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This paper contains preliminary findings from research work still in progress and should not be quoted without prior approval of the authors.

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Introduction

In this note we argue that the marginal welfare costs of trade taxes will typically substantially exceed those of commodity taxes for a small percentage increase in rates from similar initial levels. Recent public finance literature has suggested that the social cost of raising additional revenues using rate increases for existing distorting taxes may be large; perhaps 30-50 cents per $1 of revenues for a tax system such as in the U.S. (see Browning (1976); Stuart (1984); Ballard, Shoven and Whalley (1985)). This has been influential in persuading many public finance economists to rethink their views on the efficiency costs of taxes, and has been especially important in suggesting that cost benefit analyses can be seriously misleading if they neglect the additional distorting costs associated with the financing requirements of projects. However, little attention has been given to the marginal welfare costs of trade taxes, despite the fact that in many developing countries tariffs and export taxes are a major source of revenue.

The reasons why marginal costs of trade taxes exceed commodity taxes are that they apply to net trades rather than total consumption. Tariffs levied at similar rates to commodity taxes have larger distorting effects, but yield smaller revenues if production is not specialized. A commodity tax will only distort consumption, whereas a tariff distorts both consumption and production. Marginal welfare costs associated with raising tariffs thus exceed those for commodity taxes at the same initial

rate.

We present some estimates of these costs produced by a numerical general equilibrium model of the Philippines. These confirm the line of argument presented above, and suggest sharp difference in the relative efficiency of commodity taxes and tariffs as revenue raising devices. This point seems especially important for those developing countries with high tariffs who rely on trade taxes as major revenue sources, suggesting that major gains are possible by switching to alternative non trade based revenue raising instruments.

II. Marginal Welfare Costs of Taxes and Tariffs

Recent public finance literature on marginal welfare costs of taxes continues a tradition of welfare analysis represented by Hotelling (1938) and continued in Harberger (1964). In a simple one commodity partial equilibrium diagram in which the supply function is perfectly elastic, the Hotelling-Harberger approximation for the deadweight loss for a distorting tax (DWL) is given by:

(1) $DWL = -1/2\ E \cdot t\ R$

where E is the elasticity of the compensated demand function, t is the tax rate, and R is the revenue raised by the tax. From (1), it follows that the incremental cost of raising revenue by raising tax rates $\partial DWL/\partial R$ is linear in the tax rate, i.e.,

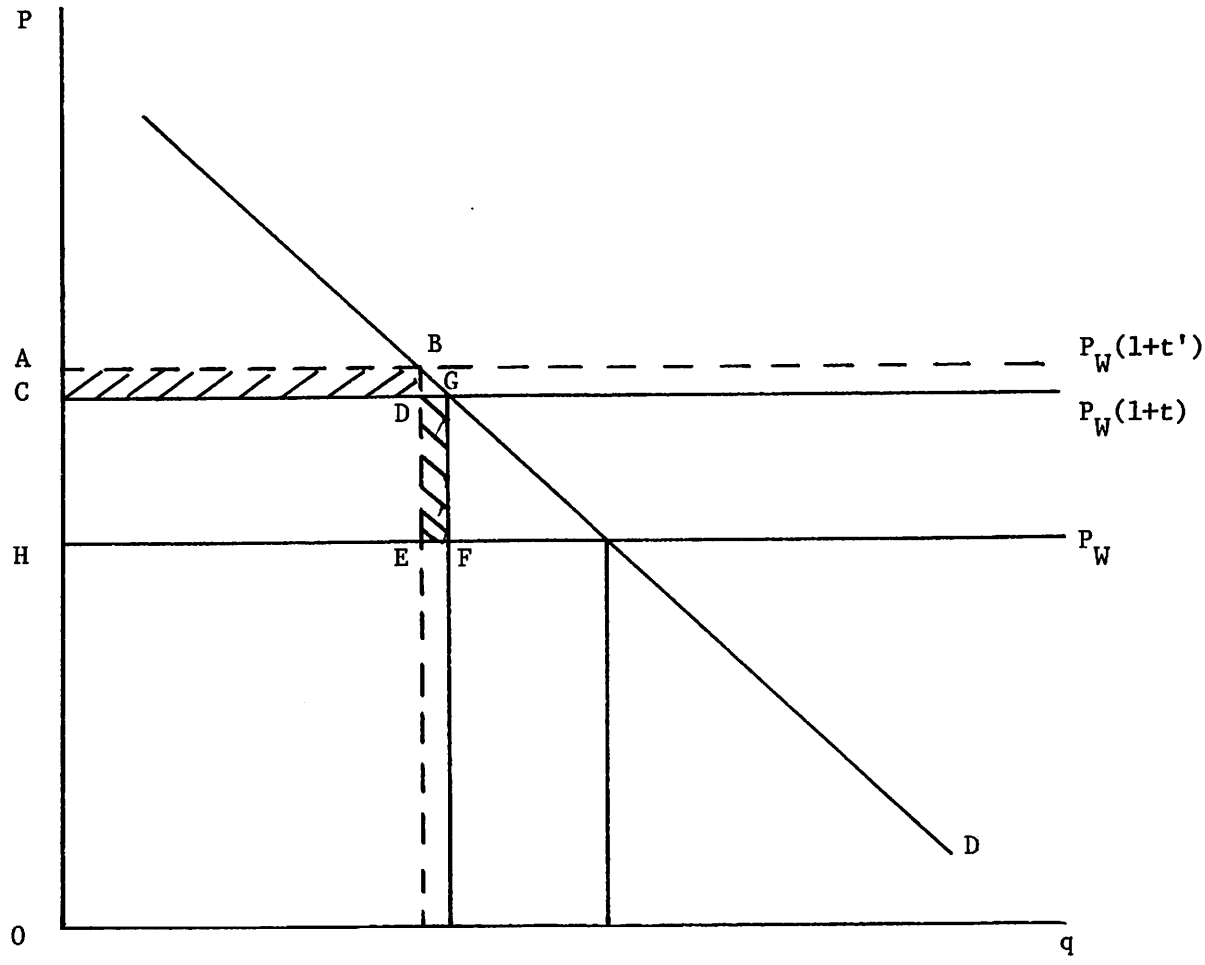
(2) $\partial DWL/\partial R = -1/2\ E\ t.$

The implication is that raising an additional dollar of revenue by raising the tax rate for an existing distorting tax will have costs significantly above those associated with raising an additional dollar of revenue from a tax which operates at a zero rate.

This same argument is also presented in Figure 1. We consider a single commodity for which the compensated demand function is linear, and assume a perfectly elastic supply function. This could, for instance, be a small-open-price-taking economy for which the world supply function is perfectly elastic at the world price, P_W. We assume an existing tax operates at rate t, yielding a domestic consumer price of $P_W(1+t)$.

Figure 1

The Marginal Welfare Cost of a Commodity Tax



We now suppose the tax rate increases from t to t', and as a result consumption falls and the welfare cost of the tax increases. The incremental welfare cost due to the tax increase is given by the area BGFE, and the change in tax revenue is given by the difference between the two rectangles ABDC and DGFE. Figure 1 thus indicates that incremental welfare costs from raising tax rates are larger the higher the initial tax rate. In turn, the higher the initial tax rate, the smaller the increment to revenues from a given tax increase. Marginal welfare costs of raising additional revenues from increases in tax rates will increase with the tax rate for the commodity in question, and beyond the revenue maximizing tax rate will be negative.

This same line of argument also underlies Browning's (1976) work, which suggests that the marginal welfare costs of raising income taxes in the U.S. could be as high as $0.25 per additional dollar of revenues raised. It also underlies a simple general equilibrium calculation made by Stuart (1984) for the U.S. which estimates marginal welfare costs of taxes of around $0.50 per dollar of revenues raised, and more recent general equilibrium calculations by Ballard, Shoven and Whalley (1985) which suggest estimates for the U.S. in the region of $0.35 to $0.50 per additional dollar of revenues.

Because tariffs and other trade taxes are important revenue raising devices in some developing countries, it is clearly important if marginal welfare costs of tariffs significantly exceed those of commodity taxes when comparing small rate

increases around comparable initial rates for both taxes.

The reasons why this is the case are indicated in Figure 2, using the same single commodity partial equilibrium diagram presented in Figure 1. Increasing the tariff rate from t to t' yields marginal welfare costs given by the two areas CDEF and ABGH. The impact on revenues is given by the areas BCJK less the two areas KDEF and AJGH. In the small open economy case a tariff increase introduces two additional distortions; one on the demand side and one on the production side; rather than the single consumption side effect with a commodity specific tax. In turn, the impact on revenues of an increase in tariff rates is smaller than for a comparable increase in commodity tax rates, because both of the effects on the production and the demand sides act to reduce revenues. Marginal welfare costs associated with an increase in a tariff rate from t to t' are larger, while incremental revenues smaller.[1]

III. Some Marginal Welfare Cost Calculations Using a Small Economy Numerical General Equilibrium Model of the Philippines

In order to give some indication of the orders of magnitude involved in comparisons between marginal welfare cost of commodity taxes and tariffs, we have made some calculations using a small open economy numerical general equilibrium model of the

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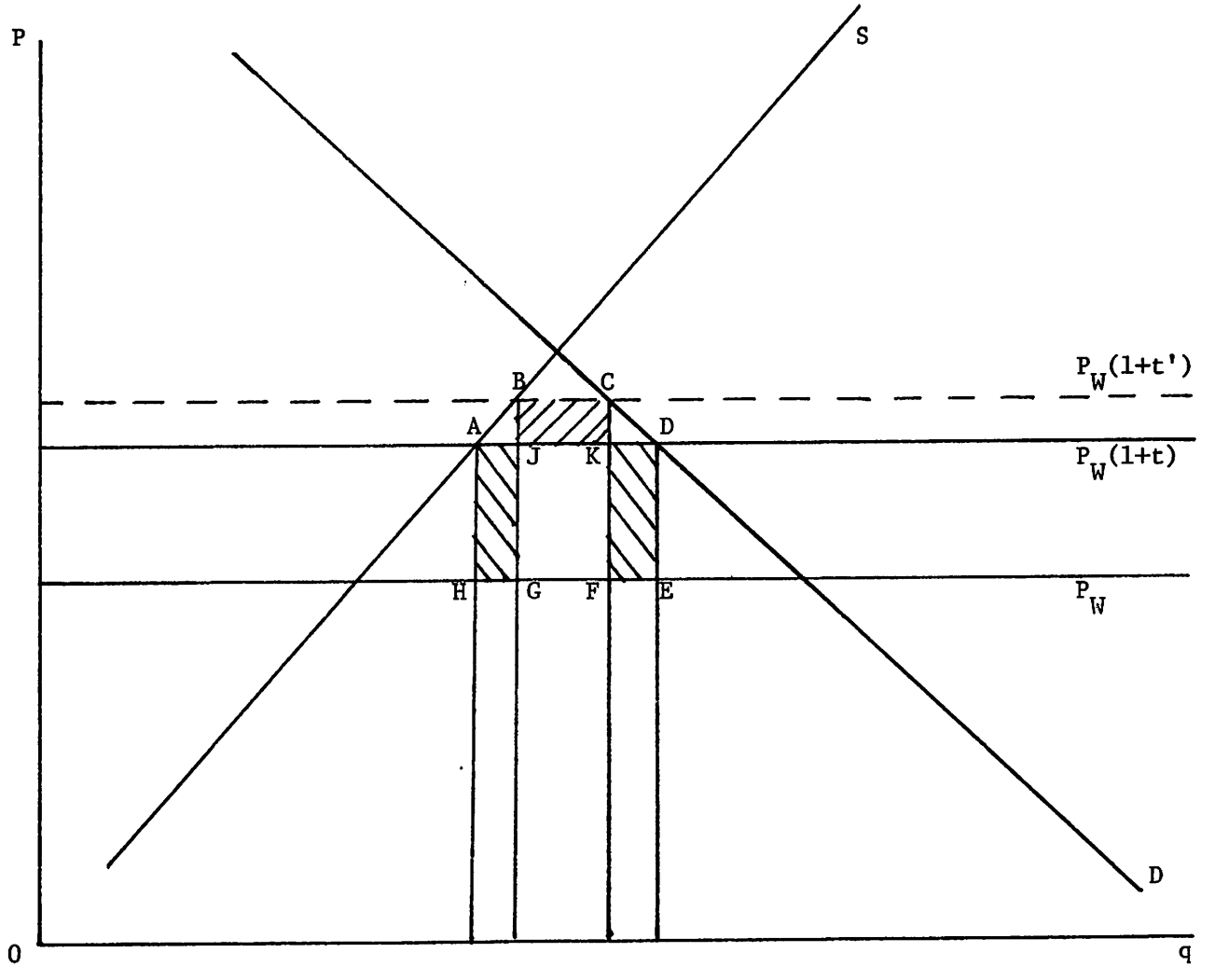
[1]Indeed not only will marginal welfare costs of tariffs substantially exceed those of commodity specific taxes, but the revenue maximizing tariff rate will be lower than the revenue maximizing tax rate because of the additional production side effect acting to reduce revenues.

Figure 2

The Marginal Welfare Cost of a Tariff



Philippines due to Clarete (1984) adapted slightly here to capture the effects of both commodity and trade taxes. This model is presented in detail in Clarete, and is also described in Clarete and Roumasset (1985) and Clarete and Whalley (1985), and so we only briefly summarize it here.

The model consists of N sectors producing T tradable goods and NT homegoods; N=T+NT. World prices are given for traded goods. Each producer uses variable factors and a fixed factor in production, with production in each industry represented by a Cobb-Douglas value-added function defined on both variable and sector-specific factors. Using sector-specific factors avoids any problems of complete specialization when modelling the impacts of policy changes in small countries.

Consumer demands are assumed to be Cobb-Douglas. The consumer sector is endowed with both variable and sector-specific factors, with the rent accuring to the latter appearing as part of household incomes.

A treatment of tradables as a Hicksian composite good closes the external sector of the model (see Diewert (1978)). The excess demand function for this composite commodity equals the total net imports of domestic residents. When the market for this commodity clears, trade balance holds, i.e., residents sell enough goods and services to non-residents to pay for their imports.

In a small open-economy without homegoods, world prices for tradables fully characterizes a domestic equilibrium. Any excess

demands are absorbed by the much larger rest of the world, and trade balance is satisfied by Walras' Law. But in the presence of non-traded goods, the prices of nontradables are endogenously determined, since in equilibrium any excess demand for non-tradables must be fully absorbed domestically by appropriate adjustments in their prices relative to those of traded goods.

In the basic version of the model, the government collects both tariffs and export taxes and redistributes the revenues to the consumer in a lump-sum fashion. In the version used here, the government also has the ability to raise revenues through commodity specific consumption taxes, with revenues again redistributed in lump sum fashion. In either case, the simultaneity between the revenues generated by distortions and demands imples that government transfers to consumers are endogenous (see Shoven and Whalley (1972)). In order to evaluate consumer demands at any set of prices, a government distribution of revenues to consumers must be assumed. Consumers then calculate their income (consisting of transfers from the public sector and the value of endowments of variables and sector-specific factors). Given this income, consumers are able to evaluate their demands, based on which either tax or tariff revenues can be computed. In full equilibrium the income received from the government by the household sector exactly matches the revenues actually collected through commodity or trade taxes.

The small economy model developed by Clarete for the Philippines has been calibrated to a 1978 Philippine benchmark

equilibrium data set using the procedures described in Mansur and Whalley (1984). Seven sectors are included in the model: three exportables, two importables, and two homegoods. Exportables are commercial crops, agricultural food industries, and industrial exportables. Importables include industrial importables (consisting mainly of producer goods), and import substitutes. The home goods sectors are other agricultural products and services. Two variable factors are specified; labor and capital; with the aggregate supply of each assumed to be fixed.

Tariff and export tax rates used in the model are trade-weighted averages of respective industry average rates using commodity specific data listed in the Philippine Tariff Code for 1978. In the 1978 base year data, industrial importables have an ad valorem tariff rate equal to 23 percent, and import substitutes face a rate of 62 percent. Export tax rates for commercial crops, agricultural food industries, and industrial exportables are set at 5, 3, and 3 percent respectively.

These policy parameters are combined with other data from Clarete (1984) to assemble the benchmark equilibrium data set used in the model. Calibration procedures determine the parameters for the production and demand functions, which, in turn, are used in the counterfactual marginal welfare cost analyses reported on here.

We have performed a series of marginal welfare cost calculations using this model. Our procedure is to calibrate the model to the 1978 data, as in Clarete, and first compute an

equilibrium in which the tariff on import substitutes is reduced from its benchmark value of 62 percent to zero. We then perform a series of further equilibrium computations in which first the tariff rate on this commodity is sequentially increased by increments of 0.5 percent from the zero level, and then a series of alternate calculations in which the commodity tax rate on this commodity is similarly increased. Tax rates are thus zero in all the tariff calculations, and tariff rates zero in the tax calculations. We cease increasing the respective tax and tariff rates when the tariff level is such that the direction of trade in one of the tradables changes. The tax is distorting since consumption of only one commodity in the world is taxed.

In each case we have calculated the welfare effect of a small increase in tax or tariff rates as the Hicksian equivalent variation from the comparison to the equilibrium associated with the tax or tariff rate before it is increased. We have expressed this welfare measure as a ratio of the extra revenue raised, and reported the results in Table 1. These clearly suggest that marginal welfare costs from raising tariff rates are large and increase rapidly. Incremental welfare costs from raising extra revenues when the tariff rate on import substitutes is 30 percent are over 6 pesos per peso of additional revenues raised. In contrast, marginal welfare costs of taxes are small. For low initial tax rates there is actually a benefit from raising tax rates because of the offset effect with other distortions in the model (other tariffs and export taxes). However, after a 15

Table 1

Marginal Welfare Costs of Raising Revenues from Tariffs and Commodity Taxes on Import Substitutes in the Philippine Model Using 1978 Data

Tax or Tariff Rate	Marginal Welfare Cost of Raising Taxes, expressed as Pesos[1] per Pesos of Revenue Raised	Marginal Welfare Cost of Raising Tariffs expressed as Pesos[1] per Pesos of Revenue Raised
5%	-0.08	0.31
10%	-0.04	0.53
15%	-0.001	0.86
20%	0.04	1.44
25%	0.09	2.62
30%	0.14	6.73

[1]Calculated as the Hicksian equivalent variation under the policy change.

percent rate marginal welfare costs begin to increase, but still remain significantly below those for comparable tariff rate increases.

These general equilibrium calculations thus clearly support the earlier diagrammatic analysis. Marginal welfare costs of raising revenues using trade taxes are larger than those for comparable rate commodity taxes. Where trade taxes are used as revenue raising instruments in developing countries, this analysis suggests that policy should be reexamined, and other more efficient instruments considered.

IV. Conclusion

In this paper we argue that the marginal welfare costs of raising additional revenues using trade taxes, such as tariffs, will substantially exceed those of commodity taxes on comparable commodities set at similar rates. We suggest that this observation is important for those developing countries which rely on trade based taxes as significant revenue raising devices. Some general equilibrium calculations using a model for the Philippines indicate that the differences in marginal welfare cost measures between these instruments are large.

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