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The Respending Effects of Untying Aid

David S. C. Chu and Robert Shishko

A Report prepared for

AGENCY FOR INTERNATIONAL DEVELOPMENT

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PREFACE

This report is one in a series carried out by The Rand Corporation under the sponsorship of the Agency for International Development. It addresses a particular aspect of the balance-of-payments effects of untying development loans: namely, the long-run changes in world trade which would result.

In the short run, the untying of development loans causes a loss of exports for the United States, balanced by export gains for certain other nations. As their incomes rise in response to these export gains, so will their imports from the United States, to the corresponding benefit of the United States balance of payments. Moreover, as United States income declines with the loss of exports, so will United States imports, to the further benefit of the United States balance of payments. This report estimates these respending effects and measures how much they might offset the initial loss from untying, under a variety of alternative policies.

This is basically a technical report, prepared in support of the principal study in this series (Robert L. Slighton et al., The Effect of Untied Development Loans on the U.S. Balance of Payments, R-973-AID, April 1972). A report on the special problem of additionality, likewise technical in nature, is also available (Richard V. L. Cooper, The Additionality Factor in U.S. Development Assistance, R-974-AID, April 1972).

SUMMARY

The balance-of-payments effect of untying development loans can be divided into two parts: the initial change in exports, and the subsequent change in exports which is thereby induced. The latter we call the respending effect, and its estimation is the subject of this report.

Previous estimates of the respending effect have used either models of reserve accumulation or models embodying the "reflection ratio" concept. The reserve accumulation models assume that each nation siphons off a fixed proportion of increases in exports as reserves and that the remainder is spent on imports. The reflection ratio models postulate a fixed and direct relationship between changes in exports and changes in imports (the reflection ratio), based on the historical relationship between these series. Both approaches suffer from serious weaknesses; most important, neither links changes in exports to changes in income and thus to changes in imports. We employ a model which does make this link, a multiregional model of world income and trade which is known as the multisector multiplier model.

In the multisector multiplier model, final changes in income in any region are decomposed into three parts: autonomous changes in income, self-induced changes in income (the familiar domestic multiplier process), and changes in income which result from changes in exports to other regions (the foreign trade multiplier). Both expenditures on domestic goods and expenditures on imports are assumed to be linear functions of income, and the supply of all goods in all regions is assumed to be perfectly elastic (in order to abstract from the problems of relative price changes). Given a set of autonomous changes in income (the first-round export changes associated with untying development assistance), the system can be solved for the equilibrium value of final income change in each region. With these equilibrium income values in hand, the change in the imports and exports of each region can be computed.

To apply the multisector multiplier model to the respending question, two sets of parameters are required: the marginal propensity to spend on domestic goods (for which we use the marginal propensity to consume), and the marginal propensity to spend on imported goods, discriminated by region of origin of the imports. These parameters are estimated from time series data for a world of 15 regions.

When the multisector multiplier model is applied to the respending problem, it yields estimates of the United States respending gain which are at the low end of the range established by reserve accumulation and reflection ratio models. If no government undertakes compensatory fiscal-monetary policy, and if imports of the less-developed regions are not foreign-exchange constrained, the multisector multiplier model suggests that the United States balance-of-payments respending gain will be 14 to 17 percent of the initial (United States) export loss, depending on the circumstances of untying, and the degree of United States competitiveness which is assumed.

Relaxing the assumption on compensatory fiscal-monetary policy reduces the size of the United States respending gain in most cases. If first-round losers (including the United States) undertake compensatory fiscal-monetary policy, then the United States respending gain will probably be 8 to 10 percent of the first-round loss. The difference, of course, is attributable to the link between imports and income: without compensation, imports decline as income falls, and the balance of payments correspondingly improves; with compensation, income is held steady, and there will be no improvement in the balance of payments from this source.

Relaxing the assumption on the import behavior of the less developed regions increases the U.S. respending gain in all cases. If imports of the less developed regions are foreign-exchange constrained, then the U.S. respending gain would be 17 to 19 percent of the first-round loss. The difference is that the less developed regions now respend <u>all</u> their export gains.

If first-round losers undertake compensatory fiscal-monetary policy <u>and</u> imports of the less developed regions are foreign-exchange constrained, then the likely range of United States respending gains is 8 to 14 percent of the first-round loss.

These ranges for the respending effect are particularly sensitive to assumptions about how much aid is untied. If untying takes place on a multilateral basis and all development loans (not just explicitly tied development loans) are untied, then the U.S. respending gain would be somewhat higher. In the most optimistic case, it could be one-third of the first-round U.S. loss.

ACKNOWLEDGMENTS

The authors owe a special debt to Robert L. Slighton of The Rand Corporation, who suggested how the respending problem might be approached, and who offered valuable advice and guidance as this study progressed. In truth, he has really been a co-author; only his modesty as a project leader precluded listing his name on the title page.

A number of others have generously offered assistance during the course of this study. Richard V. L. Cooper, also of the Rand staff, furnished the basic trade data series on which the respending estimates depend. John Despres, John E. Koehler, Albert P. Williams, Jr. (all of The Rand Corporation), and Constantine Michalopoulos (Agency for International Development) offered helpful comments on an earlier draft. George Henry (Board of Governors of the Federal Reserve System) and Edwin M. Truman (Yale University) provided guidance on relevant, recent research. In addition, Professor Truman kindly shared his preliminary estimates of the income elasticity of imports in Western Europe. The authors are grateful for this assistance; nonetheless, they bear the responsibility for any remaining errors, and for the conclusions of this study, which do not necessarily represent the opinions of The Rand Corporation, nor of the Agency for International Development.

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I. INTRODUCTION

One of the considerations in untying aid is what the balance-of-payments effects will be for the countries involved. Those effects can be divided into two parts: (1) the initial change in trade flows--for example, Brazil's decision to spend in Germany the aid money that previously had to be spent in the United States; and (2) the respending effects--to use the same example, increased U.S. exports to Germany resulting from the autonomous change in Germany's exports to Brazil. Clearly, respending effects can partially reverse the initial balance-of-payments effects of untying. For the United States in particular, respending effects may be quite strong. According to one recent set of estimates, a unit increase in the exports of the United States' Western European trading partners improves the U.S. balance of payments by .37 to .98 units.[1]

In view of the potential importance of respending effects, this study was undertaken to estimate what their magnitude would be were U.S. development loan assistance untied.[2] Since the present report is basically technical in nature, those who are not concerned with technical details may prefer to concentrate their attention on Section II, which describes previous approaches to estimating respending effects; Section III, which outlines the model we have used; and Section V, which provides a summary of results. For the technically inclined, Section IV describes the data and procedures used to estimate the model, while Section VI analyzes the time profile of adjustment. To assist in keeping track of the notation, a Glossary is provided (p. 49).

---

[1] Piekarz and Stekler, 1967, Table 6.

[2] It should be emphasized that the methodology developed here is applicable to the untying of aid in general. This report, however, concentrates on providing estimates for the particular case of untying development loan assistance.

II. EARLIER APPROACHES TO THE RESPENDING QUESTION

Previous estimates of the respending effect have been based on models of reserve accumulation or models embodying the "reflection ratio" concept.[1] The reserve-accumulation models assume that governments want to hold foreign exchange in proportion to their nations' trade volume. Reserves[2] are desired not only as a transactions balance, but also as a buffer against the short-term variability of receipts and payments. Governments therefore add to reserves as exports increase; what they do not retain is respent on additional imports. Since one of the variables affecting the level of desired reserves is their opportunity cost, an extreme form of the model assumes that developed countries retain as reserves all the foreign exchange generated by an increase in exports, and the underdeveloped countries retain none.[3]

While there is substantial empirical support for the notion that foreign-exchange reserves vary proportionately with trade volume,[4] proportionality need not be maintained in the way the reserve-accumulation models suggest. Reserves can also be accumulated through capital

---

[1]For published examples of the reserve accumulation model, see Hicks, 1963; Rhomberg and Boissonneault, 1964; Salant et al., 1963, Chapter 6 and Appendix. For examples of the reflection ratio approach, see Beckerman, 1956; Piekarz and Stekler, 1967.

[2]We recognize that the term "reserve" is subject to rather arbitrary definition, a problem the literature on reserve accumulation models has not tried to tackle, nor do we attempt to do so here. In terms of empirical application, there are two difficulties: which official assets should be counted as reserves, and how the line between "official" and "private" assets should be drawn.

[3]The extreme form of the model can also be derived from another set of assumptions: (1) Imports of the underdeveloped countries are foreign-exchange constrained, thus these countries respend all additional foreign exchange received; and (2) the import behavior of the developed countries is governed by variables outside the model, which do not change with the shift in trade flows. This appears to be the set of assumptions adopted by Salant et al., 1963, Appendix to Chapter 6.

[4]For a recent review of the literature on demand for reserves, see Grubel, 1971. Ironically, the variable used by most studies to measure trade volume is imports or the marginal propensity to import, not exports.

account transactions, which indeed seems more likely for the developed countries, where interest rate manipulation and capital controls are more frequently used as reserve policy instruments than are controls over trade. If proportionality is maintained through capital account transactions, then the import projections of the reserve-accumulation models are of questionable validity. Without exchange control over trade transactions, it is difficult to see how the monetary authority siphons off a constant fraction of incremental exports. After all, demand for imports--and thus for foreign exchange--rests largely with the private sector, which makes its decisions without regard for the reserve preferences of the monetary authority. The weakness of the reserve-accumulation models, therefore, is that they rely on an implausible assumption about how the proceeds from an increment of exports is respent on imports.

In the reflection-ratio approach, the demand for imports is assumed to be a direct function of exports. A simple formulation would therefore be

$$M = a + rX \tag{1}$$

where M represents imports, X represents exports, and r is the reflection ratio.

Equation (1) is justified by referring to the effect of a change in exports on income, and thus on imports.[1] The problem with this type of equation lies on the properties of its estimated coefficients. Since exports are not the only autonomous element of income, Eq. (1) is misspecified. Not only will its use lead to inefficient estimates of the true parameters, but if cyclical fluctuations in the major trading nations are correlated (as is likely to be the case), estimated reflection ratios will be biased upward.[2]

---

[1] Beckerman, 1956, pp. 240-241; Piekarz and Stekler, 1967, p. 517.

[2] In fact, estimated reflection ratios tend to be rather high, sometimes exceeding unity. (See, for example, Piekarz and Stekler, 1967, Table 1.) As is clear from Eq. (7), the reflection ratio cannot be greater than one. This restriction on the reflection ratio likewise holds when the relative price of importables is introduced into the

To see this, let us use a simple Keynesian model of income determination, where the elements of national income, Y, are consumption, C; investment, I; government expenditures, G; and exports; and both consumption and imports are linear functions of Y. Thus the familiar national-income identity is

$$Y \equiv C + I + G + X - M \tag{2}$$

while

$$C = \alpha + \beta Y \tag{3}$$

$$M = \gamma + \delta Y \tag{4}$$

Substituting Eq. (3) into Eq. (2) yields:

$$Y = \alpha + \beta Y + I + G + X - M \tag{5}$$

or:

$$Y = \frac{1}{(1-\beta)} [\alpha + I + G + X - M] \tag{5a}$$

Using this expression in Eq. (4) gives us:

$$M = \gamma + \frac{\delta}{(1-\beta)} [\alpha + I + G + X - M] \tag{6}$$

Solving for M this yields:

$$M = \frac{\gamma(1-\beta)}{1-\beta+\delta} + \frac{\delta\alpha}{1-\beta+\delta} + \frac{\delta}{1-\beta+\delta} [I + G + X] \tag{6a}$$

which gives an expression for the reflection ratio, r:

$$r = \frac{\delta}{1-\beta+\delta} \tag{7}$$

---

model, as Piekarz and Stekler have done in estimating their reflection ratios. (For a proof, see Gehrels, 1957, p. 77.)

It is clear from Eq. (6a) that r is properly the coefficient of all autonomous changes in income; the problem with Eq. (1) is that the only source of autonomous changes in income (and thus in imports) is a change in exports. In the real world from which the observations are drawn to estimate Eq. (1), imports may be responding to autonomous changes in income arising from other sources--investment or fiscal stimulus.[1]

Since changes in I and G may dominate changes in X, estimates for r will be inefficient when X alone is included in the estimating equation. Moreover, the correlation in cyclical fluctuations among the advanced industrial nations will lead to collinearity in X, I, and G, and thus an upward bias in reflection ratios estimated from Eq. (1). This suggests that the appropriate model for estimating respending effects is one which links changes in imports directly to changes in income. It is just such a model that we have selected.

---

[1]In addition, of course, imports may be responding to changes in other variables, such as relative prices.

III. THE MULTISECTOR MULTIPLIER MODEL

The model used here is based on Chipman's formulation of the multisector multiplier.[1] For ease of exposition, let us assume that the world is composed of three countries. Countries 1 and 2 are developed countries; Country 3 is an underdeveloped country.

Final changes in income in any country can be decomposed into three parts: autonomous changes in income, self-induced changes in income (the familiar domestic multiplier process), and changes in income which result from changes in exports to other countries (the foreign-trade multiplier). Assuming that both imports and spending on domestic goods are linear functions of income, and that the supply of imports and the supply of domestic goods are both perfectly elastic,[2] the final change in income for Country 1, dY_1, can be written as

$$dY_1 = dA_1 + m_{11}dY_1 + m_{21}dY_2 + m_{31}dY_3 \tag{8a}$$

where dA_1 represents the autonomous change in income in Country 1; dY_2, dY_3 represent the final changes in income in Countries 2 and 3; m_{11} is the marginal propensity to spend on domestic goods; and m_{21}, m_{31} are the marginal propensities of Countries 2 and 3 to import from Country 1. Similar equations can be written for the other two countries:

$$dY_2 = dA_2 + m_{12}dY_1 + m_{22}dY_2 + m_{32}dY_3 \tag{8b}$$

---

[1] Chipman, 1950a, pp. 359-361.

[2] This assumption allows us to ignore relative price changes. It implicitly insures that all countries are at less than full employment, and that the marginal propensities to import are not a function of the level of economic activity.

It may be argued that leaving relative prices out of the model does some violence to reality. However, for the modest income and trade changes with which we are concerned, relative price changes are probably not important.

$$dY_3 = dA_3 + m_{13}dY_1 + m_{23}dY_2 + m_{33}dY_3 \tag{8c}$$

Equations (8a) through (8c) can be rewritten as

$$(1-m_{11})dY_1 - m_{21}dY_2 - m_{31}dY_3 = dA_1 \tag{8a'}$$

$$- m_{12}dY_1 + (1-m_{22})dY_2 - m_{32}dY_3 = dA_2 \tag{8b'}$$

$$- m_{13}dY_1 - m_{23}dY_2 + (1-m_{33})dY_3 = dA_3 \tag{8c'}$$

or, in matrix notation,

$$(I-m)dY = dA \tag{9}$$

where I is the identity matrix, and

$$m = \begin{bmatrix} m_{11} & m_{21} & m_{31} \\ m_{12} & m_{22} & m_{32} \\ m_{13} & m_{23} & m_{33} \end{bmatrix}$$

$$dY = \begin{bmatrix} dY_1 \\ dY_2 \\ dY_3 \end{bmatrix}.$$

$$dA = \begin{bmatrix} dA_1 \\ dA_2 \\ dA_3 \end{bmatrix}$$

Given a vector of autonomous income changes, dA, Eq. (9) can be solved for the vector of final income changes, dY:

$$dY = (I-m)^{-1}dA \tag{10}$$

In the context of the respending question, dA is the first-round change in exports resulting from untying. Given these first-round changes, and solving for dY, the subsequent change in exports of Country 1 can be computed as

$$S_{x1} = m_{21}dY_2 + m_{31}dY_3 \tag{11a}$$

Likewise, the subsequent change in imports of Country 1 is just

$$S_{m1} = (m_{12} + m_{13})dY_1 \tag{11b}$$

Similar expressions describe the subsequent change in imports and exports of Countries 2 and 3. The respending effect on the balance of payments of the ith country is therefore

$$S_{xi} - S_{mi} \tag{12}$$

What happens if governments seek to neutralize the income effects of untying by pursuing compensatory fiscal and monetary policies? Fortunately, it is a simple matter to incorporate such behavior in the model. In the case where the ith country compensates for the first-round change in exports, set $dA_i = 0$. Should that country wish to completely insulate itself from the income effects of untying, set $dY_i = 0$. Note that even if a country compensates perfectly ($dY_i = 0$), it will still experience the effects of untying in its balance of payments; although imports will remain constant, exports will fluctuate with the income of its trading partners. However, if every country compensates, there will be no respending effects on anyone's balance of payments, since compensation by every country eliminates the vector of autonomous export changes.

The model can also be modified to change the assumption that imports of the underdeveloped country respond to income, substituting the alternative assumption that its imports are foreign-exchange constrained. This is accomplished by setting the underdeveloped country's

marginal propensities to import out of income (m_{31}, m_{32}) equal to zero, and replacing Eq. (7c) with

$$dF_3 = dA_3 + m_{13}dY_1 + m_{23}dY_2 \tag{13}$$

where dF_3 is the final change in foreign exchange available to Country 3.

The system now becomes

$$dY_1 = dA_1 + m_{11}dY_1 + m_{21}dY_2 + f_{31}dF_3 \tag{14a}$$

$$dY_2 = dA_2 + m_{12}dY_1 + m_{22}dY_2 + f_{32}dF_3 \tag{14b}$$

$$dF_3 = dA_3 + m_{13}dY_1 + m_{23}dY_2 \tag{14c}$$

where f_{31}, f_{32} are the marginal propensities of Country 3 to import from Countries 1 and 2 out of foreign exchange.

It is required that

$$f_{31} + f_{32} = 1 \tag{15}$$

Equations (14a) through (14c) can be solved for dY_1, dY_2, and dF_3. Much as before, the respending change in the exports of Country 1 is

$$S_{x1} = m_{21}dY_2 + f_{31}dF_3 \tag{16a}$$

while the respending change in its imports is

$$S_{m1} = (m_{12} + m_{13})dY_1 \tag{16b}$$

The same holds true for Country 2. For the underdeveloped country (Country 3), the respending change in exports is

$$S_{x3} = m_{13}dY_1 + m_{23}dY_2 \tag{17a}$$

while the respending change in its imports is

$$S_{m3} = (f_{31} + f_{32})dF_3 = dF_3 \tag{17b}$$

(since $f_{31} + f_{32} = 1$).

To apply Eqs. (7a) through (7c) or (14a) through (14c) to the respending problem, estimates are needed for the marginal propensity to spend on domestic goods, m_{ii}; for the marginal propensity to import out of income, discriminated by country of origin of the imports, m_{ij}; and for the marginal propensity to import out of foreign exchange, f_{3j}, in the case where imports of the underdeveloped country are assumed to be foreign-exchange constrained. The next section discusses the estimation of these parameters.

IV. DATA AND ESTIMATING PROCEDURES

REGIONAL GROUPINGS

To apply the multisector multiplier model to the respending problem, we divided the world into 15 regions. Six of these "regions" are individual countries: the United States, Canada, the United Kingdom, Germany, France, and Japan. The others are the Caribbean, South America, other European Economic Community (EEC), other European countries, Africa, the Middle East, South Asia, the Far East, and Australia-New Zealand-South Africa (ANZA). Sino-Soviet bloc countries were excluded because most trade with them takes place on the basis of bilateral agreements and therefore is not a function of income (at least for the purpose of intermediate-term prediction). The countries included in each region are listed in Appendix A.[1]

THE MARGINAL PROPENSITY TO SPEND ON DOMESTIC GOODS

For the marginal propensity to spend on domestic goods (MPS), we used the marginal propensity to consume (MPC). This was estimated by constructing regional totals of gross national product (GNP) and consumption at current prices and fitting time-series regressions for the period 1958-68,[2] using

$$C_i = c_{oi} + \hat{m}_{ii} Y_i \tag{18}$$

where C_i and Y_i are consumption and GNP in region i, $\hat{m}_{ii}$ is the marginal propensity to consume (a proxy for MPS), and c_{oi} is a constant term. The results are displayed in Table 1. As expected, MPCs for the underdeveloped regions are higher than those for the developed regions, with the exception of Africa and the Near East. The latter is not surprising, in view of the rapid expansion of income from oil production

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[1] The regional definitions in this report correspond to those in the other reports of this series (see the Preface).

[2] This interval was selected to correspond to the longest period for which trade data were available.

during this period, and the fact that most such income accrues to the government. The low MPC for Africa reflects the influence of Libya in the African totals, and the explosive growth of oil output in that country. (Were Libya excluded, the MPC for Africa would be .67.[1])

Table 1

MARGINAL PROPENSITIES TO CONSUME

Region	MPC	Standard Error of MPC
United States	.5770	.0042
Canada	.5442	.0090
Caribbean	.7621	.0051
South America	.7452	.0177
United Kingdom	.5832	.0093
Germany	.5518	.0086
France	.5774	.0077
Other EEC	.6084	.0060
Other Europe	.5835	.0042
Africa	.5422	.0259
Middle East	.5817	.0037
South Asia	.8215	.0090
Japan	.5124	.0105
Far East	.6910	.0248
ANZA	.5762	.0051

Principal sources of underlying data: International Monetary Fund, International Financial Statistics, various issues; United Nations, Yearbook of National Accounts Statistics, various issues.

Unfortunately, this procedure for estimating MPS is subject to bias from five sources, which probably leads to a modest overstatement of the domestic multiplier.

First, there is the well-known problem of simultaneous-equation bias. Using ordinary least squares on Eq. (18) will result in estimates for m_{ii} which are biased upward.

[1] With a standard error of .02.

Second, if the regional consumption function is shifting upward over time, using time-series observations on income and consumption will result in an overstated MPC.

Third, observed consumption includes both domestic and imported goods. This will result in a further upward bias in the estimated MPS.

Fourth, some elements of investment and government expenditure may be income-responsive;[1] using MPC as a proxy will therefore lead to an underestimate of MPS.

Fifth, in constructing regional totals for GNP and consumption, we converted observations on individual countries to a common currency (U.S. dollars) using the principal import exchange rate. It would have been preferable to use purchasing-power parity rates, but these were not available. One difficulty with using import rates is that they understate the contribution of countries where the price of non-traded goods is relatively low. Presumably, these will be the least-developed countries in any region, and the regional MPC will be underestimated. On the other hand, observed import rates may be overvalued, particularly for countries with rapid rates of domestic inflation. If inflationary countries have a higher MPC (which is likely to be the case), then their contribution will be overstated when import rates are used, leading to an overestimate of the regional MPC.

The extent of bias arising from overvaluation can be explored by substituting free-exchange rates (FER) for the principal import rate (PIR), in the cases where such rates are available. Table 2 presents the results of estimating MPC using FER aggregates. Only in the case of the Far East does the use of FERs make a significant difference, and in this case the FER MPC is less plausible than the PIR MPC. Apparently, the bias from overvaluation offsets the bias from purchasing-power inequality.

In view of these possible biases, how well do our estimates of the domestic multiplier (1/(1-MPS)) compare with estimates from more

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[1] As the accelerator and capacity models of investment behavior suggest.

Table 2

COMPARISON OF FREE-EXCHANGE-RATE AND PRINCIPAL-IMPORT-RATE MARGINAL PROPENSITIES TO CONSUME

Region	FER MPC[a]	PIR MPC[a]
Caribbean	.7549 (.0055)	.7621 (.0051)
South America	.7475 (.0150)	.7452 (.0177)
Middle East	.5633 (.0310)	.5817 (.0037)
Far East	.6084 (.0060)	.6910 (.0248)

[a]Numbers in parentheses represent standard errors. Principal sources of underlying data: See Table 1.

sophisticated models of income determination? Table 3 presents the results from a limited review of the literature on this subject. For the United States and the United Kingdom, the multipliers from Eq. (18) agree remarkably well with standard estimates. In the case of the EEC countries, Resnick's estimates include the intra-Community respending effects of an autonomous increase in a single government's expenditures; therefore his multipliers should be somewhat higher than ours. Measured against this standard, our French multiplier is probably not far from wrong, but our German and Other EEC multipliers may be on the high side.[1]

THE MARGINAL PROPENSITY TO IMPORT

To estimate the marginal propensity to import out of income (MPI), we use equations of the form

[1]If Resnick's Belgian, Italian, and Dutch multipliers are weighted by the 1968 GNP of these countries, a "weighted average" multiplier of 2.30 results.

Table 3

COMPARISON OF DOMESTIC MULTIPLIERS

Region	Multiplier from Eq. (18)	Alternative Estimates	
		Author	Value
United States	2.36	Fromm-Taubman, 1968	2.7-2.9[a]
		Evans-Klein, 1967	2.79-2.84[a]
		Klein-Goldberger[b]	2.11
		Suits[b]	1.10
		Morishima-Saito[b]	2.37
		Evans, 1966	4.00
		Liu, 1963	2.25
		Ando-Goldfeld, 1968 (1)	2.33[c]
		Ando-Goldfeld, 1968 (2)	3.26[c]
United Kingdom	2.40	Ball[b]	2.45
Germany	2.23	Resnick, 1968	2.27
France	2.37	Resnick, 1968	3.26
Other EEC			
Belgium	2.55	Resnick, 1968	1.29
Italy		Resnick, 1968	2.90
Netherlands		Resnick, 1968	1.36

[a]After ten quarters. Values at the end of four quarters are 2.1-2.4 (Ando-Goldfeld, 1968) and 2.63-2.85 (Evans-Klein, 1967).

[b]Computed by Evans, 1966.

[c]After four quarters.

[d]Assumes a more rapid adjustment of consumption than Ando-Goldfeld (1).

$$M_{ij} = m_{oij} + m_{ij}Y_i \tag{19}$$

where M_{ij} is the imports of region i from region j, Y_i is GNP in region i, m_{ij} is the marginal propensity of region i to import from region j (out of income), and m_{oij} is a constant term. Equation (19) was fitted with time-series observations on the current dollar value of merchandise imports and regional GNP.[1] Because of the problem of varying c.i.f. coverage, as well as the possible underinvoicing of imports in high-tariff countries, import flows were constructed from f.o.b. figures of the exporting region. Thus "imports of region i from region j" are really "exports of region j to region i," and imports are stated in f.o.b. terms. Three different definitions of trade were used, varying in their treatment of aid-financed imports; the specific content of these definitions is explained in Table 4. The reason for the differing definitions, of course, was to more nearly approximate commercial trade in estimating the MPIs. Definitions 1a and 3 were introduced because data for the best definition (4) were available only for 1965-68; observations on 1a and 3 were available for longer periods of time.

The major weakness of Eq. (19) is that it contains no relative-price term. Relative prices were not included in the estimation of Eq. (19), because the cost in empirical effort would have exceeded the resource limits on this study. Ordinarily, the omission of relative prices would not be a serious problem, since we are really interested in the predictive value of estimates of m_{ij}, not in their structural accuracy. To the extent that estimates of m_{ij} include the effects of continuing relative-price trends, their predictive value is actually enhanced.

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[1] As before, observations on GNP for individual countries were converted to U.S. dollars, using the principal-import exchange rate. The sole exception to this procedure was in the estimate of the U.K. MPI for Trade Definition 4. For that case, all U.K. GNP figures were converted to U.S. dollars, using a constant exchange rate (1966 rate) in order to avoid the problem caused by devaluation of the pound in 1967. Using current rates gave unacceptable results, regardless of whether the figures were expressed in dollars or pounds.

Table 4

TRADE DEFINITIONS

Definition[a]	Interregional Content	Additionality Assumptions[b]	Period Covered by Available Data
1a	Merchandise trade less Military Assistance Program (MAP)	Not applicable	1958-68
3	Merchandise trade less MAP, P.L. 480, and U.S.-tied aid	Caribbean = .6 South America = .6 Rest of world = .9	1962-68
4	Merchandise trade less MAP, P.L. 480, and DAC-tied[c] aid	U.S. to Caribbean = .6 U.S. to South America = .6 U.S. to rest of world = .9 Other DAC to all countries = .9	1965-68

[a]Numbers are the same as those used in the main report of this series. (Slighton et al., 1972.)

[b]The proportion of aid shipments that are additional to the flow of trade if aid funds were not tied. For a full discussion of the additionality problem, see Cooper, 1972.

[c]Members of the Development Assistance Committee of OECD (Australia, Austria, Belgium, Canada, Denmark, France, Germany, Italy, Japan, the Netherlands, Norway, Portugal, Sweden, Switzerland, United Kingdom, and United States).

The recent currency realignments, however, pose a dilemma. On the one hand, the competitive position of the United States, Canada, ANZA, Latin America, and the Far East has improved vis-à-vis the rest of the world. Thus their MPIs should decline, and the marginal propensities of the rest of the world to import from them should rise. On the other hand, other things being equal, the circumstances which led to the realignments can be expected to continue. Revision of the MPIs would have to be tempered by projections of relative price trends over the period when aid is to be untied and the respending reaction measured.

Because no relative price trend was introduced in Eq. (19), we cannot do this directly; and in any event, such a procedure is only as strong as the price-trend predictions that underlie it. However, it is possible to approach the problem indirectly by capitalizing on the fact that the three trade definitions cover different periods of time. To the extent that realignment will make the U.S. dollar and allied currencies as competitive as they were in the late 1950s and early 1960s, Trade Definition 1a should produce good MPI estimates.[1] A less optimistic view of the impact of realignment may be obtained by using coefficients derived from Trade Definition 3 or 4.

For the United States, this helpful difference among the trade definitions is reinforced by the differences in their coverage. Trade Definition 1a includes some U.S. exports which would not have taken place without aid; Definition 3 excludes such exports by the United States but includes them for the other DAC countries; Definition 4 excludes them for all countries.

In addition to the relative-price problem, three other caveats regarding our estimated MPIs should be noted. First, our trade data are confined to merchandise trade. To the extent that the MPI for invisibles differs from the MPI for merchandise trade, we will misestimate the respending balance-of-payments effects. Aside from tourist expenditures, however, this is unlikely to be a serious problem.[2]

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[1] Note that because our data series ends with 1968, the severe dollar overvaluation of 1969-71 is not reflected in the estimates.

[2] Nontourist invisibles are a small fraction of experts except for a few countries such as Norway.

Second, the income variable used to estimate Eq. (19) is GNP. This is the appropriate variable when imports are consumption goods, but for investment goods and intermediate materials, gross domestic product (GDP) would be preferable. However, since GDP and GNP are virtually identical for most countries, it was not worthwhile to carry out separate estimations for nonconsumer goods.

Third, national product data could not be obtained for all countries. In a few cases (see Appendix A), these could not be excluded from the regional trade totals. If these countries have positive MPIs, then the effect of regressing trade totals containing their imports on product totals which exclude their income is to overestimate MPI. This incongruity is a problem only in the underdeveloped regions (specifically Africa, the Middle East, and the Far East), and the problem disappears for Africa and the Far East when we assume that their imports are foreign-exchange constrained (rather than being functions of income).

Appendix B presents the complete set of m_{ij}'s for the three different definitions of trade. Aggregate MPIs for each region are displayed in Table 5, together with the sum of the statistically significant m_{ij}'s.[1] An elementary standard which the m_{ij}'s must meet is

$$\text{Estimated MPI}_i \approx \sum_j m_{ij} \tag{20}$$

It is comforting to note that with the single exception of ANZA under Trade Definition 4 this correspondence is in fact very good. In other words, errors in the disaggregated MPIs tend to be offsetting rather than cumulative.

In general, the differences across trade definitions conform to expectations. Aggregate MPIs for the U.S. and Latin America are lower when measured over the period 1958-68 (Trade Definition 1a) than when measured over 1962-68 or 1965-68 (Trade Definitions 3 and 4). The

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[1]For Trade Definitions 7 and 9 a significance level of 20 percent was used; for Trade Definition 4, 30 percent. These significance levels were chosen so as to make use of all coefficients that were at least (approximately) one and a half times their standard errors.

Table 5

AGGREGATE MARGINAL PROPENSITIES TO IMPORT[a]

Region	Trade Definition 1a		Trade Definition 3		Trade Definition 4	
	Estimated Value[b]	Sum of Disaggregated MPIs	Estimated Value[b]	Sum of Disaggregated MPIs	Estimated Value[b]	Sum of Disaggregated MPIs
United States	.0397 (.0026)	.0397	.0472 (.0030)	.0472	.0548 (.0064)	.0548
Canada	.2044 (.0042)	.2025	.2061 (.0062)	.2064	.2047 (.0135)	.2059
Caribbean	.0810 (.0130)	.0810	.1117 (.0131)	.1117	.0961 (.0279)	.0949
South America	.0553 (.0181)	.0548	.0633 (.0246)	.0623	.0932 (.0412)	.0877
United Kingdom	.1318 (.0207)	.1314	.1539 (.0533)	.1490	.1522 (.0168)	.1406
Germany	.1385 (.0050)	.1385	.1529 (.0104)	.1522	.1423 (.0405)	.1326
France	.1042 (.0036)	.1043	.1096 (.0056)	.1100	.1215 (.0136)	.1211
Other EEC	.1946 (.0069)	.1945	.1809 (.0090)	.1793	.2006 (.0207)	.2025
Other Europe	.1477 (.0047)	.1477	.1512 (.0057)	.1512	.1301 (.0157)	.1298
Africa	.1417 (.0227)	.1413	.2339 (.0268)	.2270	.1398 (.0351)	.1423
Near East	.1217 (.0058)	.1218	.1375 (.0103)	.1384	.1280 (.0377)	.1278
South Asia	.0415 (.0066)	.0387	0	.0001	0	-.0060
Japan	.0664 (.0026)	.0664	.0663 (.0038)	.0664	.0682 (.0084)	.0682
Far East	.2629 (.0263)	.2626	.2230 (.0295)	.2222	.1589 (.0154)	.1596
ANZA	.1247 (.0122)	.1246	.1271 (.0225)	.1280	0	.0352

Notes to Table 5

[a]Numbers in parentheses represent standard errors.

[b]0 indicates not significant at 20 percent or better (30 percent for Definition 4).

Sources of underlying data:

Merchandise trade: International Monetary Fund, Direction of Trade, various issues.

Excluded items (as defined in Table 4), see Cooper, 1972.

GNP -- see sources listed in Table 1.

underdeveloped countries have higher aggregate MPIs under Trade Definition 3 (when only U.S. tied aid is excluded) than under Trade Definition 4 (when all DAC tied aid is excluded). The behavior of the African coefficients reflects the changing trade relationship of France and her former colonies. Likewise, the South Asia coefficient is dominated by U.S. aid flows.

It is somewhat surprising (in light of the relative-price discussion above) that the Western European aggregate MPIs are higher when measured over the most recent years than when measured over the entire period 1958-68. This presumably reflects two major changes in trade restrictions: the formation of the EEC, and the Kennedy round tariff reductions.

A few of the disaggregated MPIs shown in Appendix B are negative (and statistically significant). In theory, such results could be defended by arguing that these imports are inferior goods whose consumption declines as income increases. To be more realistic, however, they probably reflect either relative price trends or major changes in institutional relationships (for example, France's decision to free her African colonies).

How well do the aggregate MPIs of Table 5 compare with other estimates, particularly those based on relationships which include relative prices as an explanatory variable? Table 6 summarizes the results from a survey of the recent literature. Since most equations with a price variable are estimated in the log-linear form, the comparison is presented in terms of income elasticities. In general, our estimates are somewhat lower than those of Houthakker-Magee, but they agree quite well with the estimates by Adams, Barker, and Resnick-Truman.[1] (In the cases where we have estimated income elasticities for a group of countries, our results can be expected to be lower than other estimates because intragroup trade has been excluded.)

Besides the influence of price effects, the principal explanation for the generally higher Houthakker-Magee values is that they were

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[1]The Resnick-Truman results should be considered preliminary in nature.

Table 6

COMPARISON OF IMPORT ELASTICITIES WITH RESPECT TO INCOME OR INCOME PROXIES

Country	Trade Definition 1a Elasticity at Mean	Alternative Estimates Author	Value
United States	1.34	Adams	0.76
		H-M[a]	1.68
Canada	1.30	Adams	0.90
		H-M	1.20
United Kingdom	0.95	Adams	1.07
		H-M	1.45
		Barker	1.14
		R-T[b]	[1.00][c]
Germany	1.13	Adams	1.34
		H-M	1.85
		R-T	[1.00]
France	1.12	Adams	1.32
		H-M	1.66
		R-T	1.32
Belgium		Adams	1.21
		H-M	1.94
		R-T	1.0-1.5
Italy	1.04	Adams	1.35
		H-M	2.19
		R-T	[1.00]
Netherlands		Adams	1.35
		H-M	1.89
		R-T	1.00
Australia		R-T	1.0-1.1
Denmark		H-M	1.31
		R-T	1.3
Norway	(.92)[d]	H-M	1.40
		R-T	.61-1.48
Sweden		H-M	1.42
		R-T	.8-1.2
Switzerland		H-M	1.81
Australia	(.87)	H-M	0.90
South Africa		H-M	0.91
Japan	0.87	H-M	1.23

Notes to Table 6

[a]Houthakker-Magee, 1969.

[b]Resnick-Truman (preliminary results), n.d.

[c]Brackets indicate constrained value of 1.00 statistically most successful.

[d]Parentheses indicate approximate equivalent.

Sources:

Adams et al., 1969, p. 22; Adams' elasticities are with respect to industrial production.

Barker, 1970, p. 129, Barker's elasticity is with respect to total demand for import-type goods.

Houthakker and Magee, 1969, pp. 113, 125.

Resnick and Truman, n.d., p. 16 and Appendix A.

estimated with data covering the period 1951-66. The persistence of a "dollar gap" until the mid-1950s unduly depressed the imports of the rest of the world from the United States. As the dollar gap disappeared, imports from the United States grew rapidly, and because the United States was a major supplier of industrial goods, so did total imports. Thus the rapid import growth of the early 1950s was not entirely attributable to increases in income but partly reflected the easing of the foreign exchange constraint. Since Houthakker and Magee did not take this change into account, their estimated import functions will produce income elasticities that are biased upward.

THE MARGINAL PROPENSITY TO IMPORT WHEN THE LESS-DEVELOPED REGIONS ARE FOREIGN-EXCHANGE CONSTRAINED

If the import behavior of the less-developed regions is constrained by the availability of foreign exchange (i.e., there is excess demand at the current price), we need estimates of their marginal propensities to import out of foreign exchange in order to apply the model described by Eqs. (14a) through (14c). To estimate these marginal propensities (the f_{ij}), the trade data described in the preceding section were used to fit

$$M_{ij} = f_{oij} + \hat{f}_{ij}M_i \tag{21}$$

where, as before, M_{ij} is imports of region i from region j, M_i is the total imports of region i, $\hat{f}_{ij}$ is the marginal propensity of region i to import from region j (out of total imports), and f_{oij} is a constant term.

This estimation was carried out for Central America, South America, Africa, South Asia, and the Far East, using each of the three different definitions of trade described in Table 4. The Middle East was omitted, of course, because that region is dominated by the oil-exporting countries.

The marginal propensities used in the actual application of Eqs. (14a) through (14c) were obtained from

$$f_{ij} = \hat{f}_{ij} \Big/ \sum_j \hat{f}_{ij} \tag{22}$$

This insured that $\sum_j f_{ij} = 1$, as required.

Appendix C presents the complete set of $\hat{f}_{ij}$.

V. SUMMARY OF RESULTS

The first-round impact of untying aid can be expressed as a vector of export changes from each of the 15 regions. Given such a vector, our model estimates the respending effects on the balance of payments of each region. The results from applying the model to several first-round vectors, embodying a variety of assumptions about the circumstances of untying, are summarized in this section.

FIRST-ROUND VECTORS

Table 7 briefly defines the vectors we have used; explicit values are provided in Appendix D. These vectors assume somewhat higher levels of additionality than the vectors in the main report of this series.[1] It was decided to present these vectors, rather than restate results available in the main report, as an implicit sensitivity analysis on the additionality assumptions.

There are four important differences among the vectors used here (and likewise among the vectors in the main report):[2] (1) whether untying is unilateral (U.S. only) or multilateral (some or all DAC countries); (2) how much development lending is untied; (3) how large

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[1]Slighton et al., 1972, Tables 16 and 23. The main report should be consulted for a full discussion of how the first-round effects of untying were estimated.

Additionality, it will be recalled, refers to the proportion of aid shipments that are additional to the flow of trade if aid funds were not tied. For the vectors used here (presented in Appendix D), the following additionality assumptions were made (percent):

U.S. to Latin America..... 75
U.S. to Rest of World..... 95
U.K. to South Asia..... 75
U.K. to Rest of World..... 95
Other DAC..... 95

These differ from the assumptions in Table 4 because in the present case only development loan assistance is involved.

[2]Except for the additionality assumptions, Vector 1 of this report generally corresponds to Vector 8 of the main report; Vector 3 corresponds to Vectors 5 and 6; Vector 4 corresponds to Vectors 1 and 2; and Vector 5 corresponds to Vectors 3 and 4.

Table 7

DEFINITIONS OF FIRST-ROUND VECTORS

Vector Number	Only U.S. Unties	All DAC Countries Except France Untie	All DAC Countries Untie	Only Explicitly Tied Loans Are Untied	All Loans Are Untied	U.S. Loans at 1969 Level	U.S. Loans Reduced 15%	U.S. Loans to South Asia Reduced
1	X			X		X		
2		X		X		X		
3		X			X	X		
4			X	X		X		
5			X		X	X		
6		X		X			X	X
7		X			X		X	X
8			X	X			X	X

development lending is in the postuntying period; and (4) the geographical distribution of untied U.S. development loans.

Unilateral Versus Multilateral Untying

Vector 1 assumes that only the United States unties; the other vectors assume multilateral untying. Vectors 2, 3, 6, and 7 assume that all DAC countries untie, while 4, 5, and 8 assume that all DAC countries except France untie. (No resulting boycott of France is assumed.)

Extent of Untying

Vectors 1, 2, 4, 6, and 8 assume that untying applies to development loans which can be explicitly identified as tied. Vectors 3, 5, and 7 apply to all development loans.

Level of Development Lending

All vectors hold non-U.S. development loans in the postuntying period at 1969 levels. Vectors 1 through 5 assume that U.S. development loans are also held at 1969 levels; Vectors 6 through 8 assume that U.S. development loans are reduced 15 percent (to $750 million per year).

Geographical Distribution of Untied U.S. Development Loans

Vectors 1 through 5 assume no change in the geographical distribution of U.S. development loans; Vectors 6 through 8 postulate a substantial reduction in U.S. development lending to South Asia.

Losers and Gainers

In all cases, the United States is a first-round loser. This loss is largest for Vector 1 (unilateral untying) and least for Vector 7 (complete multilateral untying and reduction of U.S. development lending). The other major first-round losers are Canada (Vectors 2 through 8), Germany (Vectors 3, 4, and 7), and France (Vectors 2, 3, and 7).

MODEL RESULTS

As a base case for applying the multisector multiplier model, we assume that no region is foreign-exchange constrained, and that no first-round loser undertakes compensatory fiscal or monetary policy. Results for the U.S. balance of payments are presented in Table 8.[1] The U.S. respending balance-of-payment gain is expressed as a percentage of the U.S. first-round export loss.

It appears from Table 8 that the U.S. respending gain for the base case would probably be 14 to 17 percent of the first-round loss. This is at the low end of the range of estimates from reserve-accumulation and reflection-ratio models (20 percent to 80 percent).

These results are not particularly affected by changing the additionality assumptions, as is readily apparent from comparing the first part of Table 8 with Table 22 of the main report.[2] As long as the additionality assumptions are all changed in the same direction, the primary effect is on the magnitude of first-round losses, not on the ratio of respending gains to first-round losses. The latter is primarily a function of the geographical distribution of the first-round vector.

The respending gain also appears insensitive to the Trade Definition used,[3] but there is a straightforward explanation for this apparent anomaly. Approximately half the U.S. balance-of-payments gain comes from the reduction in imports which accompanies the fall in U.S. income. While Trade Definition 1a makes the United States look more competitive vis-à-vis the rest of the world and thus produces larger respending effects on the export side, it also makes U.S. goods look more competitive with imports in the domestic market, so that the

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[1] Full results for all countries are presented in Appendix E.

[2] Slighton et al., 1972. See footnote 2, p. 27, for a key to correspondence of the vectors between the two reports.

[3] For an explanation of the trade definitions, see Table 4.

The results are also insensitive to an alternative method of computing the disaggregated MPIs -- namely, partitioning the aggregate MPI, using average trade shares. This sensitivity test was conducted using Trade Definition 3 and the average shares for 1966-68.

Table 8

RESPENDING EFFECTS ON U.S. BALANCE OF PAYMENTS

First-Round Vector	Respending Gain (percent of first-round loss) Trade Definition 1a	3	4
a. Base Case			
1	15.2	16.3	16.9
2	15.0	15.2	14.9
3	17.1	16.9	15.7
4	13.7	14.0	13.9
5	15.0	15.0	14.3
6	14.6	14.3	13.3
7	18.9	17.3	14.4
8	12.5	12.3	11.9
b. First-Round Losers Compensate			
1	7.3	6.9	6.0
2	10.0	8.7	6.9
3	13.1	11.0	8.3
5	10.7	8.8	6.5
7	21.7	17.6	13.0
c. LDCs Foreign-Exchange Constrained			
1	17.0	17.5	18.0
2	18.7	17.6	17.2
7	28.9	23.3	19.9
d. LDCs Foreign-Exchange Constrained and First-Round Losers Compensate			
1	9.3	8.3	7.4
2	14.1	11.4	9.5
7	33.2	24.7	19.7

MPI and the reduction of imports accompanying the fall in income are correspondingly smaller. Under Trade Definition 4, the United States is less competitive internationally; thus its respending gain on the export side is smaller, but because its MPI is higher, the reduction of imports is larger.

Therefore, we should expect that when first-round losers undertake compensatory fiscal and monetary policies,[1] the U.S. gain from respending would drop sharply for most first-round vectors. This is confirmed in Table 8, Section b. Since the respending gain is limited to the export side, the difference in relative U.S. competitiveness among trade definitions is now apparent: Trade Definition la uniformly produces a more optimistic picture than does 3 or 4.

For one vector, Vector 7, the U.S. respending gain is larger under the assumption that first-round losers compensate. This is because Vector 7 postulates the heaviest combined loss among four of the United States' principal trading partners: Canada, the United Kingdom, Germany, and France. If these countries compensate for first-round losses, their stable income plus the healthy autonomous increase in income in the rest of the world means a substantial gain for U.S. exports.

Suppose, however, that the less-developed regions (except the Near East) are foreign-exchange constrained. What happens to the U.S. balance of payments? In the base case, where there are no compensatory fiscal and monetary policies, it appears that this would mean a somewhat larger respending gain for the United States (Table 8). This is particularly true for Vector 7, where the less-developed-countries export gain is largest.

It may seem a bit surprising that the case of constrained foreign exchange produces results so similar to those of the base case. A priori, a more optimistic view of U.S. respending gains might have been expected. The data in Tables 1 and 3, however, help to explain these results. We estimated the domestic multiplier for the underdeveloped regions to be about 4, and their aggregate MPI, about 0.1

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[1] It is assumed that compensation applies only to the first-round loss, i.e., if $dA_i < 0$, set $dA_i = 0$.

to 0.2. Thus, in the base case, the change in their imports will be approximately .4 to .8 of the autonomous change in their exports (.1 x 4 and .2 x 4). This is not very different from the case where they are foreign-exchange constrained.

The most realistic set of assumptions, of course, is that the less-developed regions are foreign-exchange constrained, and that first-round losers will undertake compensatory fiscal and monetary policies. Results under these assumptions are presented in the last part of Table 8. As in the simple compensation case, the choice of trade definition makes a clear difference, while Vector 7 gives the most optimistic prediction of U.S. gains from respending. The Vector 7 result reflects a reinforcing combination of two factors: (1) the large export loss of Canada, Germany, and France, and the corresponding export (and foreign exchange) gain of other countries, in which the less-developed regions share generously; and (2) the income-maintenance policies undertaken by these first-round losers, one result of which is that their imports from the United States do not decline.

Before leaving these findings, we should point out that in addition to any improvement in efficiency which results from untying, there is a further benefit to world welfare -- namely, the improvement in world income (Table 9). The effect of untying is to redistribute exports away from regions with low domestic multipliers, and toward regions with high multipliers. Thus world income rises. Even when first-round losers do not compensate, this net gain is usually as large as total first-round export losses.

Table 9

NET EXPANSION OF WORLD INCOME

Assumptions	Net Gain (percent of first-round loss) First-Round Vector 1	2	7
Base case	82	99	60
First-round losers compensate	351	380	380
LDCs foreign-exchange constrained	99	124	101
First-round losers compensate and LDCs foreign-exchange constrained	371	409	417

COMPARISON WITH THE PIEKARZ-STEKLER REFLECTION RATIOS

Regardless of the set of assumptions selected, the results from the multisector multiplier approach imply respending gains at the low end of the range established by the reserve-accumulation and reflection-ratio models. In particular, our estimates of respending gains are much less optimistic than are those of Piekarz and Stekler,[1] which have achieved considerable acceptance. Table 10 clearly illuminates this difference.

For example, Piekarz and Stekler estimate that if British exports increase by one unit, the U.S. balance of payments will improve by .88 units. The multisector multiplier model, on the other hand, indicates that the U.S. balance of payments will improve by only .08 units. Even brief reflection should suggest that the Piekarz-Stekler respending figure is implausibly high, since it implies a marginal propensity of the United Kingdom to import from the United States of about 25 percent.

A major reason for the high Piekarz-Stekler estimates is their use of a misspecified estimating equation. As was pointed out in Section II, regressions of imports on exports force the export variable to "explain" import variations which are properly the result of other autonomous changes in income -- changes which are likely to be correlated with a change in exports. A second reason is the special assumption that Pierkarz and Stekler have made with regard to U.S. import behavior -- namely, that U.S. imports do not respond to changes in exports. Their model predicts that when income rises in response to a change in exports, there will be no change in the U.S. balance of payments. In fact, of course, the balance of payments will deteriorate as imports respond to the rise in income.

Our estimates of the likely respending gain are also much less optimistic than those produced by the reserve-accumulation models, in particular the models of Hicks and Rhomberg.[2] The explanation for this lies in the assumption about reserve accumulation made by both

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[1]Piekarz and Stekler, 1967.

[2]Hicks, 1963, pp. 171-172; Rhomberg and Boissoneault, 1964, p. 73.

authors. They assume that countries outside Western Europe are foreign-exchange constrained, and thus respend all foreign exchange received. This includes such countries as Canada, Japan, and Australia, for which such an assumption is not appropriate. Moreover, these countries have a high propensity to import from the United States. The effect of this assumption is to produce very optimistic estimates of the respending gain.

Table 10

CHANGE IN U.S. BALANCE OF PAYMENTS RESULTING FROM A UNIT CHANGE IN EXPORTS OF MAJOR TRADING REGIONS: COMPARISON WITH PIEKARZ-STEKLER RESULTS

Region Where Exports Are Increased	Change in U.S. Balance of Payments	
	Piekarz-Stekler	Multisector Multiplier Model[a]
Canada	.73	.34
United Kingdom	.88	.08
Germany	.47	.05
France	.48	.04
Other EEC	.42 to .49	.10
Other Europe	.39 to .98	.06
Japan	1.25	.05

[a]Trade Definition 1a.

VI. THE TIME PROFILE OF ADJUSTMENT

The multisector multiplier model produces estimates of the equilibrium changes in trade resulting from the respending effects of autonomous income changes. What does the time path of adjustment to this equilibrium look like?

The model can be modified to simulate the adjustment to equilibrium by assuming that income changes in the present period are the sum of autonomous changes in the present period, plus changes induced by income changes in the immediately preceding period. Thus in place of Eqs. (8a) through (8c) (or Eqs. (14a) through (14c)) we would have:

$$dY_1^t = dA_1^t + m_{11}\, dY_1^{t-1} + m_{21}\, dY_2^{t-1} + m_{31}\, dY_3^{t-1} \tag{23a}$$

$$dY_2^t = dA_2^t + m_{12}\, dY_1^{t-1} + m_{22}\, dY_2^{t-1} + m_{32}\, dY_3^{t-1} \tag{23b}$$

$$dY_3^t = dA_3^t + m_{13}\, dY_1^{t-1} + m_{23}\, dY_2^{t-1} + m_{33}\, dY_3^{t-1} \tag{23c}$$

Given a vector of autonomous income changes, dA, the dynamic equations (23a) through (23c) will simulate the adjustment of the world economy, converging to the same solution as that implied by the static model.[1]

However, the true adjustment to equilibrium is unlikely to be so simple, and probably involves complex lags which cannot easily be captured using the annual data at hand. Rather than attempt a large-scale simulation, therefore, we present here an illustrative example.

THE MODEL

Let there be two "countries," Country i and Country j, roughly corresponding to the United States and the rest of the world (ROW). In each time period, t, the following national-income identities are assumed to hold:

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[1] For a proof, see Chipman, 1950a, pp. 361-363.

$$Y_i^t = C_i^t + (X_{ij}^t - M_{ij}^t) \tag{24}$$

$$Y_j^t = C_j^t + (X_{ji}^t - M_{ji}^t) \tag{25}$$

where, as before, Y_i^t is income in Country i in period t; C_i^t is consumption in Country i in period t; X_{ij}^t is exports from Country i to Country j in period t; and M_{ij}^t is imports of Country i from Country j in period t. The same symbols with a j subscript refer to the same variables for Country j.

A time path of adjustment is easily introduced by incorporating a Robertsonian lag into the demand side of the model; that is, let consumption and imports in each country depend on the income of the previous period. In particular, let

$$C_i^t = c_{oi} + m_{ii}\, Y_i^{t-1} \tag{26}$$

$$C_j^t = c_{oj} + m_{jj}\, Y_j^{t-1} \tag{27}$$

where c_{oi} and c_{oj} are constants, m_{ii} and m_{jj} are the constant marginal propensities to consume for Country i and Country j, respectively, and

$$M_{ij}^t = m_{oi} + m_{ij}\, Y_i^{t-1} \tag{28}$$

$$M_{ji}^t = m_{oj} + m_{ji}\, Y_j^{t-1} \tag{29}$$

where m_{oi} and m_{oj} are also constants, and m_{ij} is the marginal propensity of Country i to import from Country j, and vice versa for m_{ji}.

Finally, because there are only two countries, it must be true that at any time, t, exports of one country equal imports of the other:

$$X_{ij}^t = M_{ji}^t \tag{30}$$

$$X_{ji}^t = M_{ij}^t \tag{31}$$

The initial equilibrium is then given by solving Eqs. (24) through (29), with two additional equilibrium conditions being provided by Eqs. (30) and (31). Let the symbol ° refer to the initial equilibrium values; then

$$Y_i^\circ = \frac{c_{oi} - m_{oi} + X_{ij}^\circ}{1 - m_{ii} + m_{ij}} \tag{32}$$

$$Y_j^\circ = \frac{c_{oj} - m_{oj} + X_{ji}^\circ}{1 - m_{jj} + m_{ji}} \tag{33}$$

$$X_{ij}^\circ = m_{oj} + m_{ji}\, Y_j^\circ \tag{34}$$

$$X_{ji}^\circ = m_{oi} + m_{ij}\, Y_i^\circ \tag{35}$$

Substituting Eq. (34) into Eq. (32) and Eq. (35) into Eq. (33), we can observe that there are two simultaneous linear equations,

$$Y_i^\circ = \ell_1(Y_j^\circ) \tag{36a}$$

$$Y_j^\circ = \ell_2(Y_i^\circ) \tag{36b}$$

to which a positive solution exists if the usual restrictions are placed on the constants in the model.

Now suppose there is an exogenous shift in the intercept term of Eq. (28) such that m_{oi} becomes $\overline{m}_{oi} = m_{oi} + \varepsilon$. Clearly in period 1, $X_{ji}^1 = X_{ji}^\circ + \varepsilon$, and this once-and-for-all shift implies a new equilibrium.

Let the symbol * indicate the new equilibrium position; now it can be shown that

$$Y_i^* = \frac{c_{oi} - m_{oi} - \varepsilon + X_{ij}^*}{1 - m_{ii} + m_{ij}} \tag{37}$$

or

$$Y_i^* - Y_i^\circ = \frac{X_{ij}^* - X_{ij}^\circ - \varepsilon}{1 - m_{ii} + m_{ij}} \tag{37a}$$

Similarly,

$$Y_j^* = \frac{c_{oj} - m_{oj} + X_{ji}^*}{1 - m_{jj} + m_{ji}} \tag{38}$$

or

$$Y_j^* - Y_j^\circ = \frac{X_{ji}^* - X_{ji}^\circ}{1 - m_{jj} + m_{ji}} \tag{38a}$$

Here, too, exports of one country must equal imports of the other, so

$$\begin{aligned} X_{ji}^* = M_{ij}^* &= m_{oi} + m_{ij}\, Y_i^* + \varepsilon \qquad (39) \\ &= m_{oi} + m_{ij}\, Y_i^\circ + m_{ij}(Y_i^* - Y_i^\circ) + \varepsilon \\ &= M_{ij}^\circ + m_{ij}(Y^*_i - Y_i^\circ) + \varepsilon \\ &= X_{ji}^\circ + m_{ij}(Y_i^* - Y_i^\circ) + \varepsilon \end{aligned}$$

since $M_{ij}^\circ = X_{ji}^\circ$, or

$$X_{ji}^* - X_{ji}^\circ = m_{ij}(Y_i^* - Y_i^\circ) + \varepsilon \tag{40}$$

Similarly,

$$X_{ij}^* - X_{ij}^\circ = m_{ji}(Y_j^* - Y_j^\circ) \tag{41}$$

We now have a 4 x 4 system of simultaneous linear equations which can be written in matrix form. Let ΔY_i denote $Y_i^* - Y_i^\circ$; ΔX_{ji} denote $X_{ji}^* - X_{ji}^\circ$; and so on. Then,

$$\begin{bmatrix} 0 & 1 & \frac{1}{1-m_{jj}+m_{ji}} & 0 \\ 1 & 0 & 0 & \frac{-1}{1-m_{ii}+m_{ij}} \\ -m_{ij} & 0 & 1 & 0 \\ 0 & m_{ji} & 0 & -1 \end{bmatrix} \begin{bmatrix} \Delta Y_i \\ \Delta Y_j \\ \Delta X_{ji} \\ \Delta X_{ij} \end{bmatrix} = \begin{bmatrix} 0 \\ \frac{-\varepsilon}{1-m_{ii}+m_{ij}} \\ \varepsilon \\ 0 \end{bmatrix} \tag{42}$$

or

$$\Gamma \begin{bmatrix} \Delta Y_i \\ \Delta Y_j \\ \Delta X_{ji} \\ \Delta X_{ij} \end{bmatrix} = \begin{bmatrix} 0 \\ \frac{-\varepsilon}{1-m_{ii}+m_{ij}} \\ \varepsilon \\ 0 \end{bmatrix} \tag{42a}$$

We are interested in the change in Country i (U.S.) exports from one equilibrium to another, denoted ΔX_{ij}. Using Cramer's Rule to solve this system of equations, ΔX_{ij} is given by

$$\Delta X_{ij} = \frac{1}{|\Gamma|} \cdot \begin{vmatrix} 0 & 1 & \frac{1}{1-m_{jj}+m_{ji}} & 0 \\ 1 & 0 & 0 & -\frac{\varepsilon}{1-m_{ii}+m_{ij}} \\ -m_{ij} & 0 & 1 & \varepsilon \\ 0 & m_{ji} & 0 & 0 \end{vmatrix} \tag{43}$$

where

$$|\Gamma| = \text{determinant of matrix } \Gamma$$

$$= 1 - \left(\frac{m_{ji}}{1-m_{jj} + m_{ji}}\right)\left(\frac{m_{ij}}{1-m_{ii} + m_{ij}}\right) \tag{44}$$

Hence

$$\Delta X_{ij} = \frac{\varepsilon}{|\Gamma|} \left(\frac{m_{ji}}{1-m_{jj} + m_{ji}}\right)\left(1 - \frac{m_{ij}}{1-m_{ii} + m_{ij}}\right) \tag{45}$$

THE SIMULATION

The value of ΔX_{ij} given in Eq. (45) is the ultimate change in the exports from Country i to Country j. The time path we seek is the one which goes from the initial equilibrium to the final equilibrium according to the dynamic mechanism postulated in Eqs. (24) through (31). In period 1, the income of Country i (U.S.) falls by ε, while that of Country j (ROW) rises by ε. Country i's exports remain unchanged, but its imports rise by ε. Similarly, country j's exports rise by ε, though its imports are, of course, unchanged. In Period 2 there will be some induced effects due to the operation of the Robertsonian lag. The complete pattern of income changes and export and import changes can be seen in Fig. 1, which shows the simulation algebraically. Since we are presumably interested in some real-world results, the following set of marginal propensities was used in a numerical example, the results of which are displayed in Table 11: Figure 2 shows the period-by-period changes in Country i's exports to Country j.

$m_{ii} = .577$	U.S. MPC
$m_{ij} = .0415$	Assumed U.S. MPI from ROW
$m_{jj} = .745$	ROW's MPC (a representative number for less-developed countries)
$m_{ji} = .0984$	ROW's MPI from U.S. (again a representative number for less-developed countries)

A value for ε of 1000 (millions) was chosen for convenience

	t=0	t=1	t=2	t=3	t=4	t=5	t=6	t=7
	$Y_i^t - Y_i^o = 0$	$-\epsilon$	$-\epsilon + (X_{ij}^2 - X_{ij}^o)$ $+(m_{ii}-m_{ij})(Y_i^1-Y_i^o)$	$-\epsilon + (X_{ij}^3 - X_{ij}^o)$ $+(m_{ii}-m_{ij})(Y_i^2-Y_i^o)$	$-\epsilon + (X_{ij}^4 - X_{ij}^o)$ $+(m_{ii}-m_{ij})(Y_i^3-Y_i^o)$	$-\epsilon + (X_{ij}^5 - X_{ij}^o)$ $+(m_{ii}-m_{ij})(Y_i^4-Y_i^o)$	$-\epsilon + (X_{ij}^6 - X_{ij}^o)$ $+(m_{ii}-m_{ij})(Y_i^5-Y_i^o)$	$-\epsilon + (X_{ij}^7 - X_{ij}^o)$ $+(m_{ii}-m_{ij})(Y_i^6-Y_i^o)$
	$Y_i^t - Y_j^o = 0$	$+\epsilon$	$(X_{ji}^2 - X_{ji}^o)$ $+(m_{jj}-m_{ji})(Y_j^1-Y_j^o)$	$(X_{ji}^3 - X_{ji}^o)$ $+(m_{jj}-m_{ji})(Y_j^2-Y_j^o)$	$(X_{ji}^4 - X_{ji}^o)$ $+(m_{jj}-m_{ji})(Y_j^3-Y_j^o)$	$(X_{ji}^5 - X_{ji}^o)$ $+(m_{jj}-m_{ji})(Y_j^4-Y_j^o)$	$(X_{ji}^6 - X_{ji}^o)$ $+(m_{jj}-m_{ji})(Y_j^5-Y_j^o)$	$(X_{ji}^7 - X_{ji}^o)$ $+(m_{jj}-m_{ji})(Y_j^6-Y_j^o)$
	$M_{ji}^t - M_{ji}^o = X_{ij}^t - X_{ij}^o = 0$	0	$m_{ji}(Y_j^1 - Y_j^o)$	$m_{ji}(Y_j^2 - Y_j^o)$	$m_{ji}(Y_j^3 - Y_j^o)$	$m_{ji}(Y_j^4 - Y_j^o)$	$m_{ji}(Y_j^5 - Y_j^o)$	$m_{ji}(Y_j^6 - Y_j^o)$
	$M_{ij}^t - M_{ij}^o = X_{ji}^t - X_{ji}^o = 0$	$+\epsilon$	$+\epsilon + m_{ij}(Y_i^1 - Y_i^o)$	$+\epsilon + m_{ij}(Y_i^2 - Y_i^o)$	$+\epsilon + m_{ij}(Y_i^3 - Y_i^o)$	$+\epsilon + m_{ij}(Y_i^4 - Y_i^o)$	$+\epsilon + m_{ij}(Y_i^5 - Y_i^o)$	$+\epsilon + m_{ij}(Y_i^6 - Y_i^o)$

Fig. 1--Algebraic Representation of the Simulation

Table 11

SIMULATION OF INCOME AND TRADE ADJUSTMENT
TO EQUILIBRIUM: TWO-COUNTRY EXAMPLE

Item	t=0	t=1	t=2	t=3	t=4	t=5	t=6	t=7
$Y_i^t - Y_i^\circ =$	0.0	-1000.0	-1437.1	-1611.6	-1668.3	-1675.6	-1665.0	-
$Y_j^t - Y_j^\circ =$	0.0	+1000.0	+1605.4	+1978.8	+2213.1	+2362.3	+2458.5	-
$M_{ji}^t - M_{ji}^\circ =$ $X_{ij}^t - X_{ij}^\circ =$	0.0	0.0	+ 98.4	+ 158.0	+ 194.7	+ 217.8	+ 232.4	+241.9
$M_{ij}^t - M_{ij}^\circ =$ $X_{ji}^t - X_{ji}^\circ =$	0.0	+1000.0	+ 958.5	+ 940.4	+ 933.1	+ 930.8	+ 930.5	+ 930.9

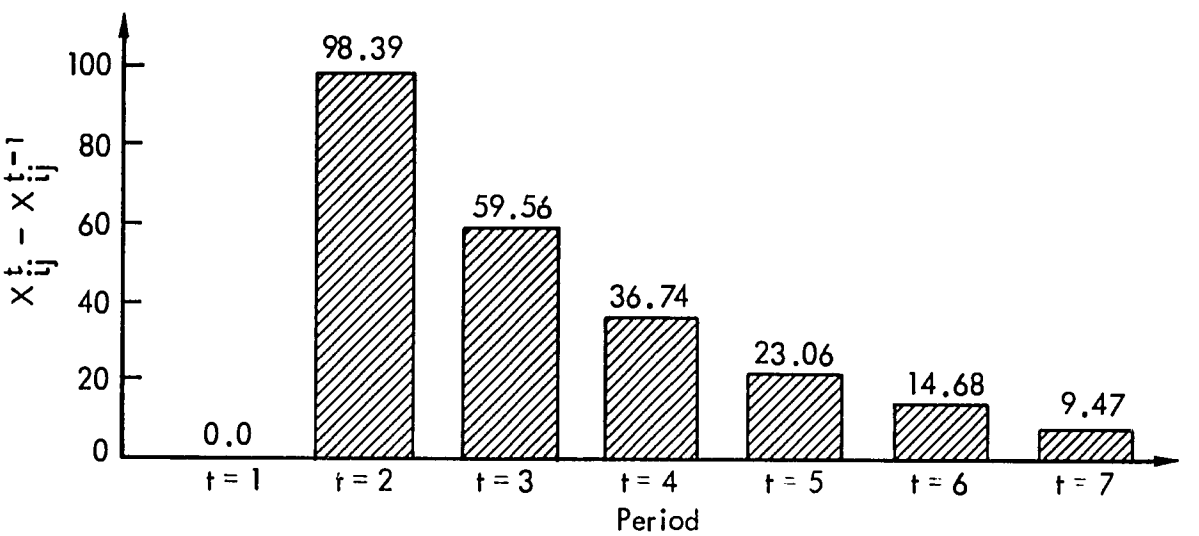

Fig. 2—Changes in exports from country i to country j

The total change in the equilibrium value for Country i's exports, using the values for the marginal propensities given above, is 260.18. That is, for each billion-dollar shift in m_{oi}, the ultimate change in exports for Country i is $260.18 million.

Table 12 converts the period-by-period changes in exports of Country i into present value discounted to t=0 for various interest rates (ρ = 0, .02, .10) and assumptions about the length of the Robertsonian lag (ℓ = 6 months, 12 months). Table 13 then gives the ratio of the sum of the present values for the changes in exports for the first seven periods to the total change in the equilibrium value. This number is essentially the percentage adjustment to the final value, assuming that the new equilibrium value was attained instantaneously.

As shown in Table 13, the shorter the period between income and demand and the smaller the discounting rate, the more closely the ratio approaches unity and the less important are time-profile-of-adjustment considerations.

Table 12

PRESENT DISCOUNTED VALUES FOR PERIOD-BY-PERIOD CHANGES IN COUNTRY i's EXPORTS

Assumptions	t=1	t=2	t=3	t=4	t=5	t=6	t=7	$\sum_{t=1}^{t=7}$
$\rho = 0$, ℓ = any length	0	98.39	59.56	36.74	23.06	14.68	9.47	241.90
$\rho = .02$, ℓ = 6 months	0	96.46	57.81	35.31	21.94	13.83	8.83	234.18
$\rho = .02$, ℓ = 12 months	0	94.57	56.12	33.94	20.89	13.03	8.24	226.79
$\rho = .10$, ℓ = 6 months	0	89.44	51.46	30.35	18.08	11.02	6.73	207.08
$\rho = .10$, ℓ = 12 months	0	81.27	44.73	25.09	14.30	8.28	4.86	178.53

Table 13

RATIO OF $\sum_{t=1}^{t=7}$ TO $\sum_{t=1}^{\infty}$

Robertsonian Lag, ℓ	$\rho = 0$	$\rho = .02$	$\rho = .10$
6 months	.930	.900	.796
12 months	.930	.872	.686

VII. CONCLUSIONS

The multisector multiplier model indicates that if development loans were untied, between 6 and 33 percent of the U.S. first-round loss would be recouped in respending effects, depending on the circumstances under which lending is untied, the stabilization-policy reactions of the countries involved, and whether or not the import behavior of the less-developed regions is foreign-exchange constrained.

In terms of influence on the respending gain, the most important circumstance of untying is the amount of U.S. lending relative to total loans untied. This, of course, is not particularly surprising, but the relationship is not a simple one. The final result depends on the relative magnitudes of the propensities to import from the United States and the domestic multipliers both in the untying regions and the regions where their untied funds are now spent.

Stabilization-policy reactions are important because of the composition of the respending gain. When untying occurs, regions that lose exports suffer a decline in income, with a concomitant decline in imports. About half the U.S. respending gain arises from this source. Were the United States to pursue compensatory fiscal and monetary policy, this would neutralize the import component of the respending gain. The same is true if all first-round losers undertake compensatory fiscal and monetary policy, unless the U.S. share of total lending untied is small. In that case, U.S. exports benefit sufficiently to offset the loss of the import component of the respending gain.

The respending gain is sensitive to whether or not the import behavior of the less-developed regions is assumed to be foreign-exchange constrained, but it is not as sensitive as one might at first expect. The reason for this unexpectedly small difference lies in the estimated values for the multiplier and the marginal propensity to import of the less-developed regions. If the import behavior of the less-developed regions is assumed to be a function of income, these estimated values imply that 40 to 80 percent of any export gain will

be respent. This is a high proportion of marginal foreign exchange receipts, and not too different from the value if it is assumed the less-developed regions are in fact foreign-exchange constrained (which would, of course, be 100 percent).

The task of correctly projecting respending effects is complicated by the recent currency realignments. For this reason, results have been presented using three matrices of marginal propensities to import, which effectively simulate differences in U.S. competitiveness. Of these, Trade Definition 1a, reflecting the U.S. position in the late 1950s and early 1960s, will probably give the best estimate of respending gains in the postrealignment period.

Trade Definition 1a usually produces the most optimistic estimate of the respending gain. Even so, our estimates of respending effects fall at the low end of the range established by the reserve-accumulation and reflection-ratio models. They would be even lower if they were discounted to a present-value basis. Under reasonable assumptions about the speed of adjustment, such discounting would require a 10 to 20 percent reduction in the equilibrium respending gains.

Moreover, if anything, the estimates derived from the multisector multiplier model are probably somewhat optimistic. For any given trade definition and set of behavioral assumptions, the parameter to which the results are most sensitive is the domestic multiplier. On balance, our simple estimating procedure is likely to bias the domestic multiplier upwards. This is confirmed by a comparison with estimates from more sophisticated models of income determination. Because of this possible bias, the respending gains from the multisector multiplier model are apt to be somewhat overstated.

GLOSSARY

C	Consumption (thus C_i is consumption in region i; C_i^t is consumption in region i at time t).
c_{oi}	Constant term in consumption function.
dA_i	Autonomous change in income in region i -- in the present case, the first-round export loss or gain resulting from untying (thus dA_i^t is the autonomous change in income in region i at time t).
dF_i	Final change in foreign exchange available to region i.
dY_i	Final change in income in region i (thus dY_i^t is the final change in income in the region i at time t).
f_{ij}	Marginal propensity of region i to import from region j out of foreign exchange.
$\hat{f}_{ij}$	Marginal propensity of region i to import from region i out of total imports (an estimate of f_{ij}).
f_{oij}	Constant term in $\hat{f}_{ij}$ equation.
M	Imports (thus M_i is total imports of region i; M_{ij} is imports of region i from region j; M_{ij}^t is imports of region i from region j at time t).
m_{ii}	Marginal propensity of region i to spend on domestic goods out of income.
$\hat{m}_{ii}$	Marginal propensity of region i to consume (estimate of m_{ii}).
m_{ij}	Marginal propensity of region i to import from region j out of income.
m_{oij}, m_{oi}, m_{oj}	Constant term in m_{ij} equation.

S_{xi}	Subsequent change in exports of region i (i.e., after first-round change).
S_{mi}	Subsequent change in imports of region i (i.e., after first-round export change).
X	Exports (thus X_{ij} is exports of region i to region j; X^t_{ij} is exports of region i to region j at time t).
Y	GNP (thus Y_i is GNP of region i).
Δ	Denotes difference.
ε	Autonomous shift in imports.
ℓ	Lag parameter.
ρ	Discount rate.

Appendix A
REGIONAL DEFINITIONS

The regional definitions in this series of reports generally correspond to the definitions used by the IMF in its Direction of Trade. The principal differences are:

(1) The IMF regions "Other Industrial Western Europe" and "Other Western Europe" less Greece and Turkey have been combined as "Other Europe."

(2) Greece and Turkey have been added to the IMF's "Middle East."

(3) The IMF's "Latin America" has been broken into "the Caribbean" and "South America."

(4) The IMF's "Other Asia" has been broken into "South Asia" and "Far East." Hong Kong has been excluded altogether, because it was impossible to separate out its entrepôt trade.

(5) The members of the IMF group "Other Western Hemisphere" have not been included in any of our regions.

In the list that follows, a single asterisk indicates that a country was excluded from the estimation of the regional marginal propensity to consume (for lack of data). A double asterisk indicates that it was not only excluded from the estimation of the regional marginal propensity to consume, but that it was also excluded from the regional income totals used to estimate marginal propensities to import (although its trade flows are included in the regional total). The latter incongruity is a result of the level of aggregation at which trade data were available; it was not possible to exclude the trade of these countries from the regional total.

Caribbean

Colombia
Costa Rica
Dominican Republic
El Salvador
Guatemala
Honduras
Mexico
Nicaragua
Panama
Venezuela

South America

Argentina
Bolivia
Brazil
Chile
Ecuador
Paraguay
Peru
Uruguay

Africa

Algeria
Angola**
Burundi**
Cameroun
Cape Verde Islands**
Central African Republic**
Chad*
Congo (Brazzaville)**
Congo (Kinshasa)
Dahomey
Ethiopia
Gabon
Gambia**
Ghana
Guinea, Portuguese**
Guinea, Republic**
Guinea, Spanish*
Ivory Coast
Kenya
Liberia*
Libya
Malagasy*
Malawi
Mali**
Mauritania*
Mauritius
Morocco
Mozambique**
Niger
Nigeria
Reunion*
Rwanda**
Sao Tome**
Senegal
Sierra Leone
Somali Republic**
Somaliland, French**
Southern Rhodesia
Sudan
Tanzania
Togo
Tunisia
Uganda*
Upper Volta
Zambia

Middle East

Bahrein**
Cyprus
Greece
Iran
Iraq
Israel
Jordan
Kuwait
Lebanon
Muscat Oman**
Qatar**
Saudi Arabia
South Yemen**
Syria
Trucial Oman**
Turkey
UAR
Yemen**

South Asia

Ceylon
India*
Pakistan

Far East

Brunei**
Burma
Cambodia
China (Taiwan)
Indonesia
Korea
Laos**
Macao**
Malaysia
Nepal
Philippines
Ryukyus**
Singapore
Thailand
Viet Nam (South)

Appendix B

MARGINAL PROPENSITIES TO IMPORT OUT OF INCOME

Coefficients in the following tables are estimated from Eq. (19). They are significant at 10 percent or better unless otherwise indicated.

Table B-1

MARGINAL PROPENSITIES TO IMPORT OUT OF INCOME
(Trade Definition 1a)

Importer:	Exporter: United States	Canada	Carib-bean	South America	United Kingdom	Germany	France	Other EEC	Other Europe	Africa	Middle East	South Asia	Japan	Far East	ANZA
United States		.01225 (.00126)	.00090 (.00012)	.00107 (.00012)	.00287 (.00029)	.00426 (.00038)	.00096 (.00010)	.00322 (.00026)	.00281 (.00012)	.00066 (.00010)	0	.00037 (.00006)	.00767 (.00039)	.00152 (.00022)	.00111 (.00014)
Canada	.16059 (.00313)		.00818 (.00198)	0	0	.00557 (.00031)	.00279 (.00020)	.00440 (.00041)	.00599 (.00025)	.00190 (.00036)	0	0	.00856 (.00037)	.00226 (.00017)	.00223 (.00026)
Caribbean	.03603 (.00791)	.00333 (.00042)		.00354 (.00035)	.00221 (.00067)	.00782 (.00097)	.00308 (.00043)	.00310 (.00125)	.01067 (.00179)	0	.00029 (.00006)	0	.01038 (.00088)	0	.00057 (.00011)
South America	.01832 (.00742)	.00379 (.00053)	0		0	.00734 (.00312)	0	.00388 (.00130)	.00988 (.00319)	.00138 (.00032)	.00470 (.00083)	-.00094 (.00030)	.00562 (.00155)	-.00052* (.00031)	.00135 (.00031)
United Kingdom	.02406 (.00546)	.00740 (.00125)	0	0		.01256 (.00204)	.00742 (.00113)	.01565 (.00225)	.03827 (.00537)	.01031 (.00201)	.00751 (.00195)	-.00192 (.00058)	.00468 (.00110)	-.00176 (.00039)	.00723 (.00189)
Germany	.01107 (.00157)	0	.00136 (.00022)	.00295 (.00029)	.00598 (.00032)		.02274 (.00090)	.05755 (.00309)	.01673 (.00131)	.01024 (.00113)	.00354 (.00085)	0	.00318 (.00027)	.00130 (.00026)	.00182 (.00018)
France	.00765 (.00072)	.00038 (.00012)	.00050 (.00014)	.00124 (.00012)	.00556 (.00068)	.02918 (.00109)		.03883 (.00178)	.00932 (.00060)	.00775 (.00136)	.00269 (.00104)	.00011 (.00005)	.00111 (.00008)	0	0
Other EEC	.02320 (.00225)	.00358 (.00029)	.00151 (.00030)	.00777 (.00115)	.01187 (.00152)	.06018 (.00199)	.03277 (.00112)		.01744 (.00111)	.01486 (.00150)	.01366 (.00091)	.00077 (.00011)	.00331 (.00022)	.00146 (.00043)	.00216 (.00043)
Other Europe	.01498 (.00067)	.00155 (.00015)	.00263 (.00015)	.00362 (.00036)	.02326 (.00094)	.04296 (.00175)	.01566 (.00106)	.02258 (.00108)		.00650 (.00060)	.00552 (.00077)	.00056 (.00012)	.00582 (.00059)	.00062 (.00012)	.00146 (.00021)
Africa	.02938 (.00298)	.00158 (.00018)	0	.00112 (.00037)	.00446 (.00235)	.02100 (.00203)	-.02206 (.00921)	.03589 (.00424)	.02253 (.00286)		.00573 (.00092)	.00230* (.00130)	.03049 (.00662)	0	.00892 (.00314)
Middle East	.01766 (.00387)	.00102 (.00017)	.00035* (.00019)	.00234 (.00025)	.01219 (.00138)	.01889 (.00169)	.01204 (.00073)	.01964 (.00118)	.01567 (.00072)	.00378 (.00067)		.00329 (.00060)	.01295 (.00093)	0	.00195 (.00046)
South Asia	.03035 (.00536)	.00182* (.00123)	0	0	-.00780 (.00204)	0	.00090 (.00044)	.00229 (.00107)	.00203 (.00055)	0	0		.00594 (.00104)	.00161* (.00097)	.00159* (.00095)
Japan	.01704 (.00130)	.00404 (.00029)	.00167 (.00020)	.00309 (.00022)	.00160 (.00015)	.00222 (.00025)	.00070 (.00004)	.00136 (.00011)	.00170 (.00012)	.00278 (.00024)	.01279 (.00050)	.00143 (.00015)		.00803 (.00059)	.00798 (.00047)
Far East	.06378 (.00981)	.00345 (.00028)	.00104 (.00049)	0	.00258* (.00164)	.01386 (.00172)	.00143 (.00054)	.00835 (.00144)	.00857 (.00090)	-.00292* (.00196)	.01041 (.00200)	.00491 (.00170)	.13182 (.01080)		.01532 (.00109)
ANZA	.04109 (.00404)	.00619 (.00073)	0	.00044 (.00009)	.01529 (.00520)	.01365 (.00115)	.00680 (.00051)	.00954 (.00066)	.00770 (.00068)	-.00209 (.00101)	.00490 (.00070)	-.00098 (.00030)	.02378 (.00133)	-.00172 (.00085)	

( ) standard error; 0 = not significant at ≤ 20 percent.

*Significant at > 10 percent (but ≤ 20 percent).

Table B-2

MARGINAL PROPENSITIES TO IMPORT OUT OF INCOME
(Trade Definition 3)

Importer:	Exporter: United States	Canada	Carib-bean	South America	United Kingdom	Germany	France	Other EEC	Other Europe	Africa	Middle East	South Asia	Japan	Far East	ANZA
United States		.01592 (.00141)	.00100 (.00012)	.00131 (.00021)	.00358 (.00031)	.00530 (.00050)	.00116 (.00010)	.00386 (.00034)	.00310 (.00013)	.00038 (.00012)	0	.00025 (.00009)	.00848 (.00062)	.00207 (.00029)	.00079 (.00018)
Canada	.16545 (.00435)		.00327* (.00173)	0	.00488 (.00096)	.00587 (.00046)	.00296 (.00032)	.00399 (.00060)	.00589 (.00037)	.00156 (.00060)	0	-.00043 (.00017)	.00886 (.00050)	.00237 (.00029)	.00177 (.00035)
Caribbean	.05089 (.00756)	.00316 (.00073)		.00354 (.00076)	.00441 (.00045)	.01066 (.00128)	.00381 (.00086)	.00645 (.00149)	.01553 (.00254)	-.00033* (.00019)	.00032 (.00012)	-.00006* (.00004)	.01284 (.00102)	0	.00049 (.00022)
South America	.02145 (.00805)	.00328 (.00056)	0		0	.00989 (.00373)	0	.00376 (.00177)	.01284 (.00514)	.00185 (.00037)	.00546 (.00121)	-.00158 (.00022)	.00437 (.00164)	-.00051* (.00030)	.00145 (.00054)
United Kingdom	.03609 (.01209)	.00881 (.00310)	0	0		.01558 (.00532)	.00774 (.00297)	.01624 (.00616)	.04394 (.01440)	.01118 (.00547)	0	-.00393 (.00116)	.00434† (.00296)	-.00175 (.00067)	.01078 (.00434)
Germany	.00351 (.00040)	0	.00157 (.00049)	.00314 (.00071)	.00508 (.00072)		.02556 (.00187)	.06994 (.00428)	.01566 (.00355)	.01517 (.00077)	.00436 (.00211)	0	.00432 (.00038)	.00174 (.00039)	.00210 (.00033)
France	.00659 (.00112)	.00045 (.00017)	0	.00083 (.00018)	.00285 (.00082)	.03159 (.00236)		.04519 (.00237)	.00939 (.00110)	.00551 (.00129)	.00621 (.00061)	0	.00142 (.00009)	0	0
Other EEC	.01787 (.00238)	.00445 (.00038)	0	.00433 (.00176)	.00615 (.00111)	.05829 (.00398)	.03207 (.00126)		.01429 (.00127)	.01976 (.00195)	.01653 (.00099)	.00084 (.00022)	.00303 (.00049)	.00168* (.00093)	0
Other Europe	.01894 (.00140)	.00199 (.00031)	.00240 (.00032)	.00458 (.00038)	.02170 (.00145)	.04018 (.00183)	.01220 (.00153)	.02362 (.00186)		.00870 (.00060)	.00740 (.00149)	0	.00773 (.00105)	.00050 (.00020)	.00122 (.00048)
Africa	.02534 (.00492)	.00123 (.00037)	-.00150 (.00064)	.00232 (.00048)	0	.02765 (.00321)	.01050* (.00539)	.04866 (.00603)	.02997 (.00364)		.00894 (.00105)	.00609 (.00242)	.04577 (.01185)	0	.02200 (.00340)
Middle East	.02412 (.00433)	.00100 (.00034)	0	.00261 (.00043)	.01154 (.00277)	.02442 (.00151)	.01317 (.00133)	.02134 (.00166)	.01676 (.00133)	.00276 (.00119)		.00404 (.00107)	.01536 (.00180)	0	.00126* (.00063)
South Asia	-.00629 (00183)	0	0	0	0	0	.00183* (.00094)	0	0	0	0		.00454* (.00252)	0	0
Japan	.01636 (.00091)	.00444 (.00052)	.00116 (.00025)	.00362 (.00024)	.00141 (.00024)	.00202 (.00042)	.00075 (.00008)	.00129 (.00022)	.00172 (.00021)	.00309 (.00043)	.01366 (.00079)	.00162 (.00028)		.00731 (.00093)	.00790 (.00079)
Far East	.03690 (.00934)	.00327 (.00044)	0	0	0	.01377 (.00121)	.00147 (.00069)	.00881 (.00185)	.00862 (.00124)	-.00481* (.00297)	.00930 (.00298)	.00648 (.00261)	.12432 (.01444)		.01402 (.00129)
ANZA	.04129 (.00834)	.00606 (.00119)	-.00047* (.00029)	.00038 (.00017)	.01396Δ (.00963)	.01673 (.00151)	.00788 (.00077)	.01126 (.00088)	.00751 (.00138)	-.00488 (.00141)	.00419 (.00142)	-.00163 (.00033)	.02571 (.00226)	0	

( ) standard error; 0 = not significant at ≤ 20 percent.

*Significant at > 10 percent (but ≤ 20 percent).

†Significant at 20.3 percent.

ΔSignificant at 20.7 percent.

Table B-3

MARGINAL PROPENSITIES TO IMPORT OUT OF INCOME
(Trade Definition 4)

Importer:	Exporter: United States	Canada	Carib-bean	South America	United Kingdom	Germany	France	Other EEC	Other Europe	Africa	Middle East	South Asia	Japan	Far East	ANZA
United States		.02103 (.00128)	.00092* (.00037)	.00146* (.00054)	.00363 (.00087)	.00676 (.00103)	.00089 (.00016)	.00481 (.00063)	.00333 (.00025)	.00044* (.00022)	-.00053 (.00015)	0	.00836 (.00191)	.00282 (.00070)	.00084† (.00049)
Canada	.16706 (.00942)		.00705† (.00508)	0	.00341* (.00151)	.00552 (.00099)	.00177 (.00032)	.00161* (.00060)	.00554 (.00[illegible])	0	-.00062† (.00040)	0	.00898 (.00124)	.00276 (.00092)	.00285 (.00038)
Caribbean	.04357 (.01344)	.00267† (.00151)		.00176† (.00126)	.00248* (.00114)	.00826 (.00222)	0	.00498† (.00279)	.01848 (.00605)	0	0	-.00017* (.00006)	.01350 (.00207)	-.00061* (.00022)	0
South America	.02638* (.00954)	.00348* (.00184)	0		0	.01480 (.00384)	.00445† (.00296)	.00678* (.00339)	.02049† (.01130)	.00131† (.00094)	.00767 (.00217)	-.00146 (.00031)	.00383† (.00243)	0	0
United Kingdom	.03434 (.00254)	0	0	0		.01583 (.00079)	.00786 (.00157)	.01722 (.00183)	.03953 (.00322)	0	.01716 (.00031)	0	.00871 (.00118)	0	0
Germany	.00333* (.00154)	.00210† (.00133)	.00405 (.00037)	0	.00395† (.00280)		.02178 (.00621)	.06614 (.01752)	0	.01295 (.00278)	.01113* (.00477)	0	.00381* (.00135)	0	.00331 (.00079)
France	.00437 (.00056)	-.00020* (.00007)	0	.00072† (.00048)	.00223* (.00102)	.04016 (.00466)		.05314 (.00529)	.00753 (.00257)	.00668† (.00365)	.00756 (.00160)	0	.00159 (.00024)	-.00097 (.00027)	-.00170† (.00115)
Other EEC	.02467 (.00533)	.00347 (.00025)	.00249 (.00026)	0	.00737 (.00210)	.07160 (.00611)	.03434 (.00303)		.01403 (.00250)	.02662 (.00416)	.01564 (.00166)	.00144* (.00060)	.00256† (.00137)	-.00176† (.00112)	0
Other Europe	.01900 (.00551)	0	.00155 (.00028)	.00373* (.00143)	.01568 (.00466)	.0[illegible]82 (.00329)	.00501* (.00196)	.01990 (.00453)		.01111 (.00174)	.01475 (.00363)	0	.00772 (.00388)	-.00046* (.00020)	0
Africa	.02544 (.00661)	0	0	.00281* (.00115)	0	.02022 (.00487)	0	.03346 (.00644)	.02073 (.00579)		.00666 (.00157)	.01092* (.00387)	0	0	.02204 (.00583)
Middle East	.02390† (.01425)	0	-.00105† (.00063)	.00227* (.00119)	.01668* (.00790)	.02667 (.00266)	.01347* (.00474)	.01444 (.00492)	.01478 (.00334)	-.00187† (.00120)		.00590† (.00331)	.01675 (.00548)	-.00411 (.00138)	0
South Asia	-.00565 (.00063)	0	0	-.00036† (.00022)	0	0	0	0	0	0	0		0	0	0
Japan	.01578 (.00184)	.00517 (.00121)	.00066† (.00043)	.00429 (.00029)	.00161* (.00062)	.00315 (.00061)	.00100 (.00004)	.00152 (.00050)	.00190 (.00042)	.00324 (.00051)	.01289 (.00202)	.00214 (.00020)		.00505 (.00094)	.00977 (.00132)
Far East	.02505* (.01113)	.00322 (.00046)	0	.00076 (.00023)	-.00475 (.00154)	.01156 (.00021)	0	.00430 (.00080)	.00877 (.00222)	-.00758 (.00312)	.00515† (.00283)	.00838† (.00495)	.09289 (.00455)		.01187 (.00065)
ANZA	0	.00506† (.00293)	0	.00087* (.00046)	-.02934 (.00428)	.01975 (.00538)	.00603* (.00244)	.01007 (.00260)	.00387 (.00128)	-.00816* (.00406)	.00651 (.00167)	-.00161† (.00100)	.02210* (.00812)	0	

( ) Standard error.
0 = Not significant at ≤ 30 percent.
*Significant at > 10 percent (but ≤ 20 percent).
†Significant at > 20 percent (but ≤ 30 percent).

Appendix C

MARGINAL PROPENSITIES TO IMPORT OUT OF FOREIGN EXCHANGE

Coefficients in the following tables are estimated from equation (21). They are significant at 10 percent or better unless otherwise noted.

Table C-1

MARGINAL PROPENSITIES TO IMPORT OUT OF FOREIGN EXCHANGE
(Trade Definition 1a)

Importer	Exporter: United States	Canada	Carib-bean	South America	United Kingdom	Germany	France	Other EEC	Other Europe	Africa	Middle East	South Asia	Japan	Far East	ANZA	Sum
Caribbean	.47348 (.02563)	.03683 (.00474)		.03809 (.00515)	.03019 (.00468)	.09108 (.00595)	.03391 (.00511)	.04746 (.00860)	.12673 (.01323)	-.00193* (.00110)	.00285 (.00081)	0	.11380 (.01174)	0	.00611 (.00137)	.99865
South America	.35196 (.04003)	.04413 (.00982)	0		.04130 (.01834)	.14338 (.01808)	.02632* (.01578)	.06517 (.00926)	.06459 (.02192)	.01496 (.00524)	.05447 (.01395)	-.01348 (.00332)	.08359 (.01432)	0	.01218 (.00578)	.98857
Africa	.16049 (.03712)	.00888 (.00194)	0	.00836 (.00187)	.03340 (.01376)	.13470 (.01154)	0	.23550 (.01384)	.14759 (.01386)		.03898 (.00358)	.01680 (.00776)	.21888 (.02506)	.00596* (.00337)	.07021 (.01444)	1.07975
South Asia	.72585 (.05792)	.03864* (.02687)	0	0	-.14895 (.05310)	.04156* (.02739)	.01952 (.00950)	.05578 (.02164)	.04866 (.00983)	0	0		.13378 (.01932)	0	.04375 (.01849)	.95859
Far East	.24964 (.01885)	.01288 (.00064)	.00497 (.00145)	0	.01290 (.00520)	.05222 (.00445)	.00570 (.00180)	.01284 (.00321)	.03074 (.00372)	0	.04101 (.00511)	.01542 (.00690)	.41925 (.01913)		.05656 (.00258)	1.00605

Table C-2

MARGINAL PROPENSITIES TO IMPORT OUT OF FOREIGN EXCHANGE
(Trade Definition 3)

Importer	Exporter: United States	Canada	Carib-bean	South America	United Kingdom	Germany	France	Other EEC	Other Europe	Africa	Middle East	South Asia	Japan	Far East	ANZA	Sum
Caribbean	.46207 (.02928)	.02932 (.00477)		.03252 (.00436)	.03841 (.00341)	.09483 (.00520)	.03213 (.00532)	.05959 (.00956)	.13463 (.02180)	-.00271* (.00168)	.00227* (.00128)	0	.11141 (.00817)	0	.00457 (.00171)	1.00004
South America	.32476 (.03530)	.03525 (.01012)	.02536* (.01351)		.04020 (.02259)	.14841 (.01917)	0	.06041 (.01096)	.19910 (.02298)	.01844 (.00697)	.06773 (.01180)	-.01697 (.00454)	.06433 (.00970)	0	.01275* (.00833)	.97997
Africa	.10065 (.02437)	.00553 (.00117)	-.00647 (.00254)	.00948 (.00212)	.03097 (.01772)	.11648 (.00953)	.04522 (.07162)	.20740 (.01218)	.12696 (.00957)		.03714 (.00412)	.02202 (.01119)	.22916 (.02927)	0	.08749 (.01793)	.99265
South Asia	0	.21604* (.11930)	0	0	0	.26716 (.11120)	.08851 (.05698)	.27176 (.05061)	.13767 (.01787)	0	0		.24798 (.09830)	.15596* (.10310)	0	1.38528
Far East	.17201 (.02706)	.01460 (.00069)	0	0	0	.05978 (.00367)	.00638 (.00296)	.04135 (.00288)	.02555 (.00710)	0	.04587 (.00796)	.02575 (.01220)	.54770 (.03182)		.06071 (.00456)	1.00965

( ) standard error; 0 = not significant at 20 percent or better.

*Significant at > 10 percent (but ≤ 20 percent).

Table C-3

MARGINAL PROPENSITIES TO IMPORT OUT OF FOREIGN EXCHANGE
(Trade Definition 4)

Importer:	Exporter: United States	Canada	Carib-bean	South America	United Kingdom	Germany	France	Other EEC	Other Europe	Africa	Middle East	South Asia	Japan	Far East	ANZA	Sum
Caribbean	.45657 (.01990)	.03033 (.00893)		.02121* (.00806)	.02622 (.00791)	.08481 (.00423)	0	.05394* (.02030)	.19515 (.01292)	0	0	0	.12930 (.02178)	-.00620 (.00150)	0	.99133
South America	.26428 (.03749)	.03907 (.00412)	0		.05583* (.01960)	.13636 (.03145)	.05435 (.00818)	.07400 (.01068)	.23513 (.01739)	.01571 (.00446)	.07060 (.01827)	-.01242* (.00434)	.04606 (.00567)	0	0	.97897
Africa	.14956* (.07428)	0	0	.02146 (.00307)	0	.13366 (.03787)	0	.22833 (.03552)	.14131 (.03618)		.04146* (.01612)	.07905 (.01627)	.12741* (.05705)	-.01101* (.00445)	.12636† (.06786)	1.03759
South Asia	0	-.13787† (.07980)	0	0	.53838† (.34380)	.49433 (.16640)	-.08364* (.03893)	0	.16555* (.03636)	0	-.39765† (.27250)		.71002 (.22730)	0	0	1.22912
Far East	.16751 (.05453)	.02018 (.00242)	0	.00448* (.00184)	-.02853* (.01107)	.07112 (.00820)	0	.02578 (.00715)	.05450 (.01421)	-.04760* (.01905)	.03384* (.01595)	.05361† (.02964)	.57438 (.05906)		.07288 (.00990)	1.00215

( ) standard error.
0 = not significant at 30 percent or better.
*Significant at > 10 percent (but ≤ 20 percent).
†Significant at > 20 percent (but ≤ 30 percent).

Appendix D

VECTORS OF FIRST-ROUND EXPORT CHANGES

Note that Vectors 1-8 of this report are not the same as Vectors 1-8 in the main report of this series, Slighton et al., 1972. For a discussion of the principal differences, see p. 27.

Table D-1

FIRST-ROUND EXPORT CHANGES
(millions of U.S.$)

	Vector							
	1	2	3	4	5	6	7	8
United States	-467.8	-352.3	-290.1	-375.4	-317.7	-252.7	-167.9	-283.0
Canada	12.7	-25.6	-19.6	-26.8	-21.1	-35.1	-28.6	-36.6
Caribbean	2.0	3.1	3.8	2.5	3.2	3.3	4.1	2.7
South America	6.4	8.8	11.0	8.1	10.2	9.3	11.7	8.4
United Kingdom	72.3	46.1	19.8	30.8	1.4	20.7	-10.3	2.2
Germany	73.3	52.3	-84.7	33.6	-106.8	40.0	-127.7	17.4
France	41.7	-53.7	-44.1	75.9	110.4	-79.7	-76.3	80.1
Other EEC	67.4	90.6	97.2	71.0	73.9	69.5	91.1	45.9
Other Europe	59.8	87.6	78.5	72.2	60.3	87.4	74.9	68.6
Africa	3.9	8.1	11.0	6.6	9.2	8.0	11.2	6.2
Middle East	7.6	14.1	18.9	12.4	16.9	13.3	18.6	11.3
South Asia	3.2	8.0	11.3	6.4	9.4	9.0	12.8	7.0
Japan	79.8	34.9	86.1	13.2	60.2	27.5	82.9	0.8
Far East	16.0	32.9	41.6	30.0	38.1	33.2	42.4	29.7
ANZA	21.7	45.2	59.2	39.5	52.3	46.2	61.1	39.2

Appendix E

RESPENDING ESTIMATES

Note that Vectors 1-8 in this report are not the same as Vectors 1-8 in the main report of this series, Slighton et al., 1972. For a discussion of the principal differences, see p. 27.

Table E-1

RESPENDING EFFECTS--BASE CASE, TRADE DEFINITION 1a
NET BOP CHANGE
(millions of U.S.$)

	Vector							
Region	1	2	3	4	5	6	7	8
United States	71.2	52.9	49.6	51.3	47.7	36.9	31.8	35.3
Canada	-10.4	8.4	6.9	8.1	6.6	13.7	12.3	13.3
Caribbean	-.2	-.9	-1.1	-.8	-1.1	-1.1	-1.4	-1.0
South America	1.0	.6	-.4	.5	-.6	.0	-1.0	-.1
United Kingdom	-17.2	-7.7	-.7	-3.1	4.8	-.6	7.8	5.0
Germany	-3.2	3.2	44.1	11.6	54.1	2.2	53.2	12.5
France	2.4	26.8	18.1	-7.4	-22.6	30.4	22.7	-11.7
Other EEC	-20.6	-36.6	-49.0	-23.1	-33.0	-29.3	-51.5	-12.8
Other Europe	-10.3	-22.1	-23.2	-17.0	-17.2	-25.1	-25.7	-18.8
Africa	5.6	2.8	-1.0	3.7	.1	.9	-3.4	2.1
Middle East	5.1	2.9	1.4	2.7	1.0	1.7	.1	1.4
South Asia	-.6	-1.3	-1.7	-1.0	-1.3	-1.4	-1.8	-1.1
Japan	-5.7	9.2	6.4	9.6	6.9	10.8	7.8	11.3
Far East	-13.6	-28.0	-35.2	-25.6	-32.4	-28.2	-35.9	-25.3
ANZA	-3.5	-10.8	-14.1	-9.4	-13.0	-11.0	-15.1	-10.0

Table E-2

RESPENDING EFFECTS--BASE CASE, TRADE DEFINITION 3
NET BOP CHANGE
(millions of U.S.$)

	Vector							
Region	1	2	3	4	5	6	7	8
United States	76.2	53.7	49.1	52.6	47.7	36.0	29.1	34.9
Canada	-12.2	7.2	5.8	6.7	5.3	12.9	11.7	12.3
Caribbean	-1.0	-1.5	-2.0	-1.4	-1.9	-1.6	-2.1	-1.5
South America	.2	-.3	-1.3	-.4	-1.5	-.7	-1.8	-.9
United Kingdom	-22.6	-12.0	-3.4	-7.1	2.4	-3.3	6.9	2.6
Germany	-6.2	.4	45.2	9.8	56.2	-.2	55.4	11.3
France	2.4	27.9	18.4	-8.0	-24.4	31.7	23.0	-12.4
Other EEC	-14.7	-31.2	-46.4	-17.4	-30.0	-25.5	-50.6	-8.6
Other Europe	-10.9	-23.1	-24.3	-17.9	-18.2	-26.1	-26.8	-19.7
Africa	4.4	1.2	-3.5	1.9	-2.7	-.4	-5.6	.4
Middle East	4.8	2.2	.3	2.8	1.0	1.0	-1.0	1.7
South Asia	.1	.6	1.2	.6	1.2	.8	1.5	.7
Japan	-5.7	9.0	5.5	9.4	5.9	10.6	6.8	11.0
Far East	-11.6	-23.8	-29.8	-21.8	-27.5	-23.9	-30.3	-21.6
ANZA	-3.1	-10.4	-14.7	-9.6	-13.7	-11.4	-16.0	-10.3

Table E-3

RESPENDING EFFECTS--BASE CASE, TRADE DEFINITION 4
NET BOP CHANGE
(millions of U.S.$)

	Vector							
Region	1	2	3	4	5	6	7	8
United States	78.9	52.6	45.7	52.3	45.3	33.6	24.2	33.6
Canada	-16.4	3.7	2.8	3.2	2.2	10.3	9.8	9.7
Caribbean	-.3	-1.0	-1.9	-1.0	-1.9	-1.3	-2.3	-1.3
South America	-2.1	-2.7	-3.1	-2.7	-3.0	-2.8	-3.2	-2.7
United Kingdom	-23.6	-15.3	-7.9	-10.2	-1.7	-7.1	1.8	-.9
Germany	-1.6	2.4	41.8	13.4	54.8	.3	49.5	13.7
France	-.6	26.7	18.2	-11.8	-27.7	31.3	24.1	-16.1
Other EEC	-21.9	-40.3	-53.7	-24.3	-34.6	-33.0	-56.7	-13.4
Other Europe	-11.1	-21.4	-19.8	-16.8	-14.3	-23.8	-21.2	-18.1
Africa	6.6	4.0	-.5	5.1	.7	1.9	-3.0	3.2
Middle East	9.2	5.5	1.4	5.8	1.8	3.2	-1.5	3.6
South Asia	1.8	2.3	2.8	2.0	2.4	2.1	2.6	1.7
Japan	-9.5	3.2	-1.3	4.1	-.2	4.9	.2	6.1
Far East	-9.7	-18.4	-22.3	-17.2	-20.9	-18.2	-22.3	-16.8
ANZA	.5	-1.3	-2.0	-2.0	-2.9	-1.5	-2.3	-2.4

Table E-4

RESPENDING EFFECTS--FIRST-ROUND LOSERS COMPENSATE, TRADE DEFINITION 1a
NET BOP CHANGE
(millions of U.S.$)

Region	Vector 1	2	3	5	7
United States	33.9	35.1	38.0	34.0	36.5
Canada	-2.5	3.2	3.5	2.9	3.2
Caribbean	.7	.2	-.0	.1	-.2
South America	2.1	1.8	1.3	1.2	.9
United Kingdom	-14.5	-4.8	3.1	8.5	8.8
Germany	1.5	10.7	26.3	27.4	24.5
France	4.1	15.6	13.2	-16.0	12.2
Other EEC	-17.8	-31.3	-38.4	-22.9	-36.1
Other Europe	-7.4	-18.3	-17.3	-11.2	-17.5
Africa	6.6	4.6	2.3	3.3	1.6
Middle East	5.7	3.9	3.1	2.7	2.7
South Asia	-.2	-1.0	-1.3	-1.0	-1.6
Japan	3.2	16.9	13.9	14.9	14.3
Far East	-13.3	-27.7	-35.0	-32.1	-35.7
ANZA	-2.2	-9.1	-12.7	-11.5	-13.6

Table E-5

RESPENDING EFFECTS--FIRST-ROUND LOSERS COMPENSATE, TRADE DEFINITION 3
NET BOP CHANGE
(millions of U.S.$)

	Vector				
Region	1	2	3	5	7
United States	32.1	30.6	31.9	27.9	29.6
Canada	-2.2	3.5	3.7	3.0	3.3
Caribbean	-.3	-.9	-1.3	-1.1	-1.4
South America	1.5	1.0	.4	.3	.1
United Kingdom	-19.5	-8.9	.1	6.1	6.9
Germany	-.4	8.9	25.8	27.4	24.0
France	4.6	16.5	13.9	-16.5	12.9
Other EEC	-10.8	-24.1	-32.2	-16.5	-30.4
Other Europe	-7.5	-19.0	-18.1	-12.0	-18.4
Africa	5.1	2.5	-.4	.4	-1.1
Middle East	5.5	3.6	2.7	3.1	2.4
South Asia	.4	.9	1.5	1.5	1.7
Japan	4.4	17.9	14.4	15.4	14.7
Far East	-10.8	-23.1	-29.2	-26.8	-29.8
ANZA	-2.1	-9.4	-13.4	-12.2	-14.4

Table E-6

RESPENDING EFFECTS--FIRST-ROUND LOSERS COMPENSATE, TRADE DEFINITION 4
NET BOP CHANGE
(millions of U.S.$)

	Vector				
Region	1	2	3	5	7
United States	28.2	24.3	24.1	20.8	21.8
Canada	-3.2	2.5	2.8	2.4	2.7
Caribbean	.6	.0	-.5	-.4	-.7
South America	-.8	-1.7	-2.2	-2.1	-2.5
United Kingdom	-20.5	-12.4	-4.7	1.6	1.6
Germany	6.0	13.6	28.6	32.1	26.5
France	1.2	13.7	11.6	-21.2	10.7
Other EEC	-17.9	-33.2	-40.9	-23.0	-38.6
Other Europe	-7.4	-17.3	-15.7	-10.6	-16.1
Africa	7.7	6.0	3.6	4.6	2.9
Middle East	9.8	7.1	4.9	4.9	3.9
South Asia	2.0	2.6	3.2	2.8	3.1
Japan	.5	11.7	6.7	8.4	6.8
Far East	-8.1	-17.1	-21.3	-19.8	-21.7
ANZA	1.9	-.1	-.2	-.7	-.5

Table E-7

RESPENDING EFFECTS--LESS-DEVELOPED REGIONS FOREIGN EXCHANGE CONSTRAINED,
TRADE DEFINITION 1a
NET BOP CHANGE
(millions of U.S.$)

Region	Vector 1	Vector 2	Vector 7
United States	79.8	66.0	48.6
Canada	-9.8	9.2	13.3
Caribbean	-2.0	-3.1	-4.1
South America	-6.4	-8.8	-11.7
United Kingdom	-16.5	-7.1	8.0
Germany	-.4	7.0	57.1
France	3.7	28.6	24.5
Other EEC	-18.5	-34.0	-48.9
Other Europe	-8.0	-19.1	-22.6
Africa	-3.9	-8.1	-11.2
Middle East	6.0	4.1	1.3
South Asia	-3.2	-8.0	-12.8
Japan	-1.6	15.3	14.7
Far East	-16.0	-32.9	-42.4
ANZA	-2.6	-9.1	-13.8

Table E-8

RESPENDING EFFECTS--LESS DEVELOPED REGIONS FOREIGN EXCHANGE CONSTRAINED,
TRADE DEFINITION 3
NET BOP CHANGE
(millions of U.S.$)

Region	Vector 1	Vector 2	Vector 7
United States	81.7	62.1	39.1
Canada	-11.5	8.6	13.7
Caribbean	-2.0	-3.1	-4.1
South America	-6.4	-8.8	-11.7
United Kingdom	-21.7	-10.7	8.1
Germany	-3.1	5.3	61.2
France	3.6	29.7	25.1
Other EEC	-12.2	-27.3	-46.1
Other Europe	-8.4	-19.5	-22.8
Africa	-3.9	-8.1	-11.2
Middle East	5.9	3.7	.8
South Asia	-3.2	-8.0	-12.8
Japan	-.5	18.1	17.8
Far East	-16.0	-32.9	-42.4
ANZA	-2.3	-9.1	-14.7

Table E-9

RESPENDING EFFECTS--LESS-DEVELOPED REGIONS FOREIGN EXCHANGE CONSTRAINED,
TRADE DEFINITION 4
NET BOP CHANGE
(millions of U.S.$)

Region	Vector 1	Vector 2	Vector 7
United States	84.0	60.6	33.4
Canada	-16.3	3.8	9.8
Caribbean	-2.0	-3.1	-4.1
South America	-6.4	-8.8	-11.7
United Kingdom	-21.5	-11.5	7.1
Germany	3.0	9.9	58.5
France	-.1	27.4	24.7
Other EEC	-19.8	-37.4	-53.8
Other Europe	-8.1	-17.0	-16.1
Africa	-3.9	-8.1	-11.2
Middle East	9.1	4.9	-2.8
South Asia	-3.2	-8.0	-12.8
Japan	-1.0	19.0	20.8
Far East	-16.0	-32.9	-42.4
ANZA	2.2	1.3	.4

Table E-10

RESPENDING EFFECTS--LESS-DEVELOPED REGIONS FOREIGN-EXCHANGE CONSTRAINED AND FIRST-ROUND LOSERS COMPENSATE, TRADE DEFINITION 1a
NET BOP CHANGE
(millions of U.S.$)

Region	Vector 1	Vector 2	Vector 7
United States	43.6	49.8	55.8
Canada	-1.9	4.1	4.4
Caribbean	-2.0	-3.1	-4.1
South America	-6.4	-8.8	-11.7
United Kingdom	-13.7	-4.0	9.4
Germany	4.8	15.1	29.6
France	5.6	17.7	14.5
Other EEC	-15.5	-28.2	-32.7
Other Europe	-4.7	-14.8	-13.5
Africa	-3.9	-8.1	-11.2
Middle East	6.7	5.2	4.2
South Asia	-3.2	-8.0	-12.8
Japan	7.9	23.8	22.5
Far East	-16.0	-32.9	-42.4
ANZA	-1.3	-7.8	-12.0

Table E-11

RESPENDING EFFECTS--LESS-DEVELOPED REGIONS FOREIGN-EXCHANGE CONSTRAINED AND FIRST-ROUND LOSERS COMPENSATE, TRADE DEFINITION 3
NET BOP CHANGE
(millions of U.S.$)

	Vector		
Region	1	2	7
United States	38.8	40.2	41.4
Canada	-1.4	5.1	5.5
Caribbean	-2.0	-3.1	-4.1
South America	-6.4	-8.8	-11.7
United Kingdom	-18.4	-7.5	8.5
Germany	3.1	14.2	30.9
France	5.9	18.6	15.5
Other EEC	-8.0	-19.8	-25.0
Other Europe	-4.6	-14.9	-13.5
Africa	-3.9	-8.1	-11.2
Middle East	6.7	5.3	4.5
South Asia	-3.2	-8.0	-12.8
Japan	10.4	27.8	27.2
Far East	-16.0	-32.9	-42.4
ANZA	-1.1	-8.0	-12.8

Table E-12

RESPENDING EFFECTS--LESS-DEVELOPED REGIONS FOREIGN-EXCHANGE CONSTRAINED AND FIRST-ROUND LOSERS COMPENSATE, TRADE DEFINITION 4
NET BOP CHANGE
(millions of U.S.$)

	Vector		
Region	1	2	7
United States	34.6	33.6	33.0
Canada	-3.0	2.7	2.8
Caribbean	-2.0	-3.1	-4.1
South America	-6.4	-8.8	-11.7
United Kingdom	-18.2	-8.3	7.3
Germany	11.3	21.9	37.1
France	1.9	14.5	11.5
Other EEC	-15.4	-29.8	-34.8
Other Europe	-3.8	-12.2	-9.9
Africa	-3.9	-8.1	-11.2
Middle East	9.9	6.6	2.8
South Asia	-3.2	-8.0	-12.8
Japan	10.3	29.0	29.5
Far East	-16.0	-32.9	-42.4
ANZA	3.9	2.9	2.9

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