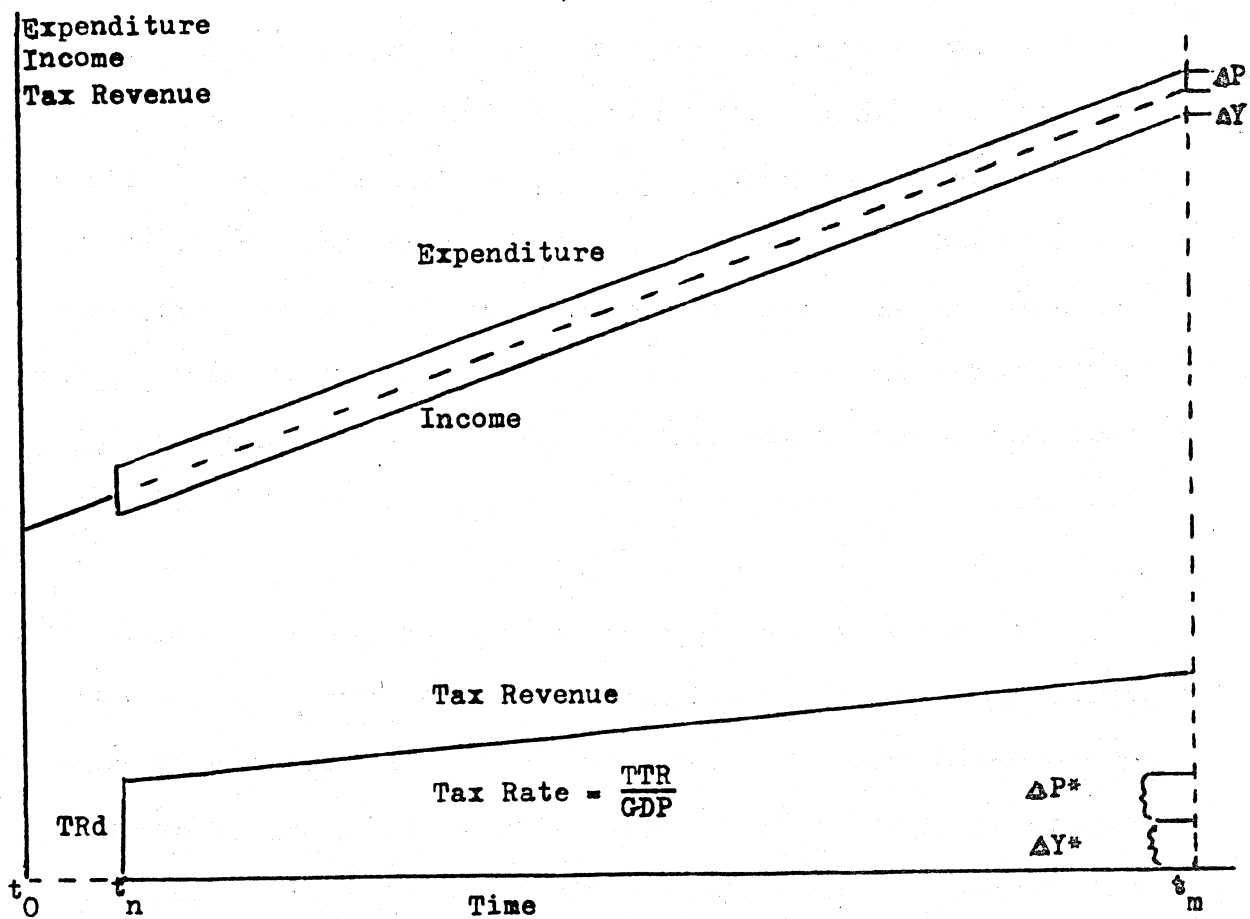
At  $t_n$  the tax is introduced, increasing tax revenue from zero to total tax revenue  $TTR_n$ . This is a special case in which the increase in tax revenue ( $\Delta TR_d$ ) from a no tax base situation is equal to  $TTR$  and exactly reflects the TTI simulation. The symbol  $\Delta TR_d$  is used to indicate that the increase in revenue is the result of a discretionary tax change (DTC) which term is used generally to cover the introduction of new taxes, the removal of existing taxes and changes in tax rates.

The diagram shows the economic incidence as an increase in prices reflected by a once and for all the time increase in the level of nominal expenditure (E) assumed to be  $0.25\Delta TR_d$  and the decrease in the level of GDP(Y) which is assumed to be  $0.25\Delta TR_d$ , reflecting the assumption that corporate production is equal to half of GDP.

It is assumed that there is no further DTC, hence the absolute magnitude of  $\Delta TR_d$  remains unchanged, as do the absolute magnitudes of the shift, since the impact/shift simulation only applies to DTC. However,  $TTR$  increases as a function of GDP over the period reflecting the tax buoyancy, the elasticity of which has been assumed to be unity. A tax incidence study using the TTI simulation at  $t_m$  will treat  $TTR_m$  as resulting from DTC and will thus over-estimate the magnitude of the shifts by the ratio of  $\Delta P^*$  to  $\Delta P$  and  $\Delta Y^*$  to  $\Delta Y$ .

It will be helpful for the development of subsequent arguments,

Figure I. Discretionary Tax Change and Tax Revenue Buoyancy



that the full implications of this demonstration should be specified.

- (i) The relationship between  $\Delta TRd$  and buoyancy should not be confused with the relationship in the calculation of the discretionary share in tax buoyancy which allocates buoyancy in proportion to successive values of  $\Delta TRd$ . In the present analysis it is the absolute magnitude of  $\Delta TRd$  which is relevant since it is solely this which constitutes the impact of DTC; the concept of the discretionary share is not relevant.



- (ii) It is explicit in the theory of tax incidence that tax shifting is solely the result of the introduction of a new tax which can logically be extended to any discretionary change in the tax system (DTC) .
- (iii) Between  $t_n$  and  $t_m$  the tax rate established by the ratio of  $\Delta TR_d$  to GDP at  $t_n$  remains constant and there is no further DTC . Therefore there cannot be any further impact of the tax system on incomes or prices between  $t_n$  and  $t_m$  .
- (iv) In the post-tax equilibrium situation corporations are paying the tax and their after-tax profits are at the same level as they were before the tax was imposed as a result of having shifted the whole of the impact burden.
- (v) In the inferior equilibrium post tax situation the new level of incomes and prices and the distribution of real income resulting from the tax impact constitute the concrete dimensions of the private sector of the economy during the continuation of the tax.

It might be contended that the historical invalidity of the impact simulation is countered by reversing the simulation to validate the magnitude of the shifts. It is true that if the tax were abolished at  $t_m$  , the magnitude of the negative DTC impact would equal  $\frac{1}{2}TTR$  at  $t_m$  . Assuming that competition in the context of general equilibrium would reverse the shifts, prices would be reduced and incomes increased by an amount equal to 0.25 of TTR in each case. The actual loss of real income requiring compensation would be over compensated to the same extent as the shifts are over estimated by the impact simulation.

The conclusion is that TTI could only be free of the distortion resulting from the failure to distinguish between DTC and buoyancy in the special (non-existent) case of zero nominal growth over the life span of the tax system.

Moving to estimation: successive DTC will give rise to a series of  $\Delta TRd$  values overtime which must be added to reflect the increase in the level of revenue derived directly from DTC and each  $\Delta TRd$  associated with any tax will increase the buoyancy of TTR to an extent depending on the built-in elasticity (E) of the tax structure at any point in time resulting from the distribution of past DTC over taxes varying in their GDP elasticities. Thus the buoyancy of the tax system measured by the increment in TTR over a period is :

$$B = (E.GDP)_{t1} \Delta TRd_{t0} + (E.GDP)_{t2} \Delta TRd_{t1} + (E.GDP)_{tn} \Delta TRd_{tn-1}$$

The only element in the increase in revenue which is correctly subject to impact/shift analysis is  $\sum_0^n \Delta TRd$ .

Accurate estimates of the  $\Delta TRd$  element as a proportion of the current level of TTR would involve calculating the series of  $\Delta TRd$  and GDP back to the origins of the tax system but, because of the cumulative reduction of the absolute magnitude of  $\Delta TRd$  effected by GDP in nominal terms, a reasonable approximation can be obtained by assuming the observed ratio of a decade remains constant, using a rate of growth characteristic of the country and calculating the sum of the series of  $\Delta TRd$  back over time until it becomes insignificant.

The countries most appropriate for this analysis are developing countries because of their concern to maximise tax revenue subject to political constraints and the extension of their tax bases over time. Although the government sector of developed countries grows faster than GDP, DTC as a proportion of TTR will have been small over several decades, being mainly directed at stabilisation or political goals, neither of which will entail a rapidly rising trend as in developing countries.

There is no international data source for cross country values of  $\Delta TR_d$  but data from a recent study in West Malaysia (W.T. Newlyn, forthcoming) over the period 1969 to 1978 can be used to calculate the order of magnitude of the ratio of  $\Sigma TR_d$  to TTR in 1978. The elasticity of TTR with respect to GDP (buoyancy) was 1.26. This is lower than the mean value (1.43) of fifteen selected developing countries in an IMF Staff Papers study of 'tax effort' (R.J. Chellia, 1971). From this it cannot be concluded that the  $\Sigma \Delta TR_d$  is lower than the mean unless the same value of E is assumed for the other countries, but the closeness to the mean in a range from 0.69 to 2.4 shows that Malaysia is not exceptionally low in respect of tax buoyancy.

The magnitude of the  $\Sigma TR_d/TTR$  in 1978 was 0.053. Projecting the same ratio over previous decades and deflating TTR of 1978 by an average annual nominal rate of GDP growth of 7.3 per cent over a century doubles  $\Sigma \Delta TR_d$  and the proportion of TTR in 1978 which reflects DTC, as distinct from income growth, is 10 per cent. Of that probably only half will relate to taxes subject to shift so the overestimation of the magnitude of shifts and adjustments to national account magnitudes would

be of the order of twenty fold. Given rates of inflation in the last two decades the Malaysian example certainly does not exaggerate distortion.

The conclusion of this section is that TTI methodology is not a valid application of economic tax incidence theory. The theory is only valid when applied contemporaneously with an actual or potential change in taxation and many studies have been done which satisfy this condition. When so applied the magnitude of the sensitivity to choice of assumption will be reduced to the extent that there will be no combinations of deviations. All the other defects are eliminated except that, in a simulated substitution of taxes, the distribution on which the change is measured will reflect the effect of the existing tax. However the rejection of TTI as a method of estimating the current effect of the total tax system on the living standards of households need not be a cause for lament since it is argued in Section III that an entirely different concept is required for that purpose.

### III. An Alternative to an Inappropriate Concept

Although it is not possible to document this unambiguously, the context in which the TTI method of determining the economic incidence of the total tax system has been used, has implied that the difference between the pre-tax and post-tax distributions specifies the current effect of the tax system on the real incomes of households. Even if it were absolutely accurate in determining the economic incidence of the total tax system, this interpretation of the results must be rejected. The concept of economic incidence is not appropriate for this purpose.

It has already been argued that economic incidence is only valid when used contemporaneously with actual or potential changes in the system; the extension of its use to the analysis of the effect of total taxation on the living standards of households is not valid. In Section II it was shown that once the post tax equilibrium has been established, the level of incomes and prices become the concrete dimensions of the economic situation of the private sector of the economy. Any subsequent analysis of factors affecting the welfare of households must be made within those dimensions. It is a methodological error in an analysis of the current effects of total taxes on the welfare of households to use a concept which is designed to estimate by how much their relative living standards would have been different had the taxes not been imposed in the past. Moreover the error of commission is compounded by the error of omission in disregarding the actual effect.

The question which needs to be asked in this respect is simply: "Who pays the taxes?". Unfortunately sometimes precisely this question has been used (G. Colm and H. Tarasov, 1940 in the title) and P.A. Samuelson, (1973), in respect of TTI studies, which invites misinterpretation. The concept which it is proposed should be substituted for economic incidence as applied to total taxes is precisely that of the actual payment incidence. This does not imply legal incidence and a methodology is required for determining the source of the current transfer to the government.

Except for the case in which DTC occurs, or the adjustment to it is incomplete, in the year of analysis (which will be dealt within Section IV), post-tax equilibrium will prevail and this post tax equilibrium

is the base of the proposed methodology. It is appropriate to call it Total Tax Payment (TTP) methodology.

Initially the methodology is applied to the market situation, in which there is a direct relationship between buyer and seller and both are operating in only one market; it will draw on propositions from general equilibrium theory as does standard tax incidence theory.

The composite proposition of general equilibrium upon which tax incidence theory relies can be stated as follows. Factors of production will be paid a price equal to their marginal revenue product at the level of production of each commodity which will yield a profit sufficient to sustain production, and that the product-mix will reflect the preferences of spenders at an equilibrium set of commodity prices, within the budget constraint.

Thus worded, the proposition applies to all market structures and the key to the solution of tax payment incidence is 'sufficing' profit which, given the relative preferences of spenders, is a necessary condition for production to continue given the effect of the tax vectors on prices of commodities and factors.

The following notation will be used in the application of these propositions to taxes on factors and commodities.

$P_w$  and  $P_k$  : purchaser prices of labour and capital  
 $T_w$  and  $T_k$  : taxes on labour and capital  
 $T_c$  : taxes on commodities.



Transport costs are disregarded.

In the labour market labour services are being bought and sold at the equilibrium price of  $P_w$  which is equal to the marginal revenue product at a level of production at which sufficient profits are being earned, labour is receiving  $P_w - T_w$  net of tax which is the perceived level of return to which the supply of services is adjusted, Thus labour is receiving  $T_w$  less than its marginal revenue product.

In the capital market, capital services are being bought and sold at the equilibrium price of  $P_k$  which is equal to the marginal product of capital at the level of investment at which sufficient profits are being received by the investor. Capital is receiving  $P_k - T_k$  which is the perceived level of return to which the supply of capital services is adjusted. Thus capital is receiving  $T_k$  less than its marginal product.

In both cases the tax is being paid by the owners of the factors in the sense that the actual source of the current transfer to government is factor income.

In the commodity and services market each commodity (service) is being bought and sold at its equilibrium price  $P_c$ , at demand levels reflecting the maximisation of consumers preferences given the budget constraint. Producers are producing a matching set of commodities and services each of which is being produced at a producer price of  $P_c - T_c$ , at a level of production which yields sufficient profits included in the producer price. Consumers are thus paying  $T_c$  in excess of the marginal cost of production plus sufficient profits. Although businesses are collecting the tax, the source of the current transfer to government

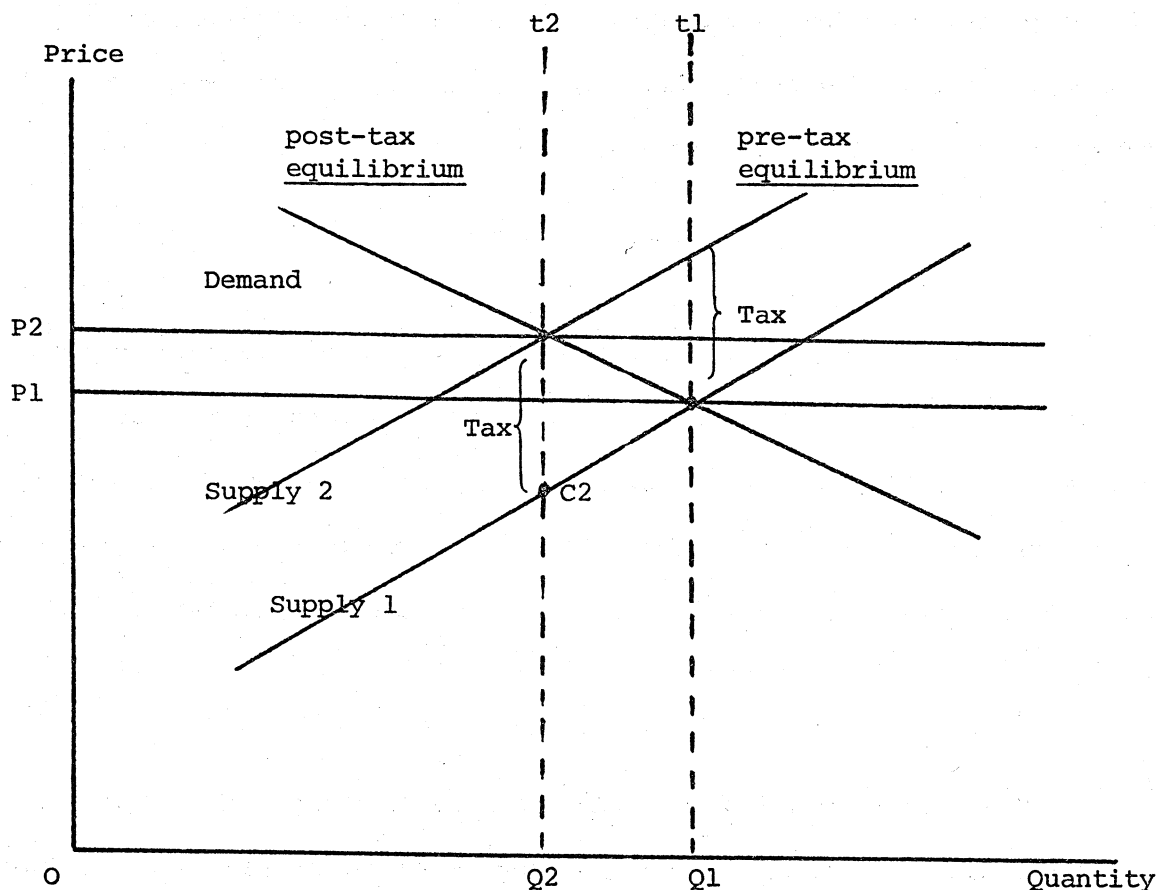
is consumer expenditure on the taxed commodities and services. A special case of this general solution is apparent in Figure II (page 19). Given the supply and demand elasticities assumed, the impact burden of the tax imposed at  $t_1$ , is shared equally between producers and consumers by the adjustment for  $Q_1 : P_1$  to  $Q_2 : P_2$ . But in the post tax equilibrium situation established at  $t_2$  the consumers are paying  $P_2$  which exceeds the marginal cost plus sufficient profits at  $C_2$  by the amount of the tax.

It is an important feature of the methodology that the solutions derived above correspond with the accounting procedures at the micro level and with National Account and Social Accounting Matrix procedures. The macro economic correspondence is analogous to the correspondence of the behavioural equality of saving and investment with the national accounting identities in equilibrium.

It is necessary to supplement the above analysis by consideration of taxes for which the solution is complicated by institutional intermediation in the relevant market or markets. The corporation income tax is described by Musgrave (1976) as "perhaps the most controversial issue in tax analysis", and the explanation for this proposed here is that the corporation tax belongs to the intermediation case. Corporations are intermediaries in the commodity and service market, in the capital market and in the labour market. The five plausible variants of shifting calculated by Musgrave do not exhaust the possible combinations; in short the outcome is indeterminate by general equilibrium analysis in TTI. So it is in TTP and no pretence is made to the contrary.

The fact that the TTP method is based on the post tax situation, however, makes it possible to use the accounting criterion as a definitive solution. The audited accounts of corporations will show total corporation income tax as a charge against gross profits. No matter what shifts have taken place historically by way of reduction of wages and or increases of prices in order to maintain the level of profit, the objective fact is that the current transfer to the government is made by the corporation leaving a sufficing profit for the owners. This is consistent with the implications of the diagram noted in Section II.

Figure II Tax Burden: Economic and Payment Incidence



The absorption of tax by institutions is, rightly, anathema in economic incidence theory in which the total impact burden must fall on

persons but in payment incidence it is evident that there is no person who currently transfers any part of corporation tax revenue to the government, directly or indirectly. This fact confirms the procedure and prevents it from being trivial in respect of its effect on post tax income distribution of households.

The only other examples of multiple solutions in the Musgrave set of assumptions are (i) the Property tax on residential property (ii) the property tax on business property and (iii) the payroll tax. All of these can be determined by the application of the general equilibrium post-tax solution method in payments incidence. The unique solutions of TTP are that the payments incidence falls as follows: (i) on the tenant as the consumer of housing services; (ii) and (iii) on the consumers of the products into which the tax enters as a cost.

To reflect the institutional absorption, the incidence format of TTI methodology which is that of an integrated corporate/household sector should be replaced by a corporation sector and a household sector. This separation permits a neglected element in tax distribution to be reflected by disaggregation of the corporate sector into industrial sub-sectors.

The unique solutions of TTP derived from the combination of the general equilibrium and accounting approaches can be simply summarised in terms of direct and indirect taxes as defined in A System of National Accounts, (SNA) United Nations, 1969. The payment incidence of direct taxes is on the legal base and that of indirect taxes is on the consumers

of the taxed commodities or services. The SNA classification is based on the method of payment, as is payment incidence. Direct taxes are levied directly on individuals and corporations as specific liabilities payable out of income. Indirect taxes are levied on commodities and services and being included in market prices are paid indirectly out of expenditure.

#### IV. Synthesis over Time

All of the preceding analysis has been related to the general practice of confining tax incidence studies to one year; this section outlines a model for application over time. Although the advantages of such a model are not limited to this context they are of particular value in determining the distributional effects of 'tax effort' in developing countries. Although there is probably no developing country which has not been the subject of more than one study using TTI methodology, differences in assumptions as to tax shifts make valid comparison over time impossible. Because of the unique solutions of TTP methodology separate studies at different points in time within country and cross-country would be comparable if confined to payments incidence. But the ideal is a model designed for comparison over time combining payments incidence with the valid use of economic incidence. This can be specified either as a comparison of the effect on distribution at different points in time or as a time-series over a period. The procedure for effecting the former follows.

A payments incidence analysis using TTP would be applied to the actual income distribution at  $t_1$ . In respect of each year an analysis of the economic incidence of any DTC impacting in any year

would be cumulatively applied to the actual income distribution of  $t_1$  over the period of study  $t_1$  to  $t_n$ . This will result in a simulated income distribution for  $t_n$  reflecting the total effect of DTC over the period ceteris paribus. A second payments incidence analysis would then be applied to the simulated income distribution for  $t_n$ . The post tax version of the simulated income distribution compared with actual income distribution of  $t_1$  would then give an unbiased ceteris paribus estimate of the total effect of taxation on income distribution over the period, subject only to the accuracy of the incidence assumptions regarding the DTC elements. It will also allow time lags in adjustment to DTC impact to be reflected.

Unless the annual changes in tax were heavily concentrated on one type of tax subject to shift, the magnitude of assumed shifts of  $\Delta TR_d$  would be very much smaller than those applied to the whole tax revenue in TTI analysis. In the Malaysian study, previously referred to, the annual ratio of  $\Delta TR_d$  to total revenue over a decade averaged 0.005 but its cumulative effect was significant. In general, the probability is that the combination of plausible shifts will entail less deviation than that generated in respect of the entire tax system. Furthermore the ability to determine shifts in the light of the current economic situation would tend to increase the reliability of the assumption. Attempts which have been made to do this using TTI will be invalid because of the historical nature of DTC.

The alternative model adds to the comparison of the distributional effect at two points in time, the development of this effect over the period. The procedure is to combine the annual estimates of the economic



incidence with annual estimates of the payment incidence thus obtaining an annual estimate of the total effect of taxation in each year. It was in this form that the integrated model was used in the Malaysian study.

SUMMARY OF CONCLUSIONS

1. In addition to already recognised defects, the standard methodology which has been generally used for determining the economic incidence of the current total tax system greatly overestimates the magnitude of tax shifting by failing to distinguish between discretionary changes in taxation and tax revenue buoyancy over time.
2. Economic incidence should only be applied to discretionary changes within their own time dimension and is not suitable for determining the economic incidence of the total tax system.
3. Moreover the tax burden to which economic incidence relates is that resulting from the impact of tax change going back over long periods and this once and for all change constitutes part of the current economic situation inherited from the past, within which any analysis of household welfare must be made.
4. The current burden affecting the living standards of persons and households confronted by the taxes is the burden of paying them.
5. Unique solutions can be derived from the application of general equilibrium analysis combined with accounting criteria for determining the payment incidence based on post tax equilibrium.
6. These unique solutions are that the payment incidence falls on the legal base in the case of direct taxes and on consumers in the case of indirect taxes.
7. None of the criticisms made of the standard method of determining tax burden apply to the proposed reformulated methodology.
8. A valid combination of the two approaches to tax incidence can be applied over time.

REFERENCES

- Chelliah, R.J. 'Trends in Taxation in Developing Countries', I.M.F. Staff Papers, July 1971
- Colm, G. and Tarasov, H. Who Pays the Taxes?, Temporary National Economic Committee Report, U.S.A., 1940
- Musgrave, R.A. and P.B. Public Finance in Theory and Practice, 2nd edition, McGraw Hill, 1976
- Newlyn, W.T. The Effects of Financial Management on Income Distribution, West Malaysia 1969-1978, Computation of results not yet complete
- Pechman, J.A. and Okner, B.A. Who bears the tax burden?, Brookings Institution, Washington D.C., 1974
- Samuelson, P.A. Economics, McGraw-Hill, 9th edition, 1973, p.176
- Whalley, J. 'The United Kingdom Tax System 1968-70: Some Fixed Point Indications of its Economic Impact', Econometrica, November, 1977.

