Some Analysis and Evidence of the Macro Effect of Direct and Indirect Taxes on Prices

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by

Allan H. Meltzer

Prepared for the Treasury Department,
Office of Tax Analysis
SOME ANALYSES AND EVIDENCE OF THE MACRO EFFECT
OF DIRECT AND INDIRECT TAXES ON PRICES

Allan H. Meltzer

The classical literature on tax shifting is largely concerned with the micro-economic aspects of the problem and the welfare implications of particular forms of supplying the general revenue. Those propositions that are generally accepted on the basis of consistency with validated economic theory, specific empirical tests, or both, furnish a basis for predicting the effect of particular sources or tax revenue on the relative prices of particular commodities. Among the more familiar propositions is the conclusion that direct and indirect taxes will have substantially different effects on the prices of particular commodities.

The application of these micro propositions to the effects on price levels or exchange rates that are relevant for aggregate trade between countries is a rather large leap. Most of our macro theory would suggest that the level of government expenditure is independent of the form in which taxes are collected. The short-run effect of the tax system on the price level comes through the size of the government's deficit and more importantly on the way in which the deficit is financed. But the existence of a government deficit is not a necessary or a

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1The model developed in this paper is a simplified version of a model developed for another purpose in some joint work with Karl Brunner. I wish to acknowledge Brunner's contribution and absolve him from responsibility for the present form and application. I am indebted to the Treasury Staff for the preparation of the underlying data.
sufficient condition for an increase in the quantity of money or a rise in the price level. In most of the countries for which the redistribution of tax burden between direct and indirect taxes is of concern to us, monetary policy is sufficiently independent of the size of the current government deficit that we can dismiss the effect of the tax system on the aggregate price level and the exchange rate.

I do not wish to suggest that if monetary policy is unchanged the size of the government deficit is irrelevant for the balance of payments position. But it does seem clear that (1) the size of the government deficit can be treated as independent of the form in which taxes are collected and (2) that monetary policy can be used to offset or strengthen the effect on the price level of any particular deficit that emerges. The equilibrium adjustment of the balance of payments will reflect the prevailing price levels of the various countries and not the particular forms in which the tax burden is imposed.

To say that the equilibrium of the balance of payments is independent of the distribution of revenue sources between direct and indirect taxes should not suggest that the sources of revenue have no effect on the economy. A simple example will help to clarify the issue. Suppose that a revenue tariff is used to replace the revenue lost through a reduction in personal income taxes. In a system of flexible exchange rates, imports by the tariff raising country will be smaller initially. There will be an adjustment in the volume of exports and imports through a change in the exchange rate. The volume of commodities exchanged will decline at first. But the adjustment of the exchange rate will restore the equality of exports and imports.

Restoring the income tax and removing the tariff at a later date might
lead businessmen to believe that the change in the source of taxation has stimulated exports, as indeed it would. It will also have stimulated imports. But it will not have succeeded in converting a country from a surplus to a deficit position. Only the exchange rate and the volume of trade will be affected. Again, both of these consequences can be avoided or furthered by monetary policy aimed at raising or lowering the price level. The consequence of doing so will of course be domestic deflation or inflation. There need be no effect on the volume of exports or imports arising from the particular sources used to collect the national revenue.  

Moreover, if we assume that the balance of payments under fixed exchange rates will reach an equilibrium at which exports plus capital inflows equal imports plus capital outflows, the same conclusion holds in this case. The size of the trade flows that prevail in the equilibrium situation may be affected, but there will be no particular trade advantage to any of the parties from changing the sources of revenue once we assume that countries pursue policies aimed at producing an equilibrium in the balance of payments. My reading of the evidence suggests that the U.S. and other countries have accepted balance of payments adjustment as a goal of domestic policy.

Since major trading countries cannot pursue "beggar your neighbor" policies by adjusting the sources of domestic revenue, there is no need to look at the effect on the balance of payments of the U.S. of changes in the forms in which the U.S. or foreign governments collect taxes. There remains another effect of the shifts between direct and indirect taxes that is of interest. Again, a simple example may help to bring out the problem.

2 These points are persuasively argued in "The Foreign Trade Effects of Changes in Domestic Tax Systems" prepared by the Treasury Staff (mimeo, Mar., 1984).
Suppose that the income tax is reduced and the license fee of barbers is raised to recapture the revenue. The price of haircuts will rise as a result of the tax, and the quantity of haircuts demanded will fall if the (after tax) income elasticity of demand for haircuts is smaller than the price elasticity. We may assume that the importation of haircuts is zero. Consumers will now purchase fewer haircuts, and since the relative prices have changed, they will reallocate their spending. They may purchase relatively more of the commodities that are exported, that are imported, or that do not move in international trade.

More generally, shifts in the composition of taxes will have effects on the prices of exported and domestically purchased commodities. These effects will of course depend on the demand and supply elasticities of the various commodities. This is the problem that the paper attempts to analyze. In the following section, a model is developed that sets out the main features of the analysis. I show that the model implies that the effect of a readjustment of the tax burden between direct and indirect taxes is indeterminate in the absence of information on various elasticities. The succeeding section presents estimates of the parameters of the model for five countries. A conclusion completes the paper.

A Rudimentary Model of a Two Tax System

To provide a framework for analyzing the effect on the relative prices of

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3 If the initial situation is 1000 haircuts purchased at $1 per haircut with price elasticity of demand for haircuts of -.25, a doubling of the price of haircuts resulting from the tax of $1 will add (or in this case restore) $750 to the government's revenue. Total consumer payments to barbers inclusive of the tax will rise by $500. If the income (after tax) elasticity of the demand for haircuts is sufficiently small, consumers will have available some fraction of $250 to allocate to other commodities.
domestic and export commodities, I start from a relatively simple model of the income-expenditure type. This class of hypotheses does not admit variations in relative prices since there is typically only one generalized commodity that consumers may purchase and only one price. To appreciate the effect of indirect taxes in a comparative statics framework, at least two prices must be considered. The model presented attempts to do that. However, for simplicity, as well as for reasons partly explained above, the level of government expenditure, the deficit or surplus in the balance of payments, and the stock of money are not considered to be a part of the problem. This does not mean that these factors will not affect the price level; it means that they are assumed not to affect the price ratios that are the primary concern here. Their influence will appear through the real wage which is taken as given for the present problem.

First, we write the demand equations for the two commodities in a particular country, call it country A. Let $x^d$ be the total quantity of one commodity demanded by domestic purchasers, and let $z^d$ be the quantity of $z$ demanded by both foreign and domestic purchases. The quantity of $x$ demanded includes purchases of imports. The commodity $z$ is the composite export commodity of country A. It may be purchased as well for domestic consumption or as a production good. Both commodities will be assumed to be dependent on relative prices and real income ($y$) after taxes ($T$). This is expressed in equations (1') and (2') where $p_x/p_z$ is the relative price of $x$ in terms of $z$, $y - T$ is aggregate real income net of direct taxes, and the $a$'s are marginal propensities.

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It should be apparent that the demand by government for the two commodities can enter as well if we wish. Nothing in the problem or the solution will be changed. The condition below that total quantity demanded equal total quantity supplied in effect assumes that government does purchase $x$ and $z$. 
Second, we introduce an indirect tax into the system in the form of a sales tax on purchases of commodity x. Denote the effective sales tax rate paid by consumers as q. We can rewrite equations (1') and (2') as (1) and (2).

\[
(1') \quad x^d = a_{11} \frac{px}{ps} + a_{12} (y - T) \quad a_{11} < 0 \quad a_{12} > 0 \\
(2') \quad s^d = a_{21} \frac{px}{ps} + a_{22} (y - T) \quad a_{21} > 0 \quad a_{22} > 0
\]

First, it is immediately apparent that if the sales tax is placed on both commodities, the after tax relative prices applicable to domestic purchases will be unchanged. Second, if we wish to treat only the problem of border tax adjustments, ps is the price applicable to foreigners and s^d their demand function.

The analysis of the text provides a framework for the problem. The quantity of all commodities demanded by domestic purchasers is then x^d. 5

Equations (3) and (4) introduce the amounts of x and s supplied as functions of the relative price and the real wage, w.

\[
(3) \quad x = a_{31} \frac{px}{ps} + a_{32} w \quad a_{31} > 0 \quad a_{32} < 0 \\
(4) \quad s = a_{41} \frac{px}{ps} + a_{42} w \quad a_{41} < 0 \quad a_{42} < 0
\]

5 The term y - T would then not appear in the demand equation for commodity s. I ignore throughout the marginal propensity to export with respect to foreign income.
The amount of total direct taxes collected, $T$, is dependent on the pace of economic activity measured by real income. This relation is expressed in equation (5) in terms of the marginal tax rate, $t$.

\[(5) \quad T = ty \quad 1 > t > 0\]

The implicit assumption that the average and the marginal tax rates are the same, introduced for simplicity, has no bearing on the final outcome.

Three equations are introduced to close the system. Equation (6) defines total real output as the sum of the amount of $x$ and $z$ supplied; equation (7) expresses aggregate real demand ($D$) as the sum of $x^d$ and $z^d$; the equilibrium condition (8) requires that the sum of the quantities demanded equals the sum of the quantities supplied.

\[(6) \quad y = x + z\]

\[(7) \quad D = x^d + z^d\]

\[(8) \quad D = y\]

The system of eight equations is sufficient to determine the relative price $p_x/p_z$, the amounts demanded and supplied, the tax collections, etc., given the marginal direct tax rate, $t$, the indirect tax rate, $q$, and the real wage, $w$. The tax rates are assumed to be policy parameters; the wage rate is determined with the aid of equations expressing the demand and supply for labor. The determination of the wage rate is not explicitly considered as a part of the problem.

Using equations (6), (7), and (8) with equations (1) to (5), we obtain
Again substituting for $y$ on the left side of the equation and rearranging terms gives

$$\left\{ (1+q)(a_{11}+a_{21}\frac{px}{pz}) + (a_{12}+a_{22})(1-t)y \right\} \frac{px}{pz} = (a_{31}+a_{41}\frac{px}{pz}) + (a_{32}+a_{42})w = y.$$  

from which we can obtain a solution for $\frac{px}{pz}$ in terms of $w$, $q$ and $t$. In this expression, the tax rates appear multiplicatively. Very similar results would be obtained if we assumed that the indirect tax rate, $q$, appeared in both the demand and supply equations. The only change in the solution for this change in assumption is that the term $(1+q)$ appears outside the bracket; all terms on the left side of the solution equation would be multiplied by $(1+q)$. If the indirect tax rate applicable to suppliers, call it $r$, is assumed to be unequal to the indirect rate in the demand equations, a term $(1+r)$ would appear as a multiplicative factor in front of $(a_{31}+a_{41})$ in the above expression.  

For the present case, we obtain the effect of changes in direct and indirect tax rates on the relative price of commodities that are or are not exported from country $A$ by taking the partial derivatives of $\frac{px}{pz}$ with respect to $q$ and $t$. To avoid a lengthy expression, we can simplify the equation above, rewriting it as

$$\left(1+q\right)b_1 + b_2 \frac{px}{pz} = b_3w \quad \text{or} \quad \frac{px}{pz} = \frac{b_3}{(1+q)b_1 + b_2}w.$$

6. I have not introduced this complication for two reasons: First, the number of degrees of freedom for the empirical work is quite small; second, doing so introduces a number of open questions in the theory of tax-shifting that I wish to avoid in this first approximation.

7. If the indirect tax rate is assumed to raise the supply price, equation (9) becomes

$$\frac{px}{pz} = \frac{b_3}{(b_1 + b_2)(1+q)}w.$$
From the signs specified above, it follows that the sign of $b_1$ is indeterminate unless we assume relative orders of magnitude for $a_{11}$ and $a_{21}$; the sign of $b_2$ is dependent on the relative orders of $a_{31}$ and $a_{41}$; unless $a_{12} + a_{22}$ is sufficiently large, $b_3$ is negative. We will assume that this condition is not met and that $b_3 < 0$.

A change in the direct tax rate, $t$, will change the relative price of non-exported to exported goods by an amount

$$
\frac{\partial p_x/p_z}{\partial t} = \frac{(a_{12} + a_{22}) \left[ (a_{32} + a_{42}) \left[ (1+q)b_1 + b_2 \right] + (a_{31} + a_{41}) b_3 \right]}{[b_1(1+q) + b_2]^2}.
$$

The change in $p_x/p_z$ arising from the change in the indirect tax rate, $q$, is

$$
\frac{\partial p_x/p_z}{\partial q} = \frac{-(a_{11} + a_{21}) b_3 w}{[(1+q)b_1 + b_2]^2}.
$$

The denominators of both partial derivatives are of course positive, but the numerators are of unknown sign unless some prior information is obtained about the orders of magnitude of the marginal propensities to purchase and produce with respect to $p_x/p_z$. Despite our failure to answer the question posed, the model provides useful information about the solution of the problem. To the extent that the hypothesis introduced is a reasonable approximation, the following conclusions can be drawn.

First, the effect of a change in the direct tax rate on the price ratio depends on the prevailing direct and indirect tax rates as well as on the relative orders of magnitude of the marginal propensities denoted $a_{j1}$ ($j = 1 \ldots 4$).

Second, the size of the change in the relative price $p_x/p_z$ following a
change in indirect tax rates is dependent on the wage rate as well as the prevailing levels of direct and indirect taxes. The larger the real wage rate in the particular country, the larger the expected positive or negative change in the price ratio resulting from a given change in the indirect tax rate. But the larger the prevailing indirect tax rate, the smaller the expected change in the ratio \( px/ps \), other things equal. The effect of the prevailing direct tax rate on the expected change in the price ratio is not known.

Third, since \( b_3 \) is assumed to be negative, the sign of the partial derivative of \( px/ps \) with respect to \( q \) depends only on the relative order of \( a_{11} \) and \( a_{21} \). If \( |a_{11}| = a_{21} \), a change in indirect tax rates will have no effect on the price ratio. Changes in the direct tax rate will have an indeterminate effect as before. If \( |a_{11}| < a_{21} \), an increase in the indirect tax rate will lower the price ratio and conversely for a rate reduction. Reversing the sign of the inequality reverses the result.  

Fourth, the model permits the effect of changes in direct and indirect tax rates on the price ratio to be approximated empirically if a simplifying assumption about the form of the solution equation is introduced. The results are reported in the following section.

Some Empirical Findings

Estimates of the effect on the price ratio of variations in direct and indirect tax rates can be obtained by ordinary least squares if the implied form of the equation is modified slightly. Since the wage rate, and the direct and indirect tax rates appear multiplicatively in equation (9), I will assume that the empirical equation is linear in the logarithms. This has the added advantage of providing

\[ \text{If } |a_{11}| = a_{21} \text{ and } |a_{41}| = a_{31} \text{, both partial derivatives become indeterminate.} \]
direct estimates in the form of elasticities that are independent of the units of
measurement that are employed in the various countries to be considered. The
equation used for estimation will be (10):

\[
\log \frac{p_t}{p_z} = c_0 + c_1 \log t + c_2 \log q + c_3 \log w + u,
\]

where \( u \) is a stochastic error term and \( c_1, c_2 \) and \( c_3 \) are the elasticities of
\( \frac{p_t}{p_z} \) with respect to the particular arguments.

Annual data for a short span of years was made available by the Treasury
for five countries: Netherlands, West Germany, Japan, the United Kingdom
and the United States. The number of annual observations available is shown in
parentheses beside the name of the country in Table I.

Before discussing the estimated elasticities, it is useful to consider
a prior question: To what extent do the data suggest that countries have varied
the distribution of the tax burden between direct and indirect taxes? Table I
supplies information on this point in the form of simple correlation coefficients.

**TABLE I**

<table>
<thead>
<tr>
<th>Country</th>
<th>No. of observations</th>
<th>( \text{Simple correlation between} )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>( t \text{ and } q )</td>
</tr>
<tr>
<td>Netherlands</td>
<td>10</td>
<td>-.61</td>
</tr>
<tr>
<td>Germany</td>
<td>11</td>
<td>-.71</td>
</tr>
<tr>
<td>Japan</td>
<td>10</td>
<td>-.08</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>11</td>
<td>.79</td>
</tr>
<tr>
<td>United States</td>
<td>16</td>
<td>.28</td>
</tr>
</tbody>
</table>
As we might expect, there is no uniformity. Germany and the Netherlands show that direct and indirect tax rates have moved inversely in recent years; in Japan and the United States there was apparently no relation between the two during the period ending in 1962; in the U.K. the rates moved in the same direction. In the Netherlands and Germany, direct taxes have gone up relative to indirect taxes; in the U.K., the opposite situation has prevailed.

The observed high correlations between direct and indirect tax rates alert us to another problem. It suggests that for three countries, multicolinearity will be present and will affect the estimates obtained. Nevertheless, estimates for all five countries are presented in Table IX.

Despite the small number of observations available and other estimation problems, the data suggest some interesting conclusions. To the extent that we find very similar patterns for the different countries, our confidence in the findings is increased.

First, the results suggest that an increase in the direct tax rate lowers the price ratio in all of the countries. A rise in income tax rates occurs either through policy action or a rise in real income that moves more households into higher real tax brackets. In both cases, the ratio $p_x/p_z$ falls; the price level applicable to domestically purchased commodities falls relative to the price level applicable to exported commodities. This in turn suggests that the recent reduction in U.S. income taxes will stimulate the volume of exports from the U.S. relatively, ceteris paribus.

Second, despite the limited number of observations for each country, the elasticity of the price ratio with respect to the direct tax rate falls between -.12 and -.18 in four of the five countries. In the Netherlands, it is slightly
<table>
<thead>
<tr>
<th>Country</th>
<th>Multiple R</th>
<th>Direct tax</th>
<th>Indirect tax</th>
<th>Wage rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Netherlands</td>
<td>.70</td>
<td>- .074</td>
<td>.075</td>
<td>.013</td>
</tr>
<tr>
<td>Elasticity</td>
<td></td>
<td>-.55</td>
<td>0.57</td>
<td>0.37</td>
</tr>
<tr>
<td>'t' value</td>
<td>-2.22</td>
<td>1.35</td>
<td>2.32</td>
<td></td>
</tr>
<tr>
<td>partial r</td>
<td>-.67</td>
<td>.45</td>
<td>.66</td>
<td></td>
</tr>
<tr>
<td>log of the mean</td>
<td>1.22</td>
<td>1.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>.67</td>
<td>- .125</td>
<td>.185</td>
<td>.098</td>
</tr>
<tr>
<td>Elasticity</td>
<td></td>
<td>-2.25</td>
<td>1.35</td>
<td>2.32</td>
</tr>
<tr>
<td>'t' value</td>
<td>-2.22</td>
<td>-1.32</td>
<td>4.32</td>
<td></td>
</tr>
<tr>
<td>partial r</td>
<td>-.67</td>
<td>-.60</td>
<td>.90</td>
<td></td>
</tr>
<tr>
<td>log of the mean</td>
<td>1.17</td>
<td>1.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>.90</td>
<td>- .159</td>
<td>-.302</td>
<td>.163</td>
</tr>
<tr>
<td>Elasticity</td>
<td></td>
<td>-2.22</td>
<td>-1.22</td>
<td>4.96</td>
</tr>
<tr>
<td>'t' value</td>
<td>-2.22</td>
<td>-1.32</td>
<td>4.96</td>
<td></td>
</tr>
<tr>
<td>partial r</td>
<td>-.67</td>
<td>-.60</td>
<td>.90</td>
<td></td>
</tr>
<tr>
<td>log of the mean</td>
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<td>0.98</td>
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<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>.95</td>
<td>- .128</td>
<td>.421</td>
<td>.221</td>
</tr>
<tr>
<td>Elasticity</td>
<td></td>
<td>-1.18</td>
<td>1.32</td>
<td>6.86</td>
</tr>
<tr>
<td>'t' value</td>
<td>-1.18</td>
<td>1.32</td>
<td>6.86</td>
<td></td>
</tr>
<tr>
<td>partial r</td>
<td>-.40</td>
<td>.45</td>
<td>.93</td>
<td></td>
</tr>
<tr>
<td>log of the mean</td>
<td>1.17</td>
<td>1.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>.81</td>
<td>- .153</td>
<td>-.180</td>
<td>.295</td>
</tr>
<tr>
<td>Elasticity</td>
<td></td>
<td>-2.57</td>
<td>-1.50</td>
<td>3.97</td>
</tr>
<tr>
<td>'t' value</td>
<td>-2.57</td>
<td>-1.50</td>
<td>3.97</td>
<td></td>
</tr>
<tr>
<td>partial r</td>
<td>-.60</td>
<td>-.40</td>
<td>.75</td>
<td></td>
</tr>
<tr>
<td>log of the mean</td>
<td>1.17</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The measurement of the variables is described in an Appendix.
higher, though still negative. Moreover, in three of the five cases, the negative
elasticity is significant by the usual tests.

Third, the findings for the elasticity of the indirect tax rate are much less
clear. In those countries for which multicollinearity is least, the U.S. and Japan,
estricles are negative and the significance level is not unreasonably low. The
data suggest that for the U.S., a reduction in direct tax rates compensated by an
equal increase in indirect tax rates would have little effect on the ratio of domestic
to export prices. On the other hand, if the much-discussed reduction in excise
taxes is approved by the Congress, the relative effect on export price and
domestic prices will be similar (in direction) to the effect of the recent reduction
in direct tax rates.

Fourth, to the extent that the findings are interpreted as sufficient to
support any conclusion, it would appear that in the Netherlands, Germany and
the U.K., some relative stimulus to exports can be achieved by shifting the tax
burden from direct to indirect taxes. In each of these countries, both the
reduction in direct taxes and the increase in indirect tax rates raise the price
of domestically purchased commodities relative to the price of exports. In
Japan, the conclusion is reversed. To achieve a minor reduction in the price of
exports relative to domestically purchased goods while approximately main-
taining tax collections, they would wish to raise direct taxes and reduce indirect
taxes.

Fifth, a rise in the domestic price of domestically produced commodities
would appear to stimulate the volume of imports. This would suggest that the
increase in the ratio px/pz will stimulate both exports and imports relative to
commodities that are domestically produced and consumed. The analysis does
not deny that this may occur through changes in the composition of the commodities included in $x^d$. But the indirect tax rate is assumed to be applicable to both the domestic and imported components of $x^d$ and the marginal propensities to purchase are assumed, in the analysis, to be the same for domestically produced and imported goods. Thus a tax policy that raises $px/pz$ will initially stimulate exports relative to domestically purchased and imported commodities. But since we assume that countries will attempt to balance their payment flows without gold loss, this effect can only be the initial effect. The relative stimulus to exports, if translated into an absolute increase in exports, must produce a return flow of imports or an increase in capital exports.

Sixth, if the rise in the ratio $px/pz$ is accompanied by an absolute fall in $pz$, it does not follow that a country stimulates exports at the expense of domestic consumption. To draw that conclusion, we must also assume that $p_e$ is the price of goods that are only exported. In general, this is not so. Commodities sold to the rest of the world are also consumed at home. The most that can be concluded from the analysis is that a redistribution of the tax burden that reduces $px$ absolutely and relative to $pz$ will alter the mix of commodities demanded and will result in an increase in the quantity of $x$ demanded both at home and for export.

Seventh, increases in the real wage rate appear to have a larger influence on prices of commodities purchased only by domestic purchasers than of commodities exported. The elasticity differs in the five countries, as might be expected. But it is positive in all five cases, and significantly so in four of the five. In interpreting this finding, it should be recalled that the mix of products exported from the U.S. differs from the mix of products consumed.
Moreover, to the extent that this conclusion may be interpreted in terms of the model of the previous section, it suggests that $b_1(1+q) + b_2$ is negative. But this information alone does not permit us to infer whether the positive sign for the wage elasticity results from the marginal propensities in the demand or supply equations.

Eighth, the correlation coefficients suggest that the equation explains the movement of the relative price ratio reasonably well, perhaps surprisingly so. Nevertheless, equation (10) was modified slightly to observe the extent to which the conclusions were heavily dependent on the particular equation used. A number of tests were made for the U.S. using linear approximations and, in some cases, additional variables. Only one of these tests was run for the other four countries; log of real income was added as an additional variable. The results are reported in Table III.

The results in Table III do not substantially change the conclusions about the effect of changes in the direct tax rate for the five countries or the relative elasticities of the price ratio with respect to direct and indirect tax rates in the U.S. Moreover, the two elasticities for Japan have moved closer together, although the spread remains wider than in the U.S. It should be recalled that the model does not imply that these elasticities will be the same magnitude/even that they will have the same sign.

The major change from Table II to Table III appears in the elasticity of the price ratio with respect to the wage rate. While the elasticity remains generally positive, its significance is generally reduced. But the additional variable, real income, is rarely significant as the underlying hypothesis implies.
TABLE III
Estimates of the Elasticities for the Equation
\[
\log \frac{p_M}{p_S} = d_0 + d_1 \log t + d_2 \log q + d_3 \log w + d_4 \log y + v
\]

<table>
<thead>
<tr>
<th>Country and Multiple R</th>
<th>Direct tax</th>
<th>Indirect tax</th>
<th>Wage rate</th>
<th>Real income</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Netherlands</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elasticity</td>
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<td>.087</td>
<td>-.089</td>
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These findings suggest, to the extent that the previous conclusions may be accepted, that the addition of real income to the empirical equation has not altered the findings. Since real income is to a large extent a summary of the composite effect of monetary and fiscal policies and other excluded influences, the result lends additional support to the model.

Conclusion

Much of the lay, and perhaps some of the professional, discussion of the effect of comparative tax systems on the balance of payments seems to suggest that countries can pursue "beggar thy neighbor" policies by redistributing the domestically paid tax burden. Economic analysis suggests that this conclusion is faulty in the general case and results from an application of micro-propositions or observations to macro events.

A model of income determination was presented that incorporated the relative price of domestically purchased to export goods. The model implied that the effect on the price ratio of variations in the direct and indirect tax rates if any, was not independent of the level of tax rates or of real wage rates. Moreover, the model implied that the effects would not in general be the same in all countries and that the direction of the effect would depend on the marginal propensities to purchase and produce with respect to the price ratio.

However, the model did permit an approximation to the size of the influence in changes in tax rates on the price ratio. Some empirical estimates were provided. The data suggest that a decrease in direct tax rates raises domestic prices relative to export prices in the five countries studied, a finding that is of course consistent with a rise in both prices. The effect of indirect taxes differed
in the various countries. For the U.S. it appeared that the two elasticities were of approximately equal magnitude. A substitution of direct for indirect taxes as a source of public revenue would appear to have little effect on the price of exports or on the volume of trade.

The price ratio appears to be relatively inelastic with respect to each tax rate in the five countries studied. Unless a substantial price elasticity of demand for exports is assumed, or identified, there is at most a minor initial stimulus to the volume of exports in those countries (Germany, the Netherlands, and the U.K.) in which the elasticities of the price ratio with respect to direct and indirect tax rate may be of opposite sign. This stimulus would be achieved, if at all, by raising indirect taxes and reducing direct taxes. Of the five countries studied, only Japan appears capable of stimulating exports by shifting the tax burden toward a greater proportion of direct taxes. The available evidence does not suggest that the Japanese government has pursued this course.

Finally, nothing in the analysis or the evidence suggests that a country can either stimulate exports at the expense of domestic consumption or obtain more than a very short-run advantage over other countries by varying the form in which taxes are collected. If countries pursue policies aimed at adjustment of the balance of payments, it is the volume of trade and not the surplus or deficit position of particular countries that is influenced by the variation in sources of revenue. The problem of border tax adjustments would seem to be of second order of importance.