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*Chapter 6*

# The Tax Substitution and International Trade

Of the debates concerning the potential effects of a value added tax, none have been more confused than those concerning international trade. Because the VAT would be rebated on exports and imposed as a border tax on imports, it is often alleged that it would therefore *stimulate* exports and *restrict* imports.

These effects are corollaries to the asserted discriminatory consequences for the U.S. balance of trade of the recent European extensions of the value added tax. Common Market countries have been replacing previously existing indirect business taxes with value added taxes as part of the tax harmonization efforts of the EEC, and similar moves toward value added taxes have been taken in the rest of Europe. These developments have often been cited as a significant contributing cause of the deterioration over the last decade of the U.S. trade position.

There are, in fact, two related questions to ask about the trade effects of a VAT: First, what are the consequences of a VAT-CIT substitution for a country's international trade position? And, second, given these consequences (if any), is this tax substitution the most desirable means of achieving trade objectives?

The question of the trade consequences of a VAT is simultaneously simple and complex. Most simply stated, there are no trade effects of a VAT per se. Whether changes in export and import patterns will accompany the introduction of a VAT depends upon the relative price consequences of the menu of change in the VAT and in other taxes. If the only consequence of the VAT and simul-

taneous changes in other taxes and government expenditures (or deficits) is to increase VAT-inclusive prices by the amount of the VAT and leave VAT-exclusive prices unchanged, then no trade consequences unique to the tax substitution can be expected. VAT-exclusive export prices will be unchanged, and VAT-inclusive import prices will rise by the same amount as the prices of import-competing goods. More generally, changes in exports will depend upon changes in export prices relative to world market prices, and imports will be affected only if import prices are affected differently than the prices of import-competing goods. Of course, even if these relative prices are unaffected by the tax substitution, imports and exports may be affected if the policy change alters the aggregate level of economic activity and hence demands for both domestic *and* foreign products, or if the composition of aggregate demand is altered.[1] But these effects of a change in fiscal policy could in general be achieved by means other than a tax substitution.

If the VAT is fully shifted forward, its effect on export prices relative to world prices and import prices relative to prices of domestic import-competing goods will be neutral. Relative price changes can then only result from other fiscal changes which accompany the introduction of the VAT. This means that the source of any change in the level and composition of the trade balance must be found in price changes resulting from the reduction *and* shifting of the corporate profits tax. The U.S. trade balance will be favorably affected by the tax substitution only if export prices are reduced by shifting some fraction of the benefits of the CIT reduction to foreign purchasers, as discussed in Chapter 4, or if import-competing prices rise by less than the VAT rate due to forward shifting of the CIT savings. Thus, just as in the case of relative price changes generally, the causal burden of changes in the balance of trade is on the CIT reduction rather than on the VAT imposition.

The answer to the second question—the relative desirability of the VAT as a means of achieving trade objectives—is somewhat simpler. Briefly put, any *trade* effects which can be achieved via a VAT, e.g., as a substitute for a forward-shifted CIT, can be as easily achieved via a one-time change in exchange rates. In consequence, trade effects would not seem to provide a compelling reason for introducing a VAT. However, it should be noted that while the consequences of a VAT-CIT substitution on the *balance of trade* might be equivalent to a corresponding devaluation, differential effects of these alternative policies for the *composition of trade* and for

1. These issues and the general subject of the trade consequences of the VAT are discussed in greater detail by Stout.

*international capital flows* and the *balance of payments* render the devaluation a less-than-perfect alternative to the VAT-CIT substitution. This point, and a further discussion of the effects on U.S. trade of the European value added taxes, will be considered in somewhat more detail at the conclusion of this chapter.

## 6.1 EFFECT OF VAT-CIT SUBSTITUTION ON EXPORTS

To repeat, the export consequences of the tax substitution depend only upon price changes resulting from the shifted CIT reduction. Given any export price changes it is then possible to determine what the resultant increase in exports will be. First, consider the definitional relationships between the *value* of exports ($V_x$), the *quantity* of exports ($x$), and relative export prices ($P_x/P_w$), where $P_x$ is the domestic price of exports and $P_w$ is an index of world prices:

$$V_x = xP_x. \tag{6-1}$$

The quantity of exports is related to domestic export prices and to world market prices via a demand function of foreign purchasers for domestic exports, i.e.,

$$x = f(P_x/P_w). \tag{6-2}$$

For present purposes the essential information conveyed by this demand function can be summarized in terms of the *price elasticity* of the demand for exports, $\epsilon_x$. Setting the indices of world prices and of pre-tax-substitution domestic export prices equal to unity, and assuming world prices to be unaffected by changes in domestic export prices ($dP_w = 0$), this elasticity is defined as

$$\epsilon_x = \left[\frac{dx}{d(P_x/P_w)}\right]\frac{P_x/P_w}{x} = \frac{dx}{dP_x}\frac{P_x}{x}. \tag{6-3}$$

Then, by differentiating equation (6-1) with respect to $P_x$, the consequences for the *value* of exports of any change in export prices, can be determined:

$$\frac{dV_x}{dP_x} = x + P_x\left(\frac{dx}{dP_x}\right) = x + x\left(\frac{dx}{dP_x}\right)\left(\frac{P_x}{x}\right) = x(1 + \epsilon_x), \tag{6-4}$$

or alternatively, the resultant change in export value is

$$dV_x = x(dP_x)\ (1 + \epsilon_x) = V_x\left(\frac{dP_x}{P_x}\right)(1 + \epsilon_x), \qquad (6\text{-}5)$$

since $x = V_x/P_x$.

Equation (6-5) provides the basis for estimating the hypothetical consequences of any tax-substitution-induced changes in prices for the value of U.S. exports. Estimates are already available for all the elements entering this equation except the price elasticity of export demand ($\epsilon_x$): $V_x$ simply represents aggregate exports prior to the tax substitution, i.e., for present purposes actual exports in 1969; and estimates of the percentage change in export prices, ($dP_x/P_x$), resulting from the tax substitution are contained in Table 3-5. A value of -1.24 for $\epsilon_x$, which has been estimated statistically by Houthakker and Magee, underlies the basic analysis. To assess the sensitivity of the export expansion and the improvement in the balance of trade resulting from the tax substitution, the absolutely higher elasticity of -2 is used as an alternative estimate. This higher value, although arbitrary, is consistent with the conventional conception of export demand as relatively price elastic.

The export expansions, or increases in the value of exports, corresponding to alternative stipulations concerning the degee of CIT reduction and shifting are presented in Table 6-1. The case of zero CIT shifting is clearly trivial: $dP_x = 0$, and no change in either the value or physical volume of exports is observed in the short run. With positive CIT shifting the increase in export value is proportionate to the percentage reduction in export prices, with $1 + \epsilon_x$ providing the factor of proportionality. Thus, the difference in export value under the alternative elasticity assumptions is greater than the difference between the elasticities [= -2 - (-1.24)]: If $\epsilon_x = -1$, then $V_x$ is independent of export price, i.e., $dV_x = 0$. Thus, the estimated expansion under the higher elasticity is always 4.17 [= (-2 + 1)/(-1.24 + 1)] times that under the lower elasticity.

Even under the assumption of full CIT removal and shifting the export effects are disappointingly small. With an elasticity of -2, the $2.3 billion increase in exports is only 5.3 percent of original export sales ($43.5 billion). The basic Houthakker-Magee elasticity of -1.24 implies an even more marginal increase in exports of less than $0.6 billion, or 1.3 percent of original export sales. However, with the higher elasticity, the export expansion alone would be sufficient to move the balance of trade from a deficit of $0.7 billion

**Table 6–1. Hypothetical Changes in U.S. Trade Balance, 1969 (dollars in billions)**

| CIT Shifting Parameter ($\alpha$) | Export Price Reduction $\left(-\frac{\Delta P_x}{P_x}\right)$ | Import Competing Price Reduction $\left(-\frac{\Delta P_d}{P_d}\right)$ | Assuming Houthakker-Magee Elasticities ($\epsilon_x = -1.24; \epsilon_x = -0.88$) | | | | Assuming Higher Elasticities ($\epsilon_x = -2.00; \epsilon_m = -1.00$) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Increase in Exports ($\Delta V_x$) | Export-Induced Imports ($\Delta V_{m'}$) | Reduction in Imports ($-\Delta V_m$) | Change in Trade Balance ($\Delta V$) | Increase in Exports ($\Delta V_x$) | Export-Induced Imports ($\Delta V_{m'}$) | Reduction in Imports ($-\Delta V_m$) | Change in Trade Balance ($\Delta V$) |
| | | | *CIT Reduction of 25 Percent* | | | | | | | |
| 0.2 | 0.29% | 0.31% | $.030 | $.007 | $0.121 | $0.144 | $0.126 | $.011 | $0.137 | $0.252 |
| 0.6 | 1.06 | 1.14 | .111 | .025 | 0.443 | 0.529 | 0.461 | .041 | 0.504 | 0.924 |
| 1.0 | 2.26 | 2.39 | .236 | .053 | 0.930 | 1.113 | 0.983 | .086 | 1.056 | 1.953 |
| | | | *CIT Reduction of 50 Percent* | | | | | | | |
| 0.2 | 0.56 | 0.61 | .058 | .013 | 0.237 | 0.282 | 0.244 | .022 | 0.270 | 0.492 |
| 0.6 | 1.91 | 2.06 | .199 | .045 | 0.801 | 0.955 | 0.831 | .073 | 0.911 | 1.669 |
| 1.0 | 3.66 | 3.92 | .382 | .085 | 1.525 | 1.822 | 1.592 | .137 | 1.733 | 3.188 |
| | | | *CIT Reduction of 75 Percent* | | | | | | | |
| 0.2 | 0.82 | 0.89 | .086 | .020 | 0.346 | 0.412 | 0.357 | .032 | 0.393 | 0.718 |
| 0.6 | 2.62 | 2.83 | .274 | .062 | 1.101 | 1.313 | 1.140 | .099 | 1.251 | 2.292 |
| 1.0 | 4.63 | 5.00 | .483 | .107 | 1.945 | 2.321 | 2.014 | .171 | 2.210 | 4.053 |
| | | | *CIT Reduction of 100 Percent* | | | | | | | |
| 0.2 | 1.07 | 1.16 | .112 | .026 | 0.451 | 0.537 | 0.465 | .041 | 0.513 | 0.937 |
| 0.6 | 3.21 | 3.48 | .335 | .075 | 1.354 | 1.614 | 1.396 | .121 | 1.538 | 2.813 |
| 1.0 | 5.35 | 5.81 | .559 | .122 | 2.260 | 2.697 | 2.327 | .196 | 2.568 | 4.699 |

Notes to Table 6-1

$V_x$ = exports of goods and services exclusive of investment income = \$43.5 billion in 1969; $V_m$ = imports of goods and services exclusive of investment income = \$44.2 billion in the same year.

$$\Delta V_x = V_x \frac{\Delta P_X}{P_x}(1 + \epsilon_x),$$

*where* $\Delta P_x$ = change in export price, and $\epsilon_x$ = relative price elasticity of exports.

$$\Delta V_m = -V_m \frac{\Delta P_d}{P_d} \epsilon_m,$$

where $\Delta P_d$ = change in import price, and $\epsilon_m$ = relative price elasticity of imports.

$$\Delta V_{m'} = \gamma \left( V_x \frac{\Delta P_x}{P_x} \epsilon_x \right) \left( 1 - \frac{\Delta P_d}{P_d} \epsilon_m \right)$$

where $\Delta V_{m'}$ = induced imports due to exports and $\gamma$ = total import coefficient per unit of exports = .0447.

$$\Delta V = \Delta V_x - \Delta V_m - \Delta V_{m'}.$$

Changes in aggregated price indices $\Delta P_x$ and $\Delta P_d$ are obtained by weighting changes in pre-VAT producer price by 1969 exports and imports, respectively.

to a surplus of $1.6 billion, while under the Houthakker-Magee elasticity the deficit would decline to $0.1 billion. The export consequences are, of course, correspondingly less for lower degrees of CIT reduction and CIT shifting.

## 6.2 EFFECT OF THE VAT-CIT SUBSTITUTION ON IMPORTS

The effects of the VAT-CIT substituion on imports can be approached in a similar manner. The value of imports ($V_m$) is simply the product of their quantity ($m$) and import prices ($P_m$):

$$V_m = mP_m. \tag{6-6}$$

The quantity of imports demanded can be expressed as a function of the price of imports relative to the prices of import-competing domestic commodities ($P_d$). These prices can be viewed as VAT-exclusive since both domestic and imported commodities are subject to VAT (if at all), and the VAT ($Z$) does not itself affect price relatives, i.e., $P_m(1 + Z)/P_d(1 + Z) = P_m/P_d$. Thus, the import demand function can be written as

$$m = g\left(\frac{P_m}{P_d}\right). \tag{6-7}$$

Assuming again that domestic tax changes do not affect VAT-exclusive world market prices, i.e., that $P_m$ is a constant, then import demand can only be affected by changes in $P_d$. The price elasticity of demand for imports is simply defined as

$$\epsilon_m = \frac{dm}{d\left(\frac{P_m}{P_d}\right)}\left(\frac{P_m/P_d}{m}\right) \tag{6-8}$$

and since $d\,P_m = 0$ ($P_m$ is constant),[2]

2. Note that

$$d\left(\frac{P_m}{P_d}\right) = \frac{1}{P_d}\,d\,P_m - \frac{P_m}{P_d{}^2}\,d\,P_d$$

and with $d\,P_m = 0$,

$$d\left(\frac{P_m}{P_d}\right) = -\left(\frac{P_m}{P_d}\right)\left(\frac{d\,P_d}{P_d}\right)$$

$$\epsilon_m = -\left(\frac{dm}{dP_d}\right)\left(\frac{P_d}{m}\right). \tag{6-8a}$$

Then differentiating the value of imports with respect to $P_d$ (the domestic import-competing price), we obtain

$$\frac{dV_m}{dP_d} = P_m\left(\frac{dm}{dP_d}\right) = P_m\left(\frac{m}{P_d}\right)\left(\frac{dm}{dP_d}\right)\left(\frac{P_d}{m}\right) = -\frac{V_m}{P_d}\epsilon_m . \tag{6-9}$$

Finally, the relative change in the value of imports is:

$$\frac{dV_m}{V_m} = -\frac{dP_d}{P_d}\epsilon_m \tag{6-10}$$

i.e., the product of the relative change in the price of import-competing goods and the price elasticity of import demand.

An index of percentage changes in the prices of import-competing goods resulting from the VAT-CIT substitution was obtained by weighting final producer prices in each industry by the quantity of imports. As in the case of exports, two alternative stipulations concerning $\epsilon_m$ have been used, the Houthakker-Magee estimate of -0.88 and the commonly assumed value of -1. The reduction in the value of imports due to the tax-substitution-induced change in prices of import-competing commodities is presented in Table 6-1 for the range of alternative CIT reduction and shifting assumptions.

## 6.3 AGGREGATE EXPORT-IMPORT EFFECTS

For imports as for exports, the trade consequences of the tax substitution follow entirely from the shifting of the CIT. If the CIT is not shifted ($\alpha = 0$), then VAT-exclusive price of domestic import-competing commodities will be unchanged by the tax substitution. VAT-inclusive (consumption) prices of both imports and domestically produced commodities will rise by the VAT rate, implying unchanged relative (domestic-to-import) prices. However, if the CIT reduction is shifted forward in the form of lower prices, then domestic prices will decline relative to prices on imports, which do not benefit from the CIT reduction. The relative reduction in imports is the product of the relative reduction in import-competing prices and the relative price elasticity of imports. Thus, the import contraction under the lower (Houthakker-Magee) elasticity of -0.88 is always 88 percent of the import contraction implied by the unitary

elasticity assumption. With complete CIT repeal and full CIT shifting the import decline is projected to be $2.3 billion under the Houthakker-Magee elasticity and $2.6 billion under the unitary elasticity assumption. These import contractions, 5.1 percent and 5.8 percent of actual 1969 imports, respectively, would alone have been sufficient to move the United States trade position from a deficit of $0.7 billion to a surplus of either $1.6 billion or $1.9 billion. As always, smaller effects are observed in the case of lower degrees of CIT reduction and shifting.

One final trade effect of the tax substitution must be incorporated before the short-run consequences to the net balance of trade can be projected. This relates to the import effect of the export expansion. From the definition of the relative price elasticity of export demand, equation (6-3), the change in the *quantity* of exports resulting from the export price reduction is

$$dx = \epsilon_x \left(\frac{d P_x}{P_x}\right) x \ . \tag{6-11}$$

At prices prevailing prior to the tax substitution the quantity of imports absorbed in each unit of exports is given by the *total* import coefficient per unit of exports, $\gamma$, and the increase in imports due to export expansion is simply $\gamma dx$. However, if it is assumed that the response of export producers to the tax-substitution-induced change in the prices of import-competing goods is consistent with the aggregate relative price elasticity of imports, $\epsilon_m$, then a fraction $\frac{dP_d}{P_d}\epsilon_m$ of this initially induced increase in imports will be displaced by domestic production. Thus, the net increase in imports in response to the induced increase in exports, denoted $dV_{m'}$, is

$$dV_{m'} = \gamma \left[ x \left(\frac{dP_x}{P_x}\right) \epsilon_x \right] \left[ 1 - \left(\frac{d P_d}{P_d}\right) \epsilon_m \right] . \tag{6-12}$$

We evaluated this expression for both pairs of elasticity assumptions and for the alternative stipulations concerning CIT reduction and shifting, employing our observed (pre-tax-substitution) value of the total import coefficient of exports, $\gamma = 0.0447$.[3]

3. Note that $x$, the quantity of exports prior to the tax substitution, measured at pre-tax substitution prices, is simply $V_x$, i.e., $x = V_x$.

Under the lower (Houthakker-Magee) export and import elasticity assumptions, the export-induced increase in the value of imports is approximately 22 percent of the increase in the *value* of exports, while under the higher elasticities less than 9 percent of the export expansion is offset by induced imports.

The net change in the balance of trade is then simply the algebraic sum of these three components: the export expansion, the import contraction, and the export-induced increase in imports, i.e.,

$$dV = dV_x - dV_m - dV_{m'}. \tag{6-13}$$

Changes in the balance of trade implied by the tax substitution are also indicated in Table 6-1. Under the most favorable assumptions of CIT repeal and full forward CIT shifting the balance of trade is improved by $2.7 billion assuming the lower (Houthakker-Magee) elasticities and by $4.7 billion assuming the higher elasticities. In all cases, the improvement is 74 percent greater using the higher elasticities.

In all cases the contribution of import contraction ($-dV_m$) is greater than that of export expansion (either $dV_x$ or $dV_x - dV_{m'}$). With the higher elasticities, for which the export elasticity, disregarding signs, is 1 plus the import elasticity, the gross increase in export value ($dV_x$) would just equal the reduction in imports ($-dV_m$) if the relative reduction in export prices were equal to the relative reduction in the prices of domestic import-competing goods. However, the relative decline in the latter is approximately 8 percent greater than the relative reduction in export prices in all cases, i.e. $(dP_m/P_m) \cong 1.08\ (dP_x/P_x)$, due primarily to the importance of agricultural exports, and this price difference generates a reduction in imports slightly greater than the gross increase in the value of exports. Because of the export-induced increase in imports (even adjusted for the reduction in import-competing prices), the decline in imports would be greater than the net increase in exports ($dV_x - dV_{m'}$) even if $|\epsilon_x| = 1 + |\epsilon_m|$.

The Houthakker-Magee elasticities, -1.24 for exports and -0.88 for imports, shift even more of the burden of the balance-of-trade improvement to imports. Even if prices of both exports and import-competing domestic goods changed proportionately, the import contraction would be 3.67 times greater than the gross expansion in the value of exports $-dV_m/dV_x = \epsilon_m/(1 + \epsilon_x) = 0.88/0.24$. Because import-competing prices decline relatively more than export prices, the import contraction is more than 3.7 times greater than the gross export expansion.

At this point a serious qualification is in order: There exists a fundamental contradiction between the aggregate export and import elasticities, on the one hand, and the export and import-competing price changes, on the other. Specifically, implicit in the estimation of the aggregate elasticities is the assumption that the *structure* of individual export (or import-competing) prices is unchanged, that is, all export (import-competing) prices must be assumed to change proportionately; only the level of these prices varies relative to world market prices. But the essential characteristic of the VAT-CIT substitution, under the assumption of forward shifting of the CIT, is that the structure of relative prices is altered. In particular, as discussed in Chapter 3, relative prices decline in those industries which are highly incorporated and capital intensive. Thus, the foregoing application of the aggregate elasticities is in contradiction to the assumptions underlying their estimation and interpretation. In the present context, in which relative prices are changing in response to the reduction and shifting of the CIT, trade effects can be legitimately projected only on a disaggregated basis. Because no reliable estimates of export and import elasticities by industry have been available, a somewhat compromising recourse has been to use estimates of aggregate elasticities. Since it is unlikely that the elasticities are identical for all industries, that procedure can at best be viewed as only an approximation.

In addition to its questionable legitimacy, the use of aggregate export and import elasticities obscures one of the most interesting dimensions of the trade consequences of the VAT-CIT substitution: the differential interindustry effects of the export and import-competing expansion. On the export side these balance-of-trade effects can be partially traced back to individual domestic industries by examining each industry's relative direct and indirect contribution of value added to total export sales. To precisely attribute the export expansion effects to individual industries it would, of course, be necessary to apply commodity-specific export price elasticities, information on which is generally nonexistent. However, export shares, in conjunction with relative price changes, are at least indicative of these differential interindustry effects.

## 6.4 INTERINDUSTY BALANCE-OF-TRADE EFFECTS

Table 6-2 indicates the distribution of export value added over producer industries. Those industries which make the greatest contributions to the value of exports and experience the greatest price re-

**Table 6-2. Export Composition and Exports and Imports Relative to Industry Value Added, Two-Digit Aggregated Industries, 1969**

| | | Industry Share of Total Exports | Ratio to Value Added of Exports | Ratio to Value Added of Imports | Producer Price Reduction[a] |
|---|---|---|---|---|---|
| 1 | AGRICULTURE | 7.68% | .1168 | .0681 | 2.20% |
| 2 | METAL MINING | 0.55 | .2354 | .7975 | 3.75 |
| 3 | COAL,STN,CLAY MNG&PROD | 2.40 | .0931 | .0615 | 5.96 |
| 4 | OIL & GAS | 1.23 | .0548 | .2673 | 4.51 |
| 5 | CONSTRUCTION | 1.62 | .0131 | .0000 | 4.31 |
| 6 | ORDNANCE | 1.15 | .1603 | .1175 | 5.14 |
| 7 | FOOD | 1.47 | .0318 | .1415 | 4.14 |
| 8 | TOBACCO | 0.09 | .0251 | .0063 | 9.24 |
| 9 | TEXTILES & APPAREL | 0.95 | .0271 | .1596 | 5.80 |
| 10 | LUMBER,WOOD PRODUCTS | 1.17 | .0858 | .1968 | 5.05 |
| 11 | FURNITURE & FIXTURES | 0.08 | .0100 | .0522 | 5.74 |
| 12 | PAPER & PRODUCTS | 2.12 | .0981 | .1599 | 7.16 |
| 13 | PRINTING & PUBLISHING | 1.61 | .0605 | .0104 | 7.61 |
| 14 | CHEM.,PLAST.,DRUGS,PNT | 8.58 | .1876 | .0532 | 10.54 |
| 15 | RUBBER & LEATHER | 1.28 | .0817 | .0768 | 6.42 |
| 16 | FOOTWEAR | 0.03 | .0082 | .2483 | 4.86 |
| 17 | PRIMARY METAL | 5.67 | .1289 | .1412 | 4.84 |
| 18 | FABRICATED METAL | 5.28 | .0900 | .0234 | 6.45 |
| 19 | NONELECT. MACHINERY | 9.33 | .1510 | .0686 | 6.23 |
| 20 | ELECTRICAL EQUIPMENT | 5.67 | .1056 | .0821 | 6.87 |
| 21 | TRANSP. EQUIPMENT | 6.47 | .1047 | .1972 | 6.10 |
| 22 | INSTRUMENTS | 1.42 | .1114 | .0822 | 8.74 |
| 23 | MISC. MANUFACTURING | 0.48 | .0557 | .2357 | 5.27 |
| 24 | TRANSP. & WAREHOUSING | 9.50 | .1342 | .0775 | 3.30 |
| 25 | COMMUNICATIONS | 1.18 | .0302 | .0000 | 11.86 |
| 26 | UTILITIES | 1.24 | .0336 | .0029 | 9.56 |
| 27 | FINANCE & INSURANCE | 1.41 | .0228 | .0140 | 16.30 |
| 28 | REAL ESTATE & RENTAL | 4.41 | .0288 | b | 2.19 |
| 29 | HOTELS & SERVICES | 6.66 | .0804 | b | 4.34 |
| 30 | AUTO REPAIR & SERVICES | 0.62 | .0286 | b | 3.72 |
| 31 | AMUSEMENTS | 0.17 | .0155 | b | 2.82 |
| 32 | MED.,ED.SERV.&NONPROF. | 0.15 | .0019 | b | 2.23 |
| 33 | WHOLESALE & RETAIL | 8.27 | .0341 | b | 1.08 |

Source: Milton L. Godfrey, Cybermatics, Inc. (See Appendix A, below.)

[a]Assuming complete CIT repeal ($S$ = 200 percent) and full forward shifting ($\alpha$ = 1).

[b]No Imports.

ductions due to shifting of the CIT can be anticipated to be most affected by the tax-substitution-induced stimulation of exports. Conversely, those with minimal direct and indirect contributions of value added to exports and exhibiting the most marginal reductions in prices would be only marginally affected by the export expansion per se, although they might be significantly affected by indirect factor and commodity price reactions to the increase in exports.

The industries which make the greatest contributions to exports are transportation and warehousing (9.5 percent of export value), wholesale trade (8.3 percent), agriculture (7.7 percent), chemicals (8.6 percent), nonelectrical machinery (9.3 percent), transportation equipment (6.5 percent), primary metals (5.7 percent), fabricated metals (5.3 percent), hotels and services (6.7 percent) and electrical equipment (5.7 percent). Together these ten industries account for about 73 percent of the value added embodied in exports.

However, five of these industries exhibit price reductions, assuming CIT repeal and full shifting, significantly smaller than average: wholesale trade (a 1.1 percent price reduction), agriculture (2.2 percent), transportation and warehousing (3.3 percent), hotels and services (4.3 percent) and primary metals (4.8 percent). Of these, wholesale trade, transportation and warehousing, and hotels and services would probably benefit significantly from the export expansion in any event, simply because of the nature of these industries, e.g., the role of trade and transportation in other export sales. Agriculture, on the other hand, would probably experience only a marginal export expansion, while the implications for primary metals would depend critically on the industry's own export elasticity and indirect embodiment in the exports of other industries, in particular fabricated metals, transportation equipment, and electrical and nonelectrical machinery.

The other five industries exhibit major price reductions (still assuming CIT repeal and full shifting): chemicals (10.5 percent), electrical equipment (6.9 percent), fabricated metals (6.5 percent), nonelectrical machinery (6.2 percent), and transportation equipment (6.1 percent). These industries would be expected to experience the most marked stimulus as a result of the export expansion.

At the other end of the spectrum are the industries whose contributions to export sales are negligible: furniture (0.1 percent); footwear (0.03 percent), tobacco (0.1 percent), and miscellaneous manufacturing (0.5 percent) industries. However, they might yet experience some stimulus from the export expansion as a result of price reductions, several of which are significant: tobacco (a 9.2 percent price reduction), furniture (5.7 percent), miscellaneous manufacturing (5.3 percent), and footwear (4.9 percent).

By ranking industries in the order of price reduction and then comparing their export shares, an alternative view is obtained of industries which might be expected to contribute significantly to the export expansion. Consider those industries experiencing the greatest price reductions: finance and insurance (a price reduction of 16.3 percent versus an export share of 1.4 percent), communications

(11.9 percent versus 1.2 percent), chemicals (10.5 percent versus 8.6 percent), utilities (9.6 percent versus 1.2 percent), tobacco (9.2 percent versus 0.1 percent), and instruments (8.7 percent versus 1.4 percent). Even those with relatively small export shares might yet gain significantly in export sales because of the decline in their selling prices.

Conversely, of industries exhibiting the smallest price reductions, even those with large shares of total export sales might be only marginally affected. Minimal price reductions are observed for wholesale and retail trade (1.1 percent price reduction versus 8.3 percent export share), real estate and rental (2.2 versus 4.4 percent), agriculture (2.2 versus 7.7 percent), medical and other services (2.2 versus 0.2 percent), amusements (2.8 versus 0.2 percent), auto repair and services (3.7 versus 0.6 percent), and metal mining (3.8 and 0.6 percent). Of these, only wholesale trade and real estate and rental could be expected to contribute significantly (indirectly) to the export expansion.

The foregoing discussion has concerned the probable contributions of different industries to the aggregate export expansion. A very different issue concerns those industries which *themselves* would be most markedly affected by increases in exports. As an indication of this potential intraindustry effect of the export expansion, estimates of value added embodied in exports as a ratio to total value added in the industry are also shown in Table 6-2.

## 6.5 VALUE ADDED AND EXPORT SUBSTITUTION

Not surprisingly, certain industries which account for a very small proportion of total exports nonetheless contribute a substantial proportion of their own value added to export sales. Most noteworthy is the case of metal mining: This industry accounts for only 0.6 percent of total exports, but 24 percent of the industry's value added is ultimately exported. The ordnance industry, accounting for 1.2 percent of exports but with exports absorbing 16 percent of total ordnance value added, provides another extreme example. With a below-average price reduction (3.8 percent), metal mining might not be markedly affected by a tax substitution, although one would also expect the relative export price elasticity to be quite high for this industry. Conversely, ordnance exhibits a more substantial price reduction, 5.1 percent, but is export price elasticity is probably much lower.

The two industries which would probably be most substantially affected internally by any export expansion are chemicals and non-

electrical machinery. Not only do these industries account for large shares of aggregate exports (8.6 and 9.3 percent, respectively) and experience relatively large price reductions if the CIT is repealed and shifted (10.5 and 6.2 percent, respectively), but exports also account for a substantial share of their own values added (18.8 percent for chemicals and 15.1 percent for nonelectrical machinery).

At the other extreme industries such as tobacco and textiles not only contribute only small shares of aggregate exports (0.1 and 1.0 percent, respectively), but exports also account for only marginal proportions of their own values added (2.5 percent for tobacco and 2.7 percent for textiles). Thus, even though they would experience significant price reductions if the CIT were repealed and fully shifted (9.2 percent for tobacco and 5.8 percent for textiles), it is still unlikely that these industries would participate in any aggregate export expansion resulting from the tax substitution.

Finally, an industry such as wholesale and retail trade accounts for a substantial 8.3 percent of aggregate export value added, but exports for this industry account for only 3.4 percent of its total value added. Thus, the industries in which the greatest absolute export expansion can be expected to occur are not necessarily the industries in which these export expansions will be large relative to the industry's own total output (value added).

## 6.6 VAT-CIT SUBSTITUTION AND IMPORT-COMPETING OUTPUT: INTERINDUSTRY EFFECTS

The probable interindustry effects of any substitution of domestic import-competing output for imports can be similarly traced back, at least in a general way, using estimates by industry of imports relative to domestic value added (exclusive of imports). As with the export expansion, those industries for which imports constitute a large fraction of total output *and* in which tax-substitution-induced price reductions are greatest would appear likely to experience the greatest import-substitution-induced increases in activity. Imports loom particularly large relative to domestic value added in six industries: metal mining (80 percent), oil and gas (27 percent), footwear (25 percent), miscellaneous manufacturing (24 percent), transportation equipment (20 percent), and lumber and wood products (20 percent). However, relative price reductions in the first three of these are significantly less than average, only 3.8 percent in metal mining, 4.5 percent in oil and gas, and 4.9 percent in footwear, suggesting that these industries might not experience marked import-substitution expansions. Although prices would decline marked-

ly in such industries as tobacco (9.2 percent), printing (7.6 percent), and fabricated metals (6.5 percent), imports of these products are so small (0.6, 1.0, and 2.3 percent, respectively) that any import substitution effect would be almost unnoticeable.

## 6.7 DEVALUATION AND VAT-CIT SUBSTITUTION

In the introductory pages of this chapter it was suggested that any net change in the balance of trade resulting from the VAT-CIT substitution could also be obtained by an appropriate overall adjustment in exchange rates. This point can now be easily demonstrated. The effect of a devaluation of the United States currency by $100\eta$ percent is to reduce the index of *foreign* prices of U.S. exports from its original value $P_x$ to $(1 - \eta)P_x$. Of course, the *domestic* price of exports does not change ($dP_x = 0$), at least initially. Thus, the devaluation is equivalent to an increase in world prices from $P_w$ to $P_w/(1 - \eta)$. Given the definition of the relative price elasticity of exports, equation (6-3), the effect of a change in world prices equivalent to a devaluation of the domestic currency is:[4]

$$d\,V_x = - P_x x \epsilon_x \frac{dP_w}{P_w}, \tag{6-14}$$

4. Since $dP_x = 0$,

$$d(P_x/P_w) = \frac{1}{P_w} dP_x - \frac{P_x}{P_w^2} dP_w = - \frac{P_x}{P_w^2} dP_w,$$

so that

$$\epsilon_x = \frac{dx}{(-P_x/P_w)dP_x} \frac{(P_x/P_w)}{x} = - \frac{dx}{dP_w} \frac{P_w}{x}$$

or

$$dx = - \epsilon_x x \frac{dP_w}{P_w}.$$

The change in the domestic value of exports ($V_x = P_x x$) is then

$$\frac{dV_x}{dP_w} = P_x \frac{dx}{dP_w} = - P_x \left( \epsilon_x x \frac{dP_w}{P_w} \right) \frac{1}{dP_w}.$$

Equation (6-14) is obtained from this relationship.

which will be positive since $\epsilon_x$ is negative.

On the import side, the devaluation increases the domestic price of imports, $P_m$, by $1/(1 - \eta)$, but the prices of import-competing goods ($P_d$) remain unchanged. The change in the value of imports ($V_m = P_m m$) resulting from an increase in import prices is then:[5]

$$dV_m = m P_m (1 + \epsilon_m)\left(\frac{dP_m}{P_m}\right). \tag{6-15}$$

Because the devaluation increases domestic import prices by a known amount– from $P_m$ to $P_m/(1 - \eta)$—the effect on import value can be determined.

Finally, as in the case of the tax substitution, it is necessary to incorporate the interaction between increased exports and imports, i.e., the increase in imports induced by the export expansion resulting from the devaluation. The increase in imports, were import prices unchanged, would simply be the product of the total import coefficient of exports ($\gamma$) and the export expansion ($dx$), i.e.,

$$\gamma dx = -\gamma \epsilon_x x \frac{dP_w}{P_w}.$$

Then, from equation (6-15), the export-induced expansion in imports, after taking into account the import price increase, is

$$dV_m' = -\gamma \epsilon_x x \frac{dP_w}{P_w} P_m \left(1 + \frac{dP_m}{P_m} + \frac{dP_m}{P_m}\epsilon_m\right). \tag{6-16}$$

5. If $dP_d = 0$, then

$$d(P_m/P_d) = \frac{1}{P_d} dP_m - \frac{P_m}{P_d^2} dP_d = \frac{dP_m}{P_d}$$

and the relative price elasticity of imports, equation (6-8), can be expressed as:

$$\epsilon_m = \frac{dm}{d(P_m/P_d)} \frac{P_m/P_d}{m} = \frac{dm}{(dP_m/P_d)} \frac{P_m/P_d}{m}$$

$$= \frac{dm}{dP_m} \frac{P_m}{m},$$

or

$$dm = \epsilon_m m \frac{dP_m}{P_m}.$$

$dV_{m'}$ must be subtracted from the export expansion to obtain the increase in exports net of induced imports.

The net effect of the devaluation on the balance of trade is simply the sum of the import, and export, and export-induced import effects, i.e.,

$$dV = dV_x - dV_m - dV_{m'}.$$

Substituting from equations (6-14), (6-15), and (6-16), and noting that

$$P_x = P_m = 1, V_x = P_x x, V_m = P_m m,$$

and

$$\frac{dP_w}{P_w} = \frac{dP_m}{P_m} = \frac{1}{1-\eta} - 1 = \frac{\eta}{1-\eta},$$

the net change in the balance of trade, as a function of the degree of devaluation, is

$$dV = -V_x\epsilon_x\left(\frac{\eta}{1-\eta}\right) - V_m(1+\epsilon_m)\frac{\eta}{1-\eta} + \gamma\epsilon_x V_x\left[\left(\frac{\eta}{1-\eta}\right) + \left(\frac{\eta}{1-\eta}\right)^2(1+\epsilon_m)\right]. \quad (6\text{-}17)$$

In the present instance, however, we are concerned not with the change in the balance of trade which would result from any specific

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Thus

$$\frac{dV_m}{dP_m} = m + P_m\frac{dm}{dP_m},$$

or

$$dV_m = mdP_m + P_m dm$$
$$= mdP_m + \epsilon_m m dP_m$$
$$= P_m m\left(\frac{dP_m}{P_m}\right) + P_m m\,\epsilon_m\left(\frac{dP_m}{P_m}\right)$$

from which equation (6-15) is obtained.

degree of devaluation, but rather with the degree of devaluation necessary to generate a change in the balance of trade equivalent to the change which would result from the VAT-CIT substitution under specific assumptions concerning the degree of CIT reduction and shifting, i.e., equation (6-17) must be solved for $\eta$, given the change in the trade balance. Thus,

$$\eta = \frac{-[\gamma\epsilon_x V_x - V_m(1+\epsilon_m) - V_x\epsilon_x] \pm \sqrt{A}}{2(\gamma\epsilon_x V_x)(1+\epsilon_m) - [\gamma\epsilon_x V_x - V_m(1+\epsilon_m) - V_x\epsilon_x] \pm \sqrt{A}} \tag{6-18}$$

where

$$A = [\gamma\epsilon_x V_x - V_m(1+\epsilon_m) - V_x\epsilon_x]^2 + 4(\gamma\epsilon_x V_x)(1+\epsilon_m)(dV).$$

Under the most favorable stipulations of repeal and full forward shifting of the CIT, the balance of trade improves by $2.697 billion under the assumption of the Houthakker-Magee export and import price elasticities ($\epsilon_x = -1.24$, $\epsilon_m = -0.88$) and by $4.696 billion if the higher elasticities ($\epsilon_x = -2$, and $\epsilon_m = -1$) are assumed. Setting $dV$ equal to these alternative values and employing observed 1969 values of exports ($43.5 billion) and imports ($44.2 billion), equation (6-18) can be used to identify the degree of dollar devaluation equivalent to each type of tax substitution.

The results of this exercise are displayed in Table 6-3, which contrasts the balance-of-trade effects flowing from the tax substitution with the consequences of an equivalent devaluation. To achieve the $2.7 billion improvement resulting from the repeal of a fully shifted CIT, given the Houthakker-Magee elasticities, would require a devaluation of approximately 5.5 percent, implying a 5.8 percent reduction in export prices relative to world prices and an equal increase in import prices relative to domestic import-competing prices. Thus, the devaluation would produce changes in *real* export and import quantities very close in magnitude to the changes implied by the VAT-CIT substitution. However, the *apparent* (i.e., nominal) changes in exports and imports would be quite different. As a result of the tax substitution domestic export prices decline. Consequently, an increase in the real level of exports of almost $2.9 billion would generate an increase in the dollar *value* of exports of only $0.5 billion. With the devaluation, however, nominal export prices are unchanged, and the full increase in the real level of exports appears as an improvement in the export contribution to the

**Table 6-3. Hypothetical Balance of Trade: Devaluation Versus CIT Repeal with Full Shifting, 1969**

| | *Houthakker-Magee Elasticities* ($\epsilon_x = -1.24$; $\epsilon_m = -0.88$) | | *Higher Elasticities* ($\epsilon_x = -2.0$; $\epsilon_m = -1.0$) | |
|---|---|---|---|---|
| | *CIT Repeal* | *Devaluation* | *CIT Repeal* | *Devaluation* |
| | *Percentage Changes* | | | |
| Degree of devaluation ($\eta$) | | 5.5% | | 5.4% |
| Change in relative export prices [$d(P_x/P_w)$] | -5.4% | -5.8[a] | -5.4% | -5.7[a] |
| Change in relative import prices [$d(P_m/P_d)$] | 5.8 | 5.8[a] | 5.8 | 5.7[a] |
| | *Amounts in Billions at Pre-Policy-Change Prices* | | | |
| Increase in export quantity ($dx$) | $2.888 | $3.150 | $4.654 | $4.916 |
| Reduction in import quantity ($-dm$) | 2.260 | 2.272 | 2.568 | 2.497 |
| Export-induced increase in import quantity ($dm'$) | 0.122 | 0.134 | 0.196 | 0.208 |
| | *Amounts in Billions at Post-Policy-Change Prices* | | | |
| Increase in export value ($dV_x$) | $0.559 | $3.150 | $2.327 | $4.916 |
| Reduction in import value ($-dV_m$) | 2.260 | -0.310[b] | 2.568 | 0 |
| Export-induced increase in import value ($dV_{m'}$) | 0.122 | 0.142 | 0.196 | 0.220 |
| Net change in balance of trade ($dV$) | 2.697 | 2.698 | 4.699 | 4.696 |

[a] $|d(P_x/P_w)| = |d(P_m/P_d)| = \eta/(1 - \eta)$.

[b] Import value increases by $0.310 billion.

balance of trade. Imports, however, exhibit identical changes in quantity and dollar values under the tax substitution, since the domestic price of imports is unchanged. But, with devaluation the reduction in the *quantity* of imports is insufficient to offset the effect of increases in domestic import prices, and the dollar value of imports actually *increases*. Thus, the real consequences of the de-

valuation and the tax substitution (assuming full CIT shifting) on the balance of trade are virtually identical, although as these changes would be revealed in the trade accounts the tax substitution appears to be most effective in reducing imports and the devaluation, in increasing exports.

The $4.7 billion improvement in the balance of trade induced by the tax substitution under the assumption of the higher export and import price elasticities would require a devaluation of approximately 5.4 percent. Again, in terms of real export and import flows the effect of the devaluation and the tax substitution would be virtually equivalent, with export expansions between $4.5 and $5 billion and import contractions of about $2.5 billion. But as before, the devaluation would *appear* to be most effective in inducing export expansion.

There are two additional, and crucial, differences between the anticipated consequences of the tax substitution and a corresponding devaluation. First, the devaluation-induced change in the balance of trade is *a function primarily of the export and import elasticities*, while the trade effects of the tax substitution are a function *both of export and import elasticities and of CIT shifting parameters.* The former are certainly open to error, but it can be safely suggested that the latter are unknown. It might, of course, be discovered that the effects of a devaluation can also be "shifted," in the sense that domestic export, import, and import-competing prices can be altered in response to an effective change in exchange rates. However, it may also be expected that the greater competitiveness of international markets would quickly undermine such individual attempts to counteract the effects of exchange rate adjustments. Thus, much greater confidence can probably be attached to the anticipated consequences of the devaluation than to the consequences of the tax substitution. If, consistent with classical price theory, the CIT is not shifted (in the short-run sense employed here), then *no* trade consequences would be observed. If the CIT is fully shifted, the change in the balance of trade would be approximately equivalent to that induced by a 5 percent devaluation, and the actual effect could fall anywhere between these extremes.

Secondly, the foregoing analysis of the potential consequences of a VAT-CIT substitution and of a United States devaluation for international trade has been restricted to a discussion of effects on the *balance of trade.* The tax-substitution-equivalent degree of devaluation has been defined quite narrowly in terms of identical net changes in the trade balance. Thus, while the VAT-CIT substitution and its corresponding devaluation might, under rather restric-

tive assumptions, be identical in terms of the balance of trade, they might be quite different in their consequences for long- or short-term capital flows or both and hence for the *balance of payments.*

Unfortunately, a serious assessment of the possible balance-of-payments effects of these alternative policies is beyond the confines of the present study. However, it can be suggested that although repeal of an unshifted CIT would have no effects on the *trade* accounts, it would increase after-tax corporate profits and rates of return, which could stimulate significant capital inflows and reduce capital outflows. The consequences for these capital flows in the short run would depend critically on the response of monetary authorities, but longer-term capital adjustments could be expected to be favorable regardless of compensatory monetary policies.

However, it must be pointed out that differential responses of international capital flows to the VAT-CIT substitution versus a devaluation would be qualitatively different from differential consequences for the balance of trade. The latter consequences stem from a fundamental change in the terms of trade and would persist beyond the initial period of reequilibration. That is, the improvement in the balance of trade would represent, ceteris paribus, a relatively permanent response to the tax substitution or change in the rate of exchange. Differential capital flow adjustments, however, would be expected to persist only through the phase of reequilibration, and would in fact represent the operating method of capital account reequilibration. Thus, the trade consequences of the devaluation, which are more certain than consequences of the tax substitution, could be expected to be more lasting than any capital account consequences of the tax substitution.

## 6.8 CONCLUSIONS

The foregoing analyses clearly demonstrate that if the VAT itself is shifted its effect on international trade is neutral. Any short-term consequences for the balance of trade flow from the substitution of a neutral destination-based tax (e.g., the VAT) for a nonneutral, i.e., shifted, origin-based tax (e.g., the CIT). If the replaced tax is not shifted (exported) then no trade effects result.

Furthermore, even if the tax to be replaced had been shifted and thus its effect in the short term had been significantly to depress exports and stimulate imports, in the longer term, there would be appropriate modifications in exchange rates to compensate for these effects. In the case of the CIT such compensatory adjustments in exchange rates are particularly likely to have occurred. The trade

imbalance engendered by the introduction of the CIT would almost necessarily have been corrected in the course of the restructuring of exchange rates which has taken place at various times over the last thirty to forty years. Given the relatively small balance-of-trade consequences which can be anticipated to accompany full CIT repeal, the very second-order effects of the changes in CIT rates which have occurred from time to time certainly must have been minor compared to other trade-disequilibrating processes which have occurred simultaneously, e.g., differential rates of inflation.

In the extreme, freely floating exchange rates would automatically correct any trade imbalances which might result from any country's tax policies. Given sufficient time to adjust "fixed" exchange rates, and certainly the period since the introduction of the CIT should have been "sufficient" in this context, the required adjustments will have in fact been made. Thus, the arguments in favor of the VAT which emphasize the depressive trade effects of the CIT seem to be somewhat misplaced in time; they should have been made when the CIT was first introduced (although they would have been no more compelling then than now). Therefore, it seems difficult to ascribe trade deficits in the early 1970s to a CIT which has been in existence for almost a half century, over which period the balance of trade has usually been in surplus.

This returns us to the other major international-trade argument for the VAT-CIT substitution: that the adoption by other countries of the VAT has been discriminatory vis-a-vis United States export and import-competing industries. But the relevant considerations are again the same: if the substitution of a VAT for another tax has no own-country balance-of-trade effects then it will have no effects for other countries' trade balances.

Specifically, the European value-added taxes introduced over the last decade would, in and of themselves, have adversely affected the U.S. trade position *only if* they replaced other taxes which were both *origin based* and *forward shifted.* In fact, in virtually every case, the European VATs replaced some form of indirect tax which was creditable on exports and was applied as a border tax to imports, i.e., a destination-based tax. These were generally very cumbersome, distortive, and inefficient taxes on wholesaler or manufacturer turnover, with very crudely estimated rebates on exports and inexactly compensatory import taxes. Their replacement by a relatively neutral and internally consistent VAT might have resulted in changes in interindustry trade *patterns*, due to vagaries in the application and administration of the displaced taxes, but these tax substitutions would not be expected to have resulted in major

changes in trade *balances*, except to the degree that the more precise rates of export rebates and import-compensatory taxes under the VAT differed systematically from the effective rates imposed under the old taxes, especially the cascade turnover type of sales tax.

Thus, while a VAT-CIT substitution does have potential trade consequences, depending on the shifting of the CIT, these consequences should not enter as arguments for or against such a tax change. Overall trade effects appear as consequences to be compensated for in comparative assessments of alternative taxes (particularly if a preexisting trade balance is assumed).[6] Implications for the composition of the trade balance, export stimulation versus import contraction, are simply a subset of the more general allocative effects of this tax substitution. Stimulation of the corporate sector relative to the noncorporate sector has the same allocative importance in the context of export and import-competing industries as it has in the case of industries producing only for domestic purchasers. That is, as discussed in the next chapter, these are *allocative*, *not trade*, arguments for a VAT as a replacement for the CIT.

6. Of course, U.S. advocates of a VAT-CIT substitution have cited the contemporary persistence of U.S. balance-of-payments deficits and more recently balance-of-trade deficits as an argument for this tax substitution. However, as indicated by John Bossons, in terms of the differential consequences of alternative taxes, trade effects appear as macroeconomic control problems from which differential incidence analysis should abstract.