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Foreign Aid and U.S. Exports

A Statistical Analysis

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April 1964

- Part I: U. S. Exports and Economic Growth
- Part II: Changes in U.S. Exports, Aid, and Foreign Currency Availability, 1957-1962
- Part III: Influence on U.S. Exports of Changes in Foreign Currency Availability and Aid
- Part IV: Estimates of Substitution and First Round Responding Effects on U.S. Exports
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FOREIGN AID AND U.S. EXPORTS: A STATISTICAL ANALYSIS

Two factors affect the volume of U.S. exports to less developed countries. The first is the availability of convertible foreign exchange, and the second is the local preference for U.S. goods as opposed to those from other foreign sources. Foreign aid may provide funds with which imports from the U.S. may be purchased. Foreign aid may also consist of U.S. commodities rather than U.S. dollars and thus contribute directly to the flow of U.S. exports. In either of these two cases a part of the aid-financed commodities may supplant U.S. commercial exports which the importing country would wish to buy even in the absence of foreign aid. If this should be true, the net increases in exports resulting from the aid program may be less than the gross value of the commodities directly furnished by the program. It may also happen that repayments of past foreign assistance loans decrease the amount of available foreign currency and lead to a reduction of imports from the U.S.

On the positive side, aid funds not directly used for U.S. exports will either find their way back to the U.S. as payments for U.S. goods or services (either from the original country or via trade with third countries) or will serve to increase gold or dollar reserves, mostly in the more developed countries. The net effect of these responding effects will probably be a further increase in U.S. exports, but it is also possible that leakage into foreign reserves can be a severe drain on U.S. dollars. Aid provided to individual countries will also increase the appetite for U.S. goods through both a demonstration and an income effect. The

demonstration effect grows out of the acquaintance of country nationals with U.S. products, both as they are provided to the country as part of the assistance program and as they are demonstrated to foreign nationals being trained in the United States. The income effect reflects the greater demand for imports as poorer nations develop and as standards of living increase. This increased demand is probably quite generalized and does not necessarily work in the favor of the U.S. as opposed to other exporting countries. Nevertheless it may be one of the principal reasons why U.S. exports, as well as those from other countries, are increasing to the less developed portions of the world.

In untangling the various factors influencing U.S. exports, three questions emerge which are largely of a quantitative and statistical nature.

- a) What portion of untied aid dollars return to the U.S. as demand for U.S. exports? (This may be referred to as the "responding effect" of U.S. aid dollars.)
- b) To what extent do aid-financed exports tend to supplant commercial exports in local markets? (This may be called the "substitution effect" of U.S. foreign assistance.)
- c) To what extent can we count on the process of economic growth itself to generate future demand for U.S. exports?

The remainder of this paper will discuss various answers to these questions. Part I presents evidence on the relationship between U.S. exports and an importing country's average income. Part II compares changes between 1957-58 and 1961-62 in various categories of U.S. exports and U.S.

aid. In part III, we investigate the effect on exports of foreign currency availability, and in parts IV and V these statistical results are tested against a hypothetically constructed "substitution-responding" model and against a parallel statistical analysis performed by Lawrence Lynn of Yale University. Part VI discusses a number of conclusions derived from the earlier analyses, extends the results to include third-country responding effects, and estimate the net true effect of tying on the A.I.D.'s fiscal 1964 expenditures. The major conclusions and results of the study are summarized in part VII.

I.

Of the three questions posed above, the one on the effect of economic growth on U.S. exports is perhaps easiest to answer. We know that in 1962 the U.S. exports to the United Kingdom came to \$20 per inhabitant and those to Japan amounted to \$15 per inhabitant. In Greece, on the other hand, which has been developing successfully but whose per capita GNP was only about \$450, U.S. exports were only \$8 per inhabitant. In India, which aside from its low income (about \$80 GNP per person) is a fairly good market for U.S. goods, 1962 U.S. exports came to only \$1.50 per person.

These results may be generalized by finding a mathematical relationship between U.S. exports per inhabitant and a country's Gross National Product per inhabitant. This has been done using a sample of 50 countries who averaged \$5 millions or more of net U.S. foreign economic assistance in 1960 and 1961. The sample was drawn from recipients of major U.S.

Government foreign assistance listed in the Statistical Abstract of the U.S., 1962, pp. 865-867, and forms the basis for most of the analytical work reported in this paper. It includes such countries as Austria, Spain, Poland, Yugoslavia, Hong Kong, and Japan, but excludes because of data limitations four other principal aid-receiving countries: Congo (Leopoldville), Nepal, Ryukyu Islands, and Trust Territory of the Pacific Islands. A list of the fifty "principal aid-receiving" countries included in the sample is given in the notes to Table 1.

The variables used in this part of the study were the following:

E_i : Exports of domestic commodities, including Special Category, from the U.S. to country i , in millions of dollars at prices f.o.b. U.S. (Source: U.S. Census Bureau unpublished, classified ledgers.)

E_{c_i} : Commercial exports, including Special Category items, from U.S. to country i , defined as equal to total exports (E_i) minus Exports directly financed under economic assistance programs (E_{a_i}) and minus goods transferred under military grants (E_{m_i}), in millions of dollars (Source: A.I.D., Statistics and Reports Division, unpublished worksheets for E_{a_i} ; and U.S. Bureau of the Census, classified unpublished ledgers for E_{m_i})

It may be noted that "economic assistance programs" throughout this study generally include A.I.D. and predecessor agencies, the Food for Peace (PL-480) programs, Export-Import Bank credits (net of reimbursements by private participants), and other major programs such as Peace Corps, Interamerican Highway construction, etc.

P_i : Population of country i , in millions (A.I.D. estimates)

Y_i : Gross national product of country i in 1961 prices, converted to U.S. dollars at the 1961 official or other effective exchange rate, in millions of dollars (Source: A.I.D., Statistics and Reports Division, Economic Data Books, first half of 1963)

D_i^r : Dummy variable taking value of 10 if country i belongs to region r and taking value of zero otherwise.

r : 1, if region is Near East and South Asia (NESAs)
2, if region is Africa
3, if region is Europe
4, if region is Latin America
5, if region is Far East

(For countries included in each region, see footnote a to Table 1)

The variables were fitted to a log-linear relationship using ordinary least-squares. Both exports and GNP were deflated by dividing by population. The dependent variables used were thus E_i/P_i and Ec_i/P_i . Structural coefficients found for the average of 1957 and 1958 were:

$$(1) \log E_i/P_i = -2.321 + 1.469 \log Y_i/P_i + d_r \log D_i^r \quad (\bar{R}^2 = .615)$$

(.463) (.217)

where $d_r = -.222$ for $r = 1$ (NESAs)
 (.182)
 = $-.117$ for $r = 2$ (Africa)
 (.208)
 = $-.527$ for $r = 3$ (Europe)
 (.283)
 = $+.137$ for $r = 4$ (Latin America)
 (.184)

$$(2) \log Ec_i/P_i = -3.178 + 1.664 \log Y_i/P_i + d^r \log D_i^r \quad (\bar{R}^2 = .658)$$

(.541) (.254)

where $d_r = -.173$ for $r = 1$ (NESAs)
 (.214)
 = $+.096$ for $r = 2$ (Africa)
 (.244)
 = $-.664$ for $r = 3$ (Europe)
 (.330)
 = $+.455$ for $r = 4$ (Latin America)
 (.215)

The numbers in parentheses represent standard errors of each coefficient; \bar{R}^2 represents the coefficient of multiple determination, corrected for degrees of freedom. The regional coefficients (d_r) differ significantly from the general constant term (-2.321 and -3.178, respectively, in equations 1 and 2) only in the case of Europe (both equations) and Latin America (equation 2, only). Nevertheless, the introduction of these regional variables improves the goodness of fit appreciably: if regional differences are not allowed for the coefficients of multiple determination drop to .544 for equation (1) and .490 for equation (2). The coefficient pertaining to the per capita GNP variable, Y_i/P_i , is highly significant. The coefficients of multiple determination (which correspond to the portion of variance in the dependent variables, $\log E_i/P_i$ and $\log Ec_i/P_i$, which is associated with per capita GNP and the country's particular region) are respectable for size-deflated equations of this type. The coefficients nevertheless suggest that a considerable portion of the variation in per capita exports (35 to 40% of the total) is apparently not associated with per capita income or with broad regional characteristics.

Understanding of these two equations may be improved by rewriting them as follows:

$$(1') \quad E_i/P_i = \left(\frac{Y_i}{P_i}\right)^{1.469} d_r'$$

$$(2') \quad Ec_i/P_i = \left(\frac{Y_i}{P_i}\right)^{1.664} d_r'$$

The exponents of (Y_i/P_i) correspond to income elasticities as conventionally measured. (Thus the exponent 1.469 signifies that for a per capita GNP change of 10% in any region, U.S. exports per inhabitant of that region should increase by about 15%, or more precisely, by 14.7%.) The coefficients, d'_r , indicate the relative importance of the various regions to U.S. exports, expressed in terms of U.S. exports per inhabitant of the region. The values of these regional coefficients for each of these latter two equations are:

Region	value of d'_r	
	Total U.S. Exports per Inhabitant (eq. 1')	Commercial U.S. Exports per In- habitant (eq. 2')
Near East and South Asia	.00286	.00045
Africa	.00365	.00083
Europe	.00142	.00014
Latin America	.00655	.00189
Far East	.00478	.00066

These regional coefficients state that, if it were not for differences in per capita gross national product, one might expect that U.S. exports to Latin America would be more than four times as great, per inhabitant, than U.S. exports to Europe. The differences among regions appear to be even greater when commercial U.S. exports alone are considered.

The statistical results reported above are consistent with some of the observed changes in U.S. exports in recent years. The income elasticities found, for example, are similar to those determined by other

observers for total imports by the less developed countries.¹ This would indicate that, other things equal, U.S. exports to these countries should increase about as rapidly as do the exports from other developed nations. This indeed appears to have happened between 1957-58 and 1961-62 in three of the five regional groups of countries. U.S. commercial exports failed to hold their own, however, in the six African countries and the seventeen Latin American countries included in our sample.

The results reported here are not consistent with an earlier study by Hollis Chenery in which the introduction of an additional explanatory variable, importing country population, significantly improved the goodness-of-fit and reduced the per capita income elasticity to close to 1.0.² For our 50-country sample, Professor Chenery's model, with a per capita income elasticity of .987, gives a 1961-62 estimate of total imports from all sources that is about 89 per cent of the total derived from use of equation (2), above, which has a per capita income elasticity of 1.66. When the equations are transformed to represent relative change between year t and base year 0 , and 1961-62 estimates are derived using these formulas and 1957-58 actuals (all imports being expressed in constant

¹A recent U.N. estimate has suggested that income elasticities for different classes of imports by the developing countries range from .35 to 1.85, with an implied average for all imports of 1.28. The implicit income elasticity for the manufactured commodity portion of this total is 1.21. (See United Nations, Department of Economic and Social Affairs, World Economic Survey, 1962, Part I: "The Developing Countries in World Trade," p.6. The implied elasticities are derived from ibid., Table 1-6, lines 1,3, and 3b.) Gross income elasticities implied by the per capita elasticities found above (1.47 to 1.66) would be about 1.25 to 1.36, assuming a population growth rate of 2.3 per cent and an annual GNP rate of growth of 5 per cent.

²Hollis B. Chenery, "Patterns of Industrial Growth," American Economic Review, v. L, no. 4(September 1960), 631-639, esp. p. 634, Table 4.

prices), the following results are obtained:

	Actual Total Imports 1961-62 (1958 prices)	Percentage Difference Between Estimated and Actual Totals		
		Chenery model ^a	Eq. b (2)	Eq. c (1)
49-country total ^d	\$27,121 m.	-6.0%	+5.7%	+2.8%
Total, excl. Venezuela	26,251	-9.3	+2.6	-0.2
Total, excl. Venezuela and Japan	21,591	-10.5	-2.8	-5.5

$$^a \text{Rewritten as: } E_t/E_o = (1 + p)^{n(1+c)}(1 + g)^{nd}$$

where E = imports by country i

p = annual population growth rate of country i

g = annual rate of increase in per capita GNP of country i

c = population exponent found by Chenery (-.281)

d = per capita income elasticity found by Chenery (.987)

o = annual average, 1957-58

t = annual average, 1961-62

n = 4 (number of years between 1957-58 and 1961-62)

$$^b \text{Rewritten as: } E_t/E_o = (1 + p)^n(1 + g)^{1.66n}$$

$$^c \text{Rewritten as: } E_t/E_o = (1 + p)^n(1 + g)^{1.46n}$$

(The per capita income elasticity used in this case, 1.46, was derived not from total U.S. exports but from total U.S. exports minus military grant transfers. It differs slightly from that shown above for equation 1.)

^dPoland was excluded from the test because of lack of comparable GNP data.

(The estimates for 1961-62 were in fact derived from regional averages of the variables rather than from country detail and may have a slight downward bias of perhaps 1-2 per cent.)

The Chenery model tends to underestimate the increase which took place between 1957-58 and 1961-62, and this underestimation increases when Venezuela is excluded. The other two models overstate the increase for the sample as a whole, come close to the actuals when Venezuela is omitted, and fall below actual increases when both Venezuela and Japan are excluded from the sample. (Imports to Venezuela fell sharply between 1957-58 and 1961-62, apparently as a result of decreased U.S. private investment in the oil industry; Japan's imports increased rapidly during the period, but not as rapidly as would be implied by a per capita income elasticity of 1.46 or 1.66.)

It should be noted that neither model was derived from precisely the sample data upon which this test was made. Professor Chenery derived his statistical findings from a 63-country sample, included many of the wealthier countries, and imports for the period 1952-54. The results from the current study are based upon U.S. exports only. It is also worthy of note that neither the Chenery model nor the one derived in this study from the actual data do well in predicting 1961-62 U.S. commercial exports, given actual 1957-58 U.S. commercial exports. Both models do moderately well in Africa, the Far East excluding Japan, and the Near East and South Asia. Both models, however, underestimate by large amounts the increase in exports to Europe and overestimate by large amounts the increases to Venezuela and to other Latin American countries. The Chenery model underestimates the 1961-62 level of exports to Japan by 12 per cent, and equation (2) overestimates the same figure by 17 per cent.

It appears that other variables are at work which influence a country's imports in addition to per capita income, regional location and (in the case of the Chenery model) country size. Some of these additional variables, namely those representing foreign currency and other resource variability, are examined in part II (see especially Table 2). In part III these new variables are formally incorporated into a statistical model.

II.

A partial understanding of the relation between aid and U.S. exports may be obtained by comparing observed changes in aid and exports over time. If, for a particular region, the absolute increase in aid-financed exports is larger than the absolute increase in total U.S. exports, then it is fairly certain that there has been a net loss of U.S. commercial markets. If total U.S. exports increase more than do aid-financed exports but less than the change in total aid, then it is at least possible that there has been a net loss in U.S. commercial markets. (This is because some of the apparent increase in U.S. exports, over and above that attributable to direct aid-financing, may be indirectly related to increases in the non-commodity portion of aid.) If, however, total U.S. exports increase more than does total U.S. aid, the conclusion must be that while some commercial markets may have been lost to aid-financed goods, on balance there must have been an absolute gain in strictly commercial U.S. exports. Finally, if the ratio of U.S. "commercial" exports (that is,

those exports not directly traceable to aid-financed, U.S. procurement) to a country or a region's imports from the whole world is constant or is rising, there is evidence that U.S. commercial exports are successfully maintaining or increasing their share of local markets.

The evidence for the years 1957-58 to 1961-62 is presented in Table 1 and summarized below for the 50 principal aid-receiving countries examined in this study:

<u>Country or Region</u>	<u>Increase in U.S. Exports</u>			<u>Increase in U.S. non-military aid</u>
	<u>Total, excl. military</u>	<u>Aid-financed</u>	<u>Commercial</u>	
Near East & South Asia	+\$597 m.	+\$484 m.	+\$113 m.	+\$623 m.
Africa	+87	+87	0	+147
Europe	+68	-88	+156	-105
Japan	+614	-71	+685	-19
Other Far East	+113	-3	+116	-164
Subtotal, ex. L.A.	+1510*	+409	+1101*	+482
Latin America	-435	+158	-593	+267
50-country total	+1075*	+567	+508*	+749

Source: Table 1

* Includes some Special Category items not included in the regional subtotals because of security classification reasons.

This summary shows that in the 33 countries outside of Latin America, total U.S. merchandise exports (excluding goods transferred under military grants) increased by an absolute amount that was over three times as great as the increase in U.S. non-military assistance. In Africa, however, it appeared that almost all of the increase in U.S. exports resulted from an

increase in aid-financed goods; in the Near East and South Asia, about 81% of the total increase could perhaps be attributed to aid-financed goods while it was possible that some portion of the remaining increase may have indirectly resulted from increases in non-commodity forms of U.S. assistance. In Latin America, total U.S. exports fell by over \$400 millions in spite of the fact that aid-financed commodities increased by \$158 millions and total economic aid by \$267 millions. For the 50 countries as a group, the increase in total U.S. exports was about 90 per cent larger than aid-financed exports alone.

The big gains in U.S. commercial exports occurred in the Far East (particularly Japan), the four European countries included (Austria, Poland, Spain, and Yugoslavia), and to a lesser extent the Near East and South Asia. U.S. commercial exports, as defined here, lost ground relative to those of other nations in Africa. They suffered an absolute value loss in Latin America at that same time that exports from other countries to Latin America were increasing.

A number of further points, however, should be considered. The first is the extent to which some commercial exports may in fact have been indirectly financed by non-commodity U.S. aid. Evidence presented later on suggests that while in some regions there was indirect aid financing of commercial exports, only in the case of Japan could part of the increase in commercial exports between 1957-58 and 1961-62 be attributed to this indirect aid-financing. The analysis suggests that, if anything, this indirect financing effect decreased on the average between the two years, and

that the "true" increase in U.S. commercial exports was therefore greater than that shown in Table 1. A possible regional expression of this phenomenon is shown below. (The corollary of this last point, of course, is that if the "true" increase in commercial exports has exceeded the apparent increase, then the "true" increase in aid-financed commodities can not have been as large as that shown by the observed data.)

Country or Region	Change in Commercial U.S. Exports 1957-58 to 1961-62 (annual averages)		
	Apparent Change from Table 1	Change in Indi- rect Financing through Aid	"True" Change in Commercial Exports
Near East & South Asia	+\$113 m.	-\$45 m.	+\$158 m.
Africa	0	-3	+3
Europe	+156	+2	+154
Japan	+685	+10	+675
Other Far East	+116	-10	+126
Subtotal (33 countries)	+1101	-46	+1147
Latin America	-593	+6	-599
50-country total	+508	-40	+548

Source: Table 1 and Table 4. The difference between columns (3) and (6) in the latter table measures the extent to which commercial exports were indirectly financed by aid.

The second point has to do with whether commodities financed by Export-Import Bank loans should be treated as "aid-financed" or "commercial" U.S. exports. They are treated as aid-financed goods in this study, following current Department of Commerce definition of "major U.S. Government

foreign assistance."³ The effect of treating Export-Import financed commodities alternatively as normal commercial exports may be judged from Table 1: since Export-Import Bank loans increased between the two pairs of years, including them in the commercial category would further increase the amount by which the change in total U.S. exports exceeded the change both in aid-financed exports and in gross economic assistance.

A third point concerns the extent to which the observed results may be influenced by the inclusion of Japan as a "principal aid-receiving country." Although U.S. Government economic assistance to Japan averaged almost \$30 millions a year (net) from 1958 through 1962,⁴ much of this was in the form of Export-Import Bank loans. The treatment of these loans not as government assistance but as commercial transactions would remove Japan from the list of principal aid-receiving countries. The effect of this change can be determined from Table 1: since Japan was responsible for much of the gain in "commercial" U.S. exports during the period under review, its exclusion would mean that for the sample as a whole the increase in U.S. non-military commodity exports would be only \$461 millions contrasted to increases in aid-financed exports (not including Export-Import) of \$536 millions. It would still remain true, however, that almost all of the apparent net loss in commercial markets occurred in Latin America.

For the 32 countries outside of Latin America and excluding Japan, commodity

³U.S. Department of Commerce, Office of Business Economics, Balance of Payments Division, Foreign Grants and Credits of the United States by the United States Government, quarterly report.

⁴U.S. Bureau of the Census, Statistical Abstract of the United States, 1963, Washington, D.C., 1963, p. 862.

exports other than military increased by \$896 millions while aid-financed commodities increased by only \$480 millions (or by \$324 millions if Ex-Im Bank-financed commodities are included under commercial transactions).

(One reason for not excluding Japan from a study of this nature is that Japan is a major trading partner of many of the principal aid-receiving countries. U.S. exports to Japan, therefore, will reflect some "responding" effects occurring in Japan but attributable indirectly to U.S. aid expenditures in countries which trade with Japan. It is of course difficult to separate these aid-originating effects from other factors leading to changes in Japan's imports from the U.S.)

The final point concerns the extent to which the results of Table 1 are affected by changes not directly related to a country's receipts of U.S. aid. The statistical analysis reported earlier indicated, for example, that at one particular point in time, such (perhaps one-half) of inter-country variation in per capita U.S. imports was associated with differences in income levels and that a smaller amount (perhaps 15 per cent) was associated with certain, unspecified regional peculiarities. It is quite likely that over a short period such as the six years under consideration, however, regional differences related to variations in foreign exchange availability may be of relatively greater importance in "explaining" changes in U.S. exports.

Some variations in foreign exchange availability result from changes in aid receipts; others, from export earnings, funds transferred by private overseas investors, local expenditures by U.S. military forces, changes in

the country's gold and dollar reserves, etc. Many of these changes occurring between 1957-58 and 1961-62 have been shown for the 50 principal aid-receiving countries in Table 2. (Not shown, however, are changes originating in non-U.S. sources except those from export earnings, net expenditures of three multilateral organizations - the IBRD, IDA, and the Inter-American Development Bank - and changes in a country's reserves, where known.)

The table indicates that foreign currency availability, to the extent that it has been possible to measure it, increased in every region. The increase in Latin America, however, was very small, and there was an actual loss in earnings from U.S. sources. It is perhaps suggestive that the drop in U.S. commercial merchandise exports to Latin America (\$593 millions from Table 1) was roughly comparable to the drop in foreign currency available from U.S. sources during this period (\$439 millions from Table 2). In Africa, on the other hand, the rather substantial increase in revenue from U.S. sources appeared to have had little or no favorable impact on U.S. commercial exports.

III.

Table 2 appears to confirm the possibility that some or all of the short term changes in U.S. exports may be linked to changes in foreign currency availability, although it is not immediately apparent to what extent changes in per capita income or other behavioral variables also may be important explanatory factors. A second statistical model was

therefore developed which explicitly related export changes to changes in foreign currency (or equivalent foreign resource) availability. The model chosen was a simple linear one of the general form⁵:

$$(3) \quad (E_i^1 - E_i^0) = a + b_j (F_{ji}^1 - F_{ji}^0)$$

where E_i = total U.S. commodity exports, including Special Category items, in millions of current year dollars, shipped to country i

F_{ji} = foreign currency or resource of type j available to country i in millions of current U.S. dollars

superscripts 0 and 1 refer, respectively, to annual averages for the years 1957-58 and 1961-62

a, b_j = structural coefficients estimated from the statistical analysis

The various types of foreign currencies or resources (F_{ji}) included in the analysis and the special symbols employed for each specific type were:

⁵Attempts were also made to relate two-year average U.S. exports to various types of foreign resource availability,

$$(4) \quad E_i^t = a + b_j F_{ji}^t, \quad \text{where } t \text{ denotes either 1957-58 or 1961-62,}$$

and to relate proportional change in U.S. exports to country i to proportional change in foreign resources,

$$(5) \quad E_i^1/E_i^0 = a + b_j (F_{ji}^1/F_{ji}^0).$$

Various experiments with equation (4) were unsuccessful because of the strong relationship in any particular year between imports, income levels, and other behavioral characteristics. A number of attempts were made to combine behavioral characteristics and foreign resource variables in the model, but different models gave results which were quite inconsistent with one another. (Laurence E. Lynn, a Yale PhD student, solved the problem in a quite satisfactory manner by introducing various measures of the U.S. historical share of a country's market as explanatory variables. Lynn's results, as reported in an unpublished document prepared for A.I.D., "U.S. Foreign Economic Assistance and the Balance of Payments, 1954-1962" (mimeographed, December 1963), will be discussed below.) The proportional change model (equation 5) failed to explain more than a very small amount of the change in U.S. exports between 1957-58 and 1961-62.

(All values are millions of current year U.S. dollars.)

A_i = Net U.S. economic assistance from all major programs (including A.I.D., PL-480, and Export-Import Bank loans of all types), (U.S. Department of Commerce, Statistical Abstract of the United States, 1963, pp. 861-863).

X_{iu} = Commodity exports to U.S. from country i , (A.I.D., Statistics and Reports Division, Country Economic Data Books).

X_{io} = Commodity exports to all other countries, excluding U.S., from country i (same source as X_{iu}).

I_{ui} = Direct, long-term private U.S. investment (net) in country i , including reinvested earnings, where country detail was available, (U.S. Department of Commerce, Office of Business Economics, Survey of Current Business, August 1963 and earlier issues; and records. Country detail not available for Afghanistan, Iran, Israel, Jordan, Lebanon and Syria.)

F_{ui} = Net financial flows, short and long term, from U.S. to country i , where available, including:

- a) changes in short-term liabilities to foreigners, reported by banks and non-financial institutions
- b) changes in short-term claims on foreigners, reported by banks and non-financial institutions
- c) changes in long-term banking claims on foreigners (this was the item most often not available)
- d) net transactions by foreigners in long-term domestic and foreign securities (not including common stocks)

(Treasury Bulletin, July 1963 and August 1963; and Federal Reserve Board, "International Finance," Supplement to Banking and Monetary Statistics, Section 15, March 1962, Tables 1, 2, 3B, 7 and 8.)

- M_i = Military expenditures by U.S. in country i , including off-shore expenditures under Military Assistance Program (Department of Defense, "U.S. Defense Expenditures Entering the International Balance of Payments," OASD (Comptroller) IBPD, 29 July 1963, classified; and records. Calendar year data were used for 1957-58 and fiscal year averages for 1961-62. Country detail not available for American Republics.)
- Mm_i - Commodities transferred from U.S. to country i under military assistance grants (U.S. Bureau of the Census, classified ledgers; includes both Special Category and non-security type commodities).
- O_i = Expenditures (net of the country's own capital subscription.) in country i by the following multilateral organizations: I.B.R.D., International Development Association, and Inter-American Development Bank (Year-end statements of credits and subscriptions, often from the Annual Reports of these organizations).
- R_i = Increase or decrease in reserves of gold and foreign exchange by country i (A.I.D., Statistics and Reports Division, Country Economic Data Books).

The analysis was made using change in both E_i (total U.S. exports) and Ec_i (total commercial, or non-aid-financed exports) as dependent variables. Both of these variables were defined earlier. Also, at one time or another during the analysis, the following combinations of variables were employed:

$$SM_i = I_{ui} + F_{ui}$$

$$SI_i = I_{ui} + F_{ui}$$

$$S_i = SM_i + SI_i + A_i + X_{iu} + X_{io} + R_i$$

$$Af_i = A_i - Ea_i \text{ (where } Ea_i = \text{U.S. exports directly financed by U.S. economic assistance as defined earlier)}$$

$$S_i^* = S_i - Em_i - Ea_i$$

The most useful statistical results of the analysis are given below. The coefficients found for each independent variable are listed directly under the symbol for that variable, and the standard errors are shown in parentheses. The symbol Δ denotes the change in average annual values of the variable between 1957-58 and 1961-62.

TABLE 3

Equa- tion No.	Depend- ent Var- iable	Inter- cept	Independent Variables									
			ΔA_i	ΔEm_i	ΔM_i	ΔX_{iu}	ΔX_{io}	ΔI_{ui}	ΔF_{ui}	ΔO_i	ΔR_i	
3.1	ΔE_i	.881 (6.28)	5.90	.591 (.105)	.803 (.188)	-.411 (.709)	.220 (.031)		.818 (.074)	.040 (.192)		
3.2	ΔE_i	.875 (7.15)	4.82	.634 (.127)	.778 (.194)	-.079 (.824)	.205 (.043)	.013 (.062)	.795 (.081)	.151 (.226)	.789 (.782)	.076 (.113)
3.3	ΔEc_i	.899 (5.68)	5.55	-.085 (.098)		-1.127 (.657)	.226 (.028)		.838 (.070)	-.027 (.182)		
3.4	ΔEc_i	.896 (6.47)	2.82	-.031 (.117)		-.796 (.765)	.196 (.039)	.053 (.058)	.823 (.076)	.081 (.211)	.713 (.727)	.051 (.106)

and

	ΔA_i	ΔEm_i	ΔM_i	ΔSM_i	ΔSI_i	ΔX_{iu}	ΔEa_i	ΔS_i^*	ΔE_i	ΔEc_i
ΔA_i	1.00	.15	-.06	.12	.08	.00	.92	.19	.28	-.07
ΔEm_i		1.00	-.18	.95	-.13	.23	-.35	-.20	.06	-.25
ΔM_i			1.00	.35	-.27	-.68	.15	-.67	-.53	-.57
ΔSM_i				1.00	-.21	-.46	.15	-.40	-.12	-.42
ΔSI_i					1.00	.36	-.12	.27	.74	.79
ΔX_{iu}						1.00	-.11	.90	.65	.74
ΔEa_i							1.00	.05	.19	-.17
ΔS_i^*								1.00	.64	.66

These two correlation tables warn that collinearity may cause trouble with respect to the statistically determined coefficients for the following independent variables:

<u>Equation No.</u>	<u>Variables</u>
3.1, 3.3	M_i and X_{iu} , M_i and F_{ui} , F_{ui} and X_{iu}
3.2, 3.4	Same plus F_{ui} and X_{io} , M_i and X_{io} , X_{iu} and X_{io} , O_i and R_i
3.5, 3.7, 3.9	None
3.6, 3.8	M_i and X_{iu}

The coefficients found for ΔA_i , ΔSM_i , ΔEm_i , ΔSI_i , ΔI_{ui} , and ΔS_i^* , on the other hand, should be moderately free of collinearity bias.

The statistical results indicate that between 1957-58 and 1961-62 85 to 90 per cent of the change in U.S. exports to these fifty aid-receiving countries was associated with change in the several foreign currency and foreign resource variables examined. Judging by the differences in \bar{R}^2 between equations 3.7, 3.9 and equations 3.5 and 3.8, it is of considerable importance to distinguish among the export-inducing effects of net economic aid, U.S. private investment, and a country's exports to the United States. Some additional gains are made by further distinguishing between transfers of military goods and overseas military expenditures and between direct private investment and private financial flows (equations 3.1 and 3.3). Adding the variables, other country exports (X_{i0}), multilateral assistance expenditures (O_i), and change in reserves (R_i), on the other hand, not only fails to improve the results but actually reduces the goodness-of-fit because of the loss of degrees of freedom (equations 3.2 and 3.4).

The results suggest that ~~about 60 cents of~~ each dollar's increase in economic assistance (net of repayments) generated ^{ABOUT 60 CENTS} ~~a dollar's~~ increase in U.S. commodity exports. The apparent net effect on commodity exports of both military grant commodity transfers and direct private U.S. investment was considerably greater, amounting to about 80 cents of each dollar. A much smaller effect, about 20 cents of increased U.S. exports for each additional dollar of foreign exchange earnings, was associated with a country's exports to the U.S. The negative coefficients found for overseas military expenditures do not differ significantly from zero in most cases.

The relative importance of the different variables in determining changes in U.S. exports may be judged by examining the beta coefficients for equations 3.1 and 3.3. These were:

<u>Independent variable</u>	<u>Eq. 3.1(ΔE_i)</u>	<u>Eq. 3.3(ΔEc_i)</u>
Net U.S. economic assistance (ΔA_i)	.282	-.040
Military grant commodities (ΔEm_i)	.226	--
Overseas military expenditures (ΔM_i)	-.040	-.107
Country exports to U.S. (ΔX_{iu})	.632	.636
Direct U.S. private investment (ΔI_{ui})	.592	.592
Private U.S. financial flows (ΔF_{ui})	.016	-.010

This suggests that most of the quantitative change in total U.S. exports was associated with changes in direct private U.S. investment, and, in spite of the low structural coefficient noted above, earnings from a country's own exports to the U.S. Of somewhat less importance were changes in economic aid and military grant commodities. A country's earnings from exports to all recipients other than the U.S. (X_{i0}) were of considerably less importance in "explaining" U.S. exports. The comparable beta coefficients for equation 3.4 (ΔEc_i), for example, were:

	<u>Beta Coefficient</u>
Earnings from exports to U.S. (ΔX_{iu})	.519
Earnings from all other exports (ΔX_{i0})	.081

In spite of the relatively good statistical fit of most of the various equations described above, an examination of the unexplained residuals (the difference between the change in actual exports to a country

and the change in exports as they would be computed from the statistically determined structural coefficients) suggests that certain regional biases exist. The seventeen Latin American countries, for example, have a disproportionately large number of cases in which computed increases in exports were larger than actual increases (and conversely where the computed decrease was less than the actual decrease). This was the same situation encountered with the per capita income model discussed in part I. In the Far Eastern countries, on the other hand, the situation was reversed, and computed increases tended to fall short of actual increases.

These regional differences indicate that neither of the two equations can be used with much accuracy for projecting changes in U.S. exports

to individual countries or regional groups of countries. This results partly from the omission of behavioral characteristics such as those reflected by price and income elasticities and possibly from the omission of certain forms of foreign exchange earnings, such as direct U.S. private investment in the Near Eastern countries and U.S. military expenditures in Latin America. A number of attempts were made to combine behavioral variables with the foreign currency and resource availability variables described above. This was done by using dummy variables to represent different ranges of per capita GNP and other dummy variables to represent the regions.⁶ The statistical results, however, were not superior to those obtained from using only foreign currency and other resource availability as explanatory variables.

⁶No attempts were made to combine the per capita income variable directly through the use of computed income elasticities, such as in equation (2), or to introduce price elasticities into the analysis. One recent, unpublished analysis by Irma Adelman of U.S. exports to 18 non-European countries found a price elasticity of -1.15, accompanied by an income elasticity of .4, and very little relationship between U.S. exports and levels of U.S. economic aid. (Irma Adelman, "An Econometric Analysis of U.S. Foreign Trade," August 31, 1962 (mimeographed).) Statistical implementation of a three-region international trade model recently developed by Rudolf Rhomberg and Lorette Boissoneault of the International Monetary Fund also suggested that price competition might be an important determinant of U.S. exports. A one per cent increase in the price ratio between U.S. goods and those exported by Western Europe was found to imply a drop in U.S. exports of 1.2 per cent. (Rudolf R. Rhomberg and Lorette Boissoneault, "Effect of Income and Price Changes on the U.S. Balance of Payments," paper presented before the Econometric Society, Boston, December 29, 1963.)

IV.

It appears furthermore that formulations similar to that shown in equation (3), above, give results consistent with two independent estimates of the net effect of U.S. exports of U.S. economic assistance. The first of these independent estimates uses explicit assumptions about the substitution and respending effects discussed earlier to obtain calculated aid-induced exports by regions. The procedures are similar to those employed in the Brookings report, *The United States Balance of Payments in 1968*,⁷ but the assumptions permit the model to be used equally well in any year. The second independent estimate was prepared for A.I.D. by Lawrence E. Lynn, using a statistical procedure developed for his Yale PhD thesis. Lynn's solution of the behavioral characteristic vs. currency availability dilemma posed above was to modify certain of his foreign currency variables with additional variables representing historical U.S. market share in a particular country. These two estimates will be discussed in turn.

The first estimate, which will be called the "substitution-respending model," begins with the following algebraic formulation:

$$(6) \quad Ea'_i = Ea_i + f_i (Ag_i - Ea_i + s_i Eta_i) - s_i Eta_i$$

where Ea'_i = net U.S. exports to country i resulting directly
and indirectly from U.S. economic assistance to

⁷Walter S. Salant, et al., The United States Balance of Payments in 1968 (Washington, D.C.: The Brookings Institution, August 1963), Chapter VI.

country \underline{i} , but omitting all indirect effects occurring via trade with third countries (i.e. account is taken only of so-called "first round" responding effects within country \underline{i} itself)

$Ea_{\underline{i}}$ = U.S. exports to country \underline{i} directly financed by U.S. economic assistance (i.e., aid-financed procurement within the U.S.)

$Ag_{\underline{i}}$ = Gross U.S. economic assistance to country \underline{i}

$Eta_{\underline{i}}$ = U.S. exports to country \underline{i} directly financed by economic assistance, which are in excess of the amount of exports which country \underline{i} would normally be expected to purchase from the U.S. These "tied exports" may be defined more precisely as equal to $Ea_{\underline{i}} - a_{\underline{i}} Ag_{\underline{i}}$, where $a_{\underline{i}}$ is the "normal" ratio of U.S. procurement to U.S. aid when aid is completely untied.

$f_{\underline{i}}$ = Ratio to dollars spent in country \underline{i} of dollars returned to the U.S. from country \underline{i} (the "first round responding effect" or "feedback ratio")

$s_{\underline{i}}$ = Ratio between U.S. commercial exports to country \underline{i} supplanted by aid-financed U.S. exports to \underline{i} and total tied U.S. aid-financed exports to \underline{i}

Equation (6) says that that the net effect of U.S. economic assistance on U.S. exports to a particular country will equal the observed or apparent

exports directly financed by aid (Ea_1) plus U.S. exports indirectly financed by net respending of aid funds minus substitution losses suffered by normal U.S. commercial exports. The respending effect is determined by applying a first round feedback ratio (f_1) to the difference between total aid (Ag_1) and aid-financed U.S. exports minus substitution losses ($Ea_1 - s_1Eta_1$). The substitution losses are found, in turn, by applying a substitution ratio (s_1) to the difference between directly financed U.S. exports and those exports which would have gone to the country in the absence of all aid-tying ($Ea_1 - a_1Ag_1$, or tied exports, Eta_1). Values of Ea_1 and Ag_1 can be measured directly (see reported subtotals in Table 2). Since there has always been some tying in the U.S. foreign assistance program (as defined in this study to include surplus agricultural programs and Export-Import Bank loans), it was not possible to directly estimate the portion of Ea_1 which would have been procured in the U.S. in the absence of tying. It was therefore necessary to indirectly estimate Eta_1 by employing the relationship,

$$Eta_1 = Ea_1 - a_1Ag_1$$

and assuming, furthermore, that a_1 (the normal U.S. procurement ratio for foreign economic assistance in the absence of tying) was equal to f_1 (the first round respending of all outlays for foreign currencies by country i in the U.S.). Conceptually, of course, the parameters a and f are similar although they may differ in practice because of different "normal" patterns between the U.S. import content of aid-financed programs as contrasted with a country's total imports.

The feedback parameter f_i , in turn, was estimated as the observed ratio between commercial U.S. imports to a country and the country's total commercial imports from all sources. Two points should be noted. First, it was not possible to estimate aid-financed imports from countries other than the U.S.; hence the denominator of the fraction just described excluded aid-financed imports from the U.S. only and may have included varying amounts of subsidized imports from other sources. The effect of this point is that if anything estimates of f_i are too low. The second point is that "commercial" U.S. imports are defined to include the commercial trade as actually observed. They thus include imports indirectly financed by aid, exclude all direct-financed aid imports and also exclude any additional commercial imports which would have existed in the absence of aid-financed goods and services. (It is only by use of these definitions that we can approximate the potential market share of the U.S. in country i , and it is precisely this share which is relevant in estimating how much of any untied aid dollars might return to the U.S. through normal commercial channels.) Stated algebraically, we have

$$(7) \quad f_i = \frac{E_i - Ea_i}{I_i - Ea_i}$$

where E_i and Ea_i are the same as defined earlier, and

I_i = imports to country i from all sources, f.o.b.
country of origin

The remaining problem is to estimate s_i , the substitution ratio between supplanted commercial imports from the U.S. and tied, aid-financed

imports from the U.S. We assume that s_i is a function of f_i and, more specifically, that $s_i = f_i$. The reasons are as follows. We first assume that $s_i = 0$ when the share of non-aid-tied U.S. exports in a market with no U.S. aid tying is zero. This is based upon the logical proposition that if no commercial U.S. exports (in the absence of aid tying) would go to a particular market, then aid tying must be 100% effective since no possibilities exist for substitution.

We next assume that $s_i = 1$ when the U.S. share of a market (in the absence of U.S. aid tying) is 100 per cent. This rests upon a similar logical proposition which states that should aid tying be inaugurated in such a market, it could not further increase the portion of imports from the U.S. since all imports already come from the U.S. All tied aid, in other words, would merely supplant "commercial" exports (which, as defined above, include all U.S. exports to country i which have been indirectly financed through first round respending of aid funds by country i .) Substitution in this case must equal 100%, or $s_i = 1$.

The third assumption, that a straight line function connects the two points just described (i.e., that $s_i = f_i$), is based largely on a simplicity criterion and because we have no a priori reason to suppose that any alternative function would prove superior. To a limited extent, the form of the function (as well as the other assumptions made in this section) may be tested by its ability to yield computed changes in U.S. exports which are consistent with those from the multiple correlation analysis described earlier.

Two additional hypotheses, sometimes advanced as influencing the degree of substitution, were ignored because their effects appear to work in opposite directions and because there is no ready evidence on which of the two might be stronger under particular circumstances. The first of these two rejected hypotheses states that aid tying may be least effective when the tied commodities constitute a relatively small portion of an aid-donor's total share of a particular market. This holds because at low levels of aid tying, it is easier for importing countries to find normal commercial imports for which the tied aid may be substituted. In contrast, the hypothesis would indicate that as more and more imports are tied the possibilities for substitution become progressively more limited and tying progressively more effective.⁸

The second rejected hypothesis states that a recipient country's incentive to substitute may be low when aid tying is relatively low and may become progressively greater as tying increases.⁹ Either of these two hypotheses could affect the nature and shape of the function describing s_i by introducing the additional variable: ratio of tied to total imports from the U.S. The two hypotheses, one relating to the ease of substitution and the other relating to the incentive to substitute, would appear to work in opposite directions. It is conceivable, in fact, that they might largely cancel one another out.

⁸Richard Cooper, "Foreign Assistance and the Balance of Payments of Donor Nations," paper prepared for the U.N. Conference on Trade and Development, Dec. 18, 1963, pp. 15-16.

⁹Richard Cooper, ibid., p. 30 and Walter Salant, et al., op. cit., p. 172.

In the actual application of equations (6) and (7) we are confronted with one further difficulty. This is that total exports of goods and services from the U.S. to individual other countries are seldom known. We are therefore limited to making deductions about f_i , s_i , and a_i by reference to commodity (or merchandise) exports only. The necessary assumption that service trade flows tend to be proportional to commodity exports or imports may occasionally be quite wide of the mark. In practice, however, we have little alternative to making this assumption.

In the instance at hand, that of testing the statistical results from the multiple correlation analysis reported above, there is no particular problem since the analysis we are testing was conducted entirely in terms of commodities. It is only necessary to specify that the exports and imports in equations (6) and (7) pertain to merchandise flows only and that gross assistance (Ag_i) exclude U.S.-procured services. (Ag_i should include, at least conceptually, all commodity procurement, cash transfers, and offshore expenditures for services. All but the last item are known. We shall be forced to exclude overseas service expenditures in computing equation (6), and thus we will underestimate the responding effect of non-commodity aid.)

With the various assumptions about Ea_i , s_i and a_i discussed above, equation (6) may be reduced to:

$$(8) \quad Ea_i' = Ea_i + f_i (Ag_i' - Ea_i + f_i Ea_i - f_i^2 Ag_i') - f_i (Ea_i - f_i Ag_i')$$

where Ea_i' and Ea_i now consist of commodities only, and

Ag_i' = direct aid-financed commodity procurement in the

U.S. and overseas plus cash transfers overseas.

Equation (8) can now be used in conjunction with equation (7) to estimate net U.S. aid-financed exports to the fifty individual countries included in the cross-section analysis. The change in these aid-financed exports between 1957-58 and 1961-62 may then be contrasted with the change estimated indirectly in the multiple correlation analysis. Regional totals based on equations (7) and (8) are given in Table 4. The individual country figures cannot be shown because they contain classified data.

The regional subtotals shown in Table 4 were obtained by applying equations (7) and (8) to the commodity procurement and other economic assistance data for each of the fifty countries in turn. The estimated respending and substitution effects were each computed from the appropriate portions of equation (8). For the fifty countries as a group, the figures suggest that the substitution loss amounted to about 13 per cent of total U.S.-procured commodities in both pairs of years and that the gains from respending (before accounting for third country effects) fell from 11 per cent to 9 per cent of U.S.-procured commodities.¹⁰ The net effect appeared to be that "real" commodity exports were slightly less in both years than were apparent U.S. exports. If third country effects were added in, however, true net U.S. exports would have exceeded apparent exports in both years. They would have amounted to about 77 per cent of gross commodity aid and cash transfers in 1957-58 and perhaps 79 per cent in 1961-62.

¹⁰ As a percentage of the difference between "gross commodities and cash" and "apparent commodity exports" (column 2 minus 3), the respending gains rose from 29% in 1957-58 to 32% in 1961-62.

It should be recalled, however, that Table 4 represents only a hypothetical answer to the unknown relationship between apparent and true U.S. exports and U.S. aid. It has been constructed, using the various a priori assumptions listed earlier, in order to test the results from the 10-country multiple correlation analysis. The results of the two approaches may be contrasted as follows:

I. All U.S. Commodity Exports

<u>Multiple Correlation Results</u>		<u>Change in U.S. Commodity Exports</u>
(b) ΔA_i ; for ΔA_i see Tables 2 or 3)		<u>Associated with U.S. Economic Aid,</u>
		<u>Excluding Third Country Respending</u>
		<u>Effects, 1957-58 to 1961-62</u>
Equation	3.1	\$460 mil. (+ \$82 mil.)
	3.2	493 (+ 99)
	3.5	483 (+ 92)
	3.6	470 (+ 91)
<u>Substitution-respending model</u>		\$511 mil.
(Table 4)		

II. U.S. Commercial Commodity Exports Attributable to Aid (Equals sum of respending gains minus substitution losses, excluding third country effects)

<u>Multiple Correlation Results</u>		
Equation	3.3	-\$66 mil. (+\$76 mil.)
	3.4	- 24 (+ 91)
	3.8	- 58 (+ 89)
<u>Substitution-respending model</u>		-\$56 mil.

It appears from this comparison that the hypothetical results built up from a priori assumptions using individual country detail on aid and exports are at least consistent with the over-all results from

the cross-section statistical analysis. The results, however, would probably not have been quite as close as they appear if the effect on commodity exports of overseas U.S. service expenditures could have been taken into account. (See discussion of assumptions underlying Ag_1 , above.)

V.

The Lynn study, already referred to, used a model similar to that of equation (4). Three types of independent variables were included: measures of available foreign currencies similar to but not as differentiated as those used in the statistical analysis reported above, dummy variables representing broad trading areas, and U.S. market share variables which were used as multiplicative weights with certain of the foreign currency variables. A number of versions of this model were tested, the more important ones using as alternatives the market shares of the preceding year (Lagged Share Model) and the average market shares average for 1949-1953 (Average Share Model). Lynn interpreted the average share model as representing a longer term situation in which the market shares were unaffected by year-to-year fluctuations of a cyclical or emergency nature. The model thus gave results which reflected not only changes in short run availability of foreign exchange but also structural changes in market shares. The average share model tended to give larger coefficients relating U.S. exports to U.S. aid (but not to other foreign currencies) than did the lagged share model, and Lynn concluded that these

differences measured the longer-term impact of aid on U.S. trade.¹¹

Several other points should be noted about the Lynn study. Estimates of the parameters were obtained using not only ordinary least squares but also, in the case of the average share model, two-stage Aitken estimates. "This latter procedure," reports the author, "has a marked effect in reducing the standard errors of the aid coefficients, with worthwhile reductions having been achieved in the standard errors of all estimated coefficients."¹² Lynn, furthermore, derives a range of coefficient estimates which, because of certain characteristics of the sample data, are assumed to represent upper and lower limits of the "true" value of these coefficients. He does this by calculating for each year one equation which uses aid disbursements as an independent variable and one equation which uses instead the cross product of aid disbursements and the historical U.S. market share. The coefficient obtained from the cross product variable can be made comparable to the simple aid-disbursement coefficient by multiplying by the sum of the cross products in the sample and then dividing by the total aid expenditures in these countries.¹³

Lynn uses two samples of less developed countries which had achieved independence by 1954. The first, for which partial annual results are reported for 1954 through 1961, consisted of 38 countries. The

¹¹"U.S. Foreign Economic Assistance and the Balance of Payments, 1954-1962," op. cit., pp. 4-10 and 4-11.

¹²Ibid.

¹³Ibid., pp. 3-17, 3-18, 4-1.

second sample consisted of 33 countries, and for this sample more detailed results are reported by Lynn for each of the years 1959 through 1962. The 33 countries represent a subsample, rather heavily weighted towards Latin America, of the 50 countries used in the analysis reported earlier. (See notes to Table 5 for names of countries.) The 38-country sample includes, in addition, the Dominican Republic, El Salvador, Iraq, Lebanon, and Indonesia.

A final point to note is that Lynn's definition of "aid" applies either to disbursements by A.I.D. and predecessor agencies or to A.I.D. disbursements plus those of the Export-Import Bank. In no case are PL-480 shipments included, and the definition of aid is thus considerably narrower (at least since 1957) than that used for the 50-country study. Lynn also has apparently omitted PL-480 aid from his measure of a country's "autonomous receipts." The U.S. market share in a country, on the other hand, is taken as the simple ratio of U.S. merchandise exports (including PL-480, Export-Import Bank, and other aid-financed commodities) to a country's total imports from all sources.

The two principal models employed by Lynn may be described algebraically as follows:

$$(9) E_i = a + b_1 D_i + b_2 T_i + b_3 A_i + b_4 F_i + b_5 F_i \cdot S_i + b_6 C_i + b_7 C_i \cdot S_i$$

and

$$(10) E_i = a + b_1 D_i + b_2 T_i + b_3 A_i \cdot S_i + b_4 F_i + b_5 F_i \cdot S_i + b_6 C_i + b_7 C_i \cdot S_i$$

where E_i = U.S. exports to country i , excluding Special

Category items

$D_i = 1$ if country i is part of the dollar area; zero otherwise

$T_i = 1$ if country i is part of the sterling area; zero otherwise

$F_i =$ autonomous receipts by country i , as taken from International Financial Statistics (IFS)

$A_i =$ gross U.S. economic aid expenditure in country i , as recorded in Foreign Grants and Credits, and limited either to "Mutual Security Program" grants and credits for economic and technical assistance (later termed "American Aid") or to this aid plus new Export-Import Bank credits net of reimbursements by private participants (repayments and reverse grants were excluded in either case) but including refinancing of earlier loans

$C_i =$ compensatory financing utilized by country i , defined to include annual change in official gold and foreign exchange reserves plus IMF drawings, as reported in IFS

$S_i =$ U.S. merchandise export share, including aid-financed commodities, in country i 's market, either in the preceding year or the average share for the years 1949-1953

a, b_1 through b_7 are the structural coefficients estimated

The coefficient b_3' is made comparable to b_3 as follows (noting the new, comparable coefficient as b_3^*):

$$(11) \quad b_3^* = \frac{b_3' \left(\sum_{i=1}^m A_i \cdot S_i \right)}{\sum_{i=1}^m A_i}, \text{ where } i = 1, 2, 3, \dots, m$$

The coefficients b_3^* and b_3 , it will be recalled, are interpreted by Lynn as representing the lower and upper limits, respectively, to the expected value of the "true" value of b_3 .

How do the results from Lynn's study compare with those of the substitution-responding model outlined above? We have applied the latter model (see equations 7 and 8, above) to regional subtotals of variables relating to the countries in Lynn's two samples. The parameter f_i was calculated, as before, by excluding all U.S. aid-financed commodities from both the numerator and the denominator of the fraction shown in equation (7), but regional totals were used rather than country totals. The estimates of the responding, substitution, and true net U.S. exports, however, pertain only to expenditures by A.I.D. and its predecessors or to these expenditures plus those of the Export-Import Bank. The 1959-1962 results are compared in Table 5 with those derived from the Lynn study.

For the four years taken together, estimated net exports derived from the various calculations may be summarized as follows:

	<u>Substitution- responding Model</u>	<u>Market Share Models (Mean Values)</u>	
		<u>Lagged Share Model</u>	<u>Average Share Model</u>
A.I.D. & predecessors	\$1814 m.	\$1775 m.	\$2315 m.
A.I.D. + Ex-Im Bank	3029	2515	3344

While there is a fair amount of variation among the year-to-year estimates of the different models, the hypothetically constructed substitution-responding model gives 4-year average results which lie between the two Lynn models. For A.I.D. alone, the substitution-responding results lie

near the lower of the mean values given by other two models. This may result from correlation between A.I.D. expenditures and U.S. exports financed under PL-480 (surplus agricultural commodities) and by the Export-Import Bank. This correlation may impart a slight upward bias to the Lynn aid-disbursement coefficients, and this bias may have been particularly pronounced in 1962 when the correlation was quite strong. For Lynn's 33-country sample, the simple correlation coefficients between A.I.D. expenditures and aid-financed U.S. commodities not furnished by A.I.D. were:

<u>Year</u>	<u>r</u>
1959	.26
1960	.43
1961	.52
1962	.65

The simple correlation between A.I.D. plus Export-Import Bank disbursements and PL-480 shipments is slightly higher than for A.I.D. disbursements alone, with a value of .37 in 1959 and .70 in 1962.¹⁴

¹⁴These high correlation coefficients for 1962 and the fact that PL-480 aid has apparently not been included among Lynn's independent variables may cast doubt on Lynn's measure of the effects on aid-tying in 1962. It is likely, nevertheless, that aid-tying and other structural changes did increase U.S. aid-related exports in that year. The substitution-responder model, for example, suggests that for Lynn's 33-country sample net A.I.D.-financed commodities as a percentage of gross expenditures increased from about 37% in 1959 and 1960 to 42% in 1961 and by 1962 had reached 49%. It is questionable, however, whether the 1962 increase was as abrupt and dramatic as that indicated by Lynn's statistical results.

VI.

Our conclusion is that results using the hypothetically constructed, substitution-responding models do not agree precisely with those from the 50-country available currency model and with those from Lynn's market share models, but that the results are nevertheless consistent with one another. This consistency does not prove that any of the results give accurate measures of the effects in question. The statistical results could easily have been influenced by random changes or by spurious correlation with variables omitted from the analyses. The hypothetically constructed results could have been thrown off in a similar direction by any of a number of misplaced judgments. In spite of this, these various estimates appear reasonable and serve as rough checks upon each other. To the extent which we believe that the two sets of statistically estimated results lend credence to the substitution-responding model, we are enabled to draw a number of important subsidiary conclusions.

We can argue, for example, that although substitution losses of commercial exports to aid-financed exports are very real, they appear to have been more than balanced out, for A.I.D. expenditures, by responding gains, even without taking third country responding effects into account.¹⁵ These effects vary among types of aid and different countries. Substitution losses increase relative to responding gains as aid-tying increases, and they are larger than responding gains in the case of Export-Import

¹⁵For economic aid as a whole, however, as suggested by Table 4 the substitution losses exceed responding gains before taking into account third country responding.

Bank loans and PL-480 shipments. The effects vary among regions in accordance with some measure of market share. In general, we believe that at low levels of nominal tying respending gains far outweigh substitution losses in regions where the U.S. commercial market share is traditionally high. Aid-tying in these regions may thus do little to increase net U.S. exports. Conversely, respending effects will be low in regions of low U.S. market share, and the potential gains from aid-tying in these regions will be relatively great. (These conclusions are similar to those of the Brookings report cited earlier.)

These relationships may be further illustrated by allowing explicitly for respending effects in third countries and by working out the relationship between apparent and real exports attributable to any form of foreign aid in the world's major importing regions. These generalized relationships may then be used to assess the effects of alternative aid-tying policies.

Third country respending gains may be formally introduced into our earlier model by replacing the feed-back ratio, f_i , in equation (6) with a total respending-effect ratio, r_i . The equation may then be divided through by total aid disbursements, Ag_i , to show the relationship between apparent and real ratios of exports to aid. Substituting the expression $Ea_i - a_i Ag_i$ for the tied-commodity variable, Eta_i , and performing the other two operations on equation (6) gives

$$(12) \quad e_i = x_i + r_i(1 - x_i + s_i x_i - s_i a_i) - s_i(r_i - a_i)$$

where: e_i = ratio of actual U.S. exports attributable to total aid expenditures after all rounds of respending

x_i = apparent ratio of U.S. procurement financed by aid to total aid expenditures

r_i = ratio of dollars returning to the U.S., after all rounds of respending, to dollars initially spent overseas

s_i = ratio between normal U.S. commercial exports supplanted by aid-financed exports and total, tied U.S. aid

a_i = "normal" ratio of U.S. procurement to U.S. aid when aid is completely untied

Following our earlier terminology, the final term in equation (12) equals the substitution effect, while the next to last term represents the respending effect. The effective tying rate is equal to $x_i - a_i$ and differs from the nominal tying rate, x_i , because most countries would normally expect to spend part of any aid funds in the U.S. even without tying. The relationships between e_i and x_i have been plotted in Figure 1 for a number of major regions.

The following assumptions underlie Figure 1.

The values of s_i are weighted average values of f_i taken from the country detail underlying Table 4. (The country weights used were the estimated values of tied procurement, $\sum a_i$.) Values of a_i are based upon non-agricultural commodity exports made under A.I.D.'s predecessor agencies during 1957-59, a period where there there was no overt tying for other-than-agricultural surplus commodities. Thus:

$$(13) \quad a_i = \frac{E_{AID_i}^*}{E_{AID_i}^* + E_{o_i}}$$

where $E_{AID_i}^*$ = A.I.D.-financed, U.S.-procured commodities, excluding agricultural products furnished under Sections 402 and 550, shipped to country i

E_{o_i} = A.I.D.-financed commodities procured overseas for use in country i

(In both cases, "A.I.D." includes its predecessor agencies, I.C.A. and D.L.F.)

Values for r_i were obtained from regional average values of f_i by applying regional ratios of total to first-round responding effects, as calculated by W. Whitney Hicks from a 1960 matrix of "reflection ratios."¹⁶ These reflection ratios were the same as those used in the Brookings study (see Appendix to Chapter VI of that volume), but the ratios in this instance were used only in finding the additional effects attributable to third country responding. This is to say that the first round effects (f_i) were first independently determined from the 50-country study described earlier.

The parameter values for the various regions were:

¹⁶W. Whitney Hicks, "Estimating the Foreign Exchange Costs of Untied Aid," Southern Economic Journal, vol. XXX, no. 2 (October 1963), pp. 174-188, Tables II and III.

1.0

Figure 1

RELATIONSHIPS BY REGION BETWEEN APPARENT AND REAL EFFECT OF A.I.D. EXPENDITURES ON UNITED STATES' EXPORTS

(Estimated relationships based on study of 50 principal aid-receiving countries, 1961-62 regional feedback ratios, Whitney Hicks' "reflection ratio" computations for calculations third country responding effects, and 1957-59 estimated levels of "untied" A.I.D. commodity procurement from 50-country study.)

True ratio (e_i) of Net U.S. Exports to U.S. Economic Assistance

.9

.8

.7

.6

0

Latin America - dollar area

Latin America - non-dollar area

Far East (excl. Japan)

U.S. Average

Near East and South Asia

Africa

True ratio equals apparent ratio

Apparent ratio (x_i) of U.S. exports to U.S. aid, based on known U.S. procurement

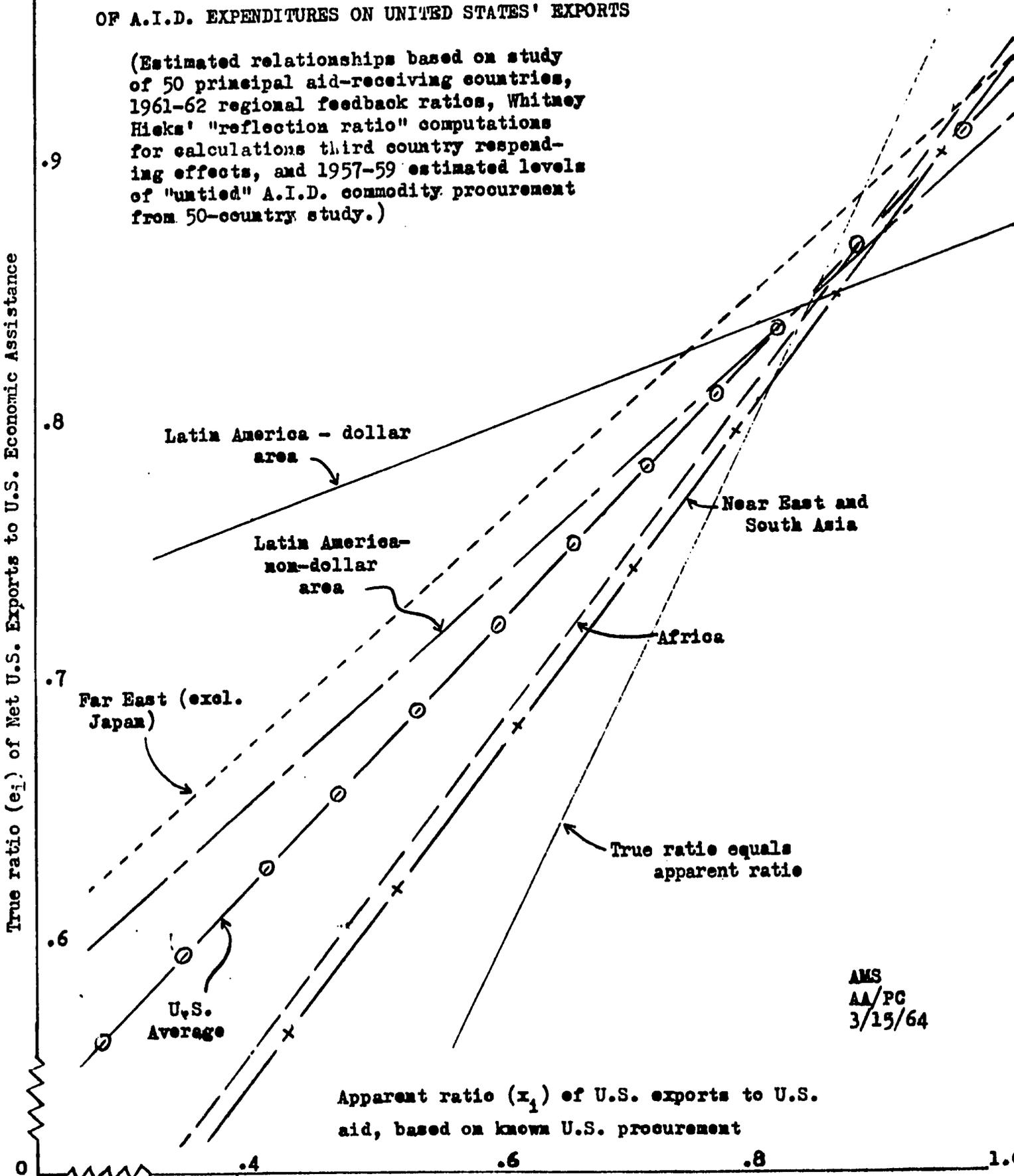
.4

.6

.8

1.0

AMS
AA/PC
3/15/64



Region	weighted average f_i ('61-'62)	f_i/r_i (from Hicks)	r_i (calculated)	s_i (weighted average f_i)	a_i (A.I.D. only, 1957-1959)
NESA	.133	.528	.252	.129	.325
Africa	.118	.406	.291	.094	.099
Europe ^a	.113	.620	.182	.083	.680
Far East, excl. Japan	.213	.492	.432	.235	.337
Latin America -					
Dollar	.512	.830	.617	.522	.350
Other	.282	.710	.397	.283	.608

^aPertains to Austria, Poland, Spain and Yugoslavia only

Figure 1 suggests that the divergence between apparent and true aid-induced U.S. exports, at low tying levels, is greatest in Latin America and the Far East (excluding Japan). For Africa, the Near East and South Asia, the true effect exceeds the apparent effect by a much smaller margin. At higher levels of apparent U.S. exports, most of the regional differences disappear, and the true effect of aid on exports falls below the apparent effect for all regions at nominal tying levels of 80 to 90 per cent. An increase in the nominal tying level is most effective in producing a net increase in U.S. exports the steeper the slope of the line shown in Figure 1. For no region, however, does the slope exceed 1, which means that the real increase can never be as great as the apparent or nominal increase.

While the true increase in U.S. exports will always fall short of the nominal increase as aid-tying progresses, the results shown in

Figure 1 nevertheless indicate that the effects of aid-tying can be quantitatively important. This is illustrated by Table 6 in which the regional relationships shown in Figure 1 have been applied to the fiscal 1964 regional pattern of A.I.D. expenditures. This table shows that with no tying of U.S. aid, the nominal expenditures made in the U.S. might be about 36 per cent of the total. After allowing for additional responding effects (there can be no substitution losses when aid is completely untied), the true U.S. expenditures would appear to be almost 60 per cent of the total. Imposing a nominal tying level of 80 per cent in each region would bring the real U.S. export rate to 82 per cent of total aid. A nominal tying rate of 90 per cent would imply that 87 per cent of all A.I.D. funds eventually constituted net additions to U.S. exports.

While these calculations suggest that the actual increase in U.S. exports is considerably less than the nominal increase, the absolute magnitudes involved are large. Thus an 80% nominal tying level implies additional U.S. exports of \$469 millions over the case with no tying. A further increase in nominal tying to 90 per cent of total aid would mean a further export gain of \$92 millions.

On a regional basis, however, the gains may seem relatively less important. In Latin America, for example, expenditures in the U.S. even with no tying might ultimately equal three-fourths of each aid dollar. Increasing the nominal tying level to 90 per cent would increase this percentage to 87 per cent, but each \$100 million increase in nominally tied goods would produce only an additional \$27 millions net of U.S. exports.

The relationships shown in Figure 1 may be used to make a final comparison among the regional effects of aid as estimated in this study, by Lawrence Lynn, and by the Brookings team. The reference year for the comparison is 1961, and the results are given in Table 7.

Table 7 shows that two substitution-responding models (that used in the Brookings study and the similar one developed in this study) give higher estimates in the Near East and South Asia and lower percentages in the other three regions than do the Lynn results. (The similarity between the Brookings-based estimate and this study's substitution-responding model results in part from the use of data from columns 1-4 in preparing both estimates.) Although the results from the three sets of estimates differ quite widely, all three suggest that in 1961 the direct and indirect contribution of A.I.D. expenditures to U.S. commodity exports was lowest in Africa and highest in the Far East. The Latin American percentages for both the Brookings-based estimate and the second substitution responding model may be underestimated. The figures in columns (1) through (4) show that, according to A.I.D. reckoning, A.I.D. expenditures in Latin America consisted of \$78 millions U.S.-procured commodities, \$64 millions offshore commodity procurement plus cash transfers, and \$56 millions unaccounted for items. Although some of this latter figure consisted of U.S.-procured services, a part of it undoubtedly represented miscellaneous offshore dollar expenditures and perhaps even U.S. commodity procurement not fully reported under the then existing

procedures. Either one of these expenditure types would directly or indirectly increase U.S. commodity exports. (An analogous situation may also exist for Africa; the unaccounted-for items in NESAs and the Far East represent much smaller portions of total A.I.D. expenditures.)

VII.

The results of the above analyses may be summarized as follows:

(1) Annual U.S. merchandise exports¹⁷ to the 50 countries in the sample increased by \$1.1 billion between 1957-58 and 1961-62 (Table 1). Of this total \$0.6 billion were directly financed by U.S. economic aid (the apparent effect of aid on exports). Another \$0.2 million could perhaps be attributed to aid under the extreme assumption that all aid funds returned to the U.S. during this period as demand for U.S. commodity exports. It seems clear that U.S. "commercial" exports, however defined, showed an absolute increase for the period of the order of at least \$0.5 billion, even when loans financed by the Export-Import Bank are excluded (Table 1, Col. 6).

(2) The impact of economic aid on U.S. exports varied greatly from region to region. U.S. exports to Africa directly financed by foreign economic aid accounted for most of the increase in total U.S. exports to Africa. In Latin America, total U.S. exports declined by \$0.4 billion annually, in spite of the fact that aid-financed exports

¹⁷ Including some Special Category items, but excluding all commodities transferred under military grants.

increased by well over \$.1 billion. Part of the explanation for this is found in Table 2 which shows that the change in annual dollar earnings from U.S. sources (including non-commodity aid, exports to U.S., and net private U.S. investment) fell by \$0.4 billion between the two pairs of years.

(3) The statistical results from the attempt to relate changes in U.S. exports to changes in various types of foreign exchange earnings suggest that the true increase of aid-related U.S. exports between 1957-58 and 1961-62 was considerably less than the apparent increase. Instead of an apparent increase of \$567 million, the real increase probably lay between \$450 and \$500 million. The difference was accounted for by the fact that in 1957-58 considerable amounts of U.S. "commercial" exports were in fact indirectly financed by U.S. aid and that some of these commercial markets were lost to direct financing of aid commodities by 1961-62. These apparent net losses of \$67 million to \$117 million, amounted to between 12% and 21% of the change in commodities directly financed by aid.

(4) Other results of interest from this part of the analysis are that the net effect on total U.S. exports of goods transferred under military grants was about 80% of the actual transfer, implying that about 20% of the goods substituted for what would otherwise be commercial exports. About the same percentage figure applied to direct U.S. overseas investment. The marginal extent to which earnings from exports to the U.S. were used to purchase commodities from the U.S. was low -- perhaps

about 20% of each additional dollar earned, but these earnings nevertheless accounted for a considerable portion of U.S. exports.

(5) The statistical results are consistent with an hypothesis which states that both export losses from substitution and gains from the respending of non-tied funds are related to the U.S. commercial share of a particular market and to the degree of aid-tying in that market. At low levels of tying, the respending gains tend to be larger than the substitution losses. It is estimated, for example, that with the FY 1964 general patterns of A.I.D. expenditures and no aid tying, about 36% of A.I.D. funds would be directly spent in the U.S. If there is no aid tying there can be no substitution losses, by definition. Respending effects under these conditions would be large, and an estimated 60% of each untied dollar would eventually return to the U.S. (Table 6). With tying, substitution losses would increase, until at 80% U.S. procurement they would just about cancel out the gains from respending. Above about 84%, in fact, the substitution losses would outweigh the gains from dollar respending, and at a 90% level of U.S. procurement the net effect on U.S. exports might amount to only 87% of the A.I.D. dollar.

(6) The absolute gains from aid tying, at least in the limited sense of short-run U.S. export promotion and balance of payments amelioration, appear to be large. For the FY 1964 A.I.D. program, gains from 90% U.S. procurement would be about \$0.5 billion over the same situation without aid tying. At the same time the results suggest that there may be more balance-of-payments losses through such "100% tied" programs as

Food-for-Peace and Export-Import Bank loans than commonly supposed. At 100% tying there may still be a net substitution loss of commercial exports equal to perhaps 9% of each tied dollar.

(7) Our hypothesis (which is very close to that of Walter Salant and others in the recent Brookings Institution Study) suggests that aid tying is most effective in regions, such as Africa, the Near East and South Asia, where U.S. commercial exports have traditionally been small relative to those from other nations. In regions such as the dollar area of Latin America, on the other hand, there would seem to be considerably less gain from aid-tying (Figure 1). The figures shown in Table 6 suggest that in contrast to no tying an average 90% tying level in Latin America would produce additional U.S. exports of only \$73 million (or about 11% of programmed aid for that region).

(8) In the longer run it is likely that the more important effect on U.S. exports will not be aid-tying but will be the steady growth of world income. In 1963 about 60% of U.S. aid consisted of directly-financed U.S. commodity exports. These aid-financed exports amounted to \$2.7 billion, leaving commercial commodity exports of \$4.9 billion going to the developing nations.¹⁸ If U.S. GNP should grow at an average 3.5% per year and if economic assistance expenditures should rise to 1% of GNP, then aid-financed commodity exports in 1973 might be higher by \$3.3 billion.¹⁹

¹⁸Survey of Current Business, vol. 44, no. 3(March 1964), pp. 16-20.

¹⁹Assumes 1973 GNP of \$106 billion, one-half of \$8.3 billion economic assistance provided by A.I.D.-type organization, 65% commodity composition of these expenditures, and 85% nominal aid-tying level for this A.I.D.-type organization.

In the meantime, however, a population growth rate of 2.3% and a per capita GNP growth of 2.7% per year for the developing nations should mean an increased demand for U.S. commercial exports by 1973 -- over and above those directly financed by U.S. aid -- of perhaps \$4.7 billion.²⁰ (This implies that for each 1.0 per cent increase in GNP of the less developed world, U.S. commercial exports if able to maintain price competitive may be expected to increase by about 1.4 per cent.)

(9) Finally, although this paper has shown that both per capita income and foreign resource availability appear to have been important determinants of U.S. exports, there are other factors which have been omitted from the analysis. U.S. exports to Latin America have declined, for example, more than can be accounted for by the loss of dollar receipts by Latin America. The explanation probably lies in our having ignored relative price changes. The study was not successful in the attempt to combine both behavioral and income availability variables in the same model, and the possible effect of the omitted variables, particularly when using the models for projecting longer run estimates of U.S. exports, remains a problem for further research.

²⁰The implied 95 per cent increase of non-aid-financed exports over the 1963 level is based on the per capita income elasticity of demand of 1.66 found in this study. A second assumption has been that no changes take place in U.S. export prices relative to these and other exporting nations. If we base our projection on Professor Chenery's finding of a .987 per capita income elasticity coupled with a -.218 population exponent, the ten-year increase in U.S. commercial exports would be only \$2.6 billions.

Table 1

SUMMARY OF CHANGES IN U.S. EXPORTS TO PRINCIPAL AID-RECEIVING COUNTRIES^{a/},
1957-58 to 1961-62, REGIONAL TOTALS

(Values are annual averages of years shown, in millions of dollars)

Region & Year	Country Commodity Imports From:						U.S. Commercial as % of: ^f		U.S. Economic Assistance ^g		Aid-financed, U.S.-Procured Commodities as % of total Aid-financed Commodities ^h (11)
	World ^b (f.o.b.)	U.S. (f.o.b.; includes "Special Category" ^c)		Aid-financed ^d		World	U.S. non- Military	Gross Aid	Ex-Im Bank		
	(1)	Total (2)	Total Excl. Military Grants ⁱ (3)	Total (4)	Ex-Im Bank (5)	"Commer- cial" ^{e,i} (6)	(7)	(8)	(9)	(10)	
<u>EECA (12 Countries)</u>											
1957-58	5157	1337	1019	512	17	507	9.8	50.	780	19	76
1961-62	6451	1741	1616	996	103	620	9.6	38.	1403	110	88
Change	+1294	+404	+597	+484	+86	+113	+8.7	+19.	+623	+91	+107
<u>Africa (6 Countries)</u>											
1957-58	789	146	140	25	8	115	14.6	82.	71	9	58
1961-62	1079	235	227	112	21	115	10.7	51.	218	23	88
Change	+290	+89	+87	+87	+13	0	0	0	+147	+14	+104
<u>Europe (4 Countries)</u>											
1957-58	3492	536	493	352	10	141	4.0	29.	383	9	95
1961-62	4981	572	561	264	47	297	6.0	53.	278	46	94
Change	+1498	+36	+68	-88	+37	+156	10.5	229.	-105	+37	+98
<u>Japan</u>											
1957-58	3110	1149	1052	156	125	896	28.8	85.	99	94	100
1961-62	4865	1697	1666	85	79	1581	32.5	95.	80	81	100
Change	+1755	+548	+614	-71	-46	+685	39.0	112.	-19	-13	+100
<u>Other Far East (10 Countries)</u>											
1957-58	3327	1381	894	397	13	497	1.9	56.	868	14	56
1961-62	3890	1335	1007	394	33	613	15.8	61.	704	35	58
Change	+563	-46	+113	-3	+20	+116	20.6	103.	-164	+21	-10

Table 1 (continued)

Region & Year	World ^b (f.o.b.)	U.S. (f.o.b.; includes "Special Category" ^c)					U.S. Commercial as % of: f		U.S. Economic Assistance ^e		Aid-financed, U.S.-Procured Commodities as % of total Aid-financed, ^h Commodities
	(1)	Total (2)	Total Excl. Military Grants ⁱ (3)	Aid-financed ^d Total (4)	Ex-Im Bank (5)	"Commer- cial" ^{e,1} (6)	World (7)	U.S. non- Military (8)	Gross Aid (9)	Ex-Im Bank (10)	(11)
<u>Latin America (17 Countries)</u>											
1957-58	6951	3704	3673	337	233	3336	47.9	92.	514	339	99
1961-62	6960	3265	3238	495	271	2743	39.5	85.	781	395	97
Change	+9	-439	-435	+158	+38	-593	---	136.	+267	+56	+93
Subtotal, excluding Latin America ^j (33 Countries)											
1957-58	15875	4625	3615	1442	173	2173	13.7	60.	2201	145	74
1961-62	21266	5679	5125	1851	223	3274	15.4	64.	2683	295	81
Change	+5391	+1054	+1510	+409	+110	+1101	20.4	73.	+482	+150	+120
Subtotal, excluding Latin America and Japan ^j (32 Countries)											
1957-58	12765	3476	2563	1286	48	1277	10.0	50.	2102	51	72
1961-62	16401	3982	3459	1766	204	1693	10.3	49.	2603	214	80
Change	+3636	+506	+896	+480	+156	+416	11.4	46.	+510	+163	+116
<u>Total^j (50 Countries)</u>											
1957-58	22826	8329	7288	1779	406	5509	24.1	76.	2715	484	78
1961-62	28226	8944	8363	2346	554	6017	21.3	72.	3464	690	84
Change	+5400	+615	+1075	+567	+148	+508	9.4	47.	+749	+206	+112

Sources: International Monetary Fund, International Financial Statistics - (Column 1).
U.S. Department of Commerce, Bureau of the Census, unpublished worksheets - (Column 2 and 3).
U.S. Department of Commerce, Office of Business Economics, Foreign Grants and Credits,
issues of Dec. 1958, Dec. 1961, and unpublished work sheets - (Columns 9,10).
Agency for International Development, Statistics and Reports Division and Program
Coordination Staff, unpublished working documents - (Columns 4, 5, 11).

See notes for further details.

Table 1 (continued)

Notes

^aIncludes all countries which in 1960-61 received an average of \$5 million or more of net U.S. foreign economic assistance (Statistical Abstract of the U.S., 1962, p. 867) except for Nepal and the Congo (Leopoldville) where the import data were unsatisfactory, Trust Territories of the Pacific Islands, and the Ryukyu Islands. The regional groups of countries consisted of:

<u>Near East and South Asia (NESA)</u>		<u>Africa</u>	<u>Europe</u>	<u>Latin America</u>	
*Afghanistan	*Jordan	*Ethiopia	Poland	*Argentina	*Honduras
Ceylon	*Lebanon	*Liberia	*Spain	*Bolivia	*Mexico
*Greece	Pakistan	*Libya	*Yugoslavia	*Brazil	*Nicaragua
India	*Syria	Morocco	Austria	*Chile	*Panama
*Iran	*Turkey	Sudan		*Colombia	*Paraguay
Israel	UAR (Egypt)	Tunisia		*Costa Rica	*Peru
				*Equador	*Uruguay
				*Guatemala	*Venezuela
				*Haiti	
<u>Japan</u>	<u>Other Far East</u>				
	Burma	*Korea			
	*Cambodia	*Laos			
	*China (Taiwan)	*Philippines			
	Hong Kong	*Thailand			
	Indonesia	*Vietnam			

* Countries for which Special Category and military grant goods have been included, where applicable, in cols (2), (3), and (6). Shipments of these types of goods to all other countries, if they occurred, are shown only in the 32-, 33-, and 50-country totals.

^bImports converted from c.i.f. to f.o.b. prices using IMF data where available (International Financial Statistics, Supplement to 1963/64 Issues, n.d., pp. xiv-xvii and 226) and otherwise applying the factors .85 for the Far East and .89 for all other regions.

^cSpecial Category commodities are those for which commodity types and recipient countries may not be divulged for security reasons. Most, but not all, of military grant commodities fall in this class as do a modest quantity of commercial exports. Special Category commodities have been shown under the regional groupings in this table only for those countries where individual country figures are to be published by the Census Bureau. For country names, see note a.

Table 1 (continued)

Notes (continued)

^dAid-financed commodities include some ocean freight and some PL-480 Title I commodities which generated currencies for U.S. uses other than country assistance. Export-Import Bank commodities include those initially financed by the Bank, but for which the Bank was later reimbursed by private participants. No Export-Import Bank-financed commodities have been attributed to those cases where loans were for the refinancing of previously purchased U.S. exports.

^eEquals column (3) minus (4). May include some U.S. commodities indirectly financed by offshore expenditures of aid dollars. In general, "commercial" exports consist of all U.S. goods exported which were not directly financed through U.S. economic assistance or transferred under U.S. military grant programs. Column includes Special Category commercial exports in regional totals, where applicable, only for those countries identified by an asterisk in footnote a.

^fColumn (7) equals $100 \times \text{column (6)} / \text{column (1)}$. Column (8) equals $100 \times \text{column (6)} / \text{column (3)}$.

^gGross aid equals all gross new, non-military grants plus all new credits plus currency claims acquired through sales of farm products and so-called "second stage operations" minus local currencies disbursed for economic grants and credits and for other uses. Export-Import Bank assistance equals direct loans less reimbursements by private participants. (Assistance is thus more narrowly defined than are "aid-financed commodities" in columns (4) and (5) which are attributed to this assistance.) The U.S. programs included are those reported in Foreign Grants and Credits and include A.I.D., Food for Peace (PL-480), Ex-Im Bank, Peace Corps, etc.

^hThe difference between 100 and the percentage shown in this column is the percent of directly financed aid commodities purchased outside the bounds of the United States.

ⁱRegional totals exclude, in addition to commodities transferred under military grants, minor quantities of Special Category goods which moved through commercial channels. The amounts are inconsequential -- pt for NESA and Other Far East where their inclusion would have increased the change for commercial U.S. exports by 10-15 per cent.

Table 1 (continued)

Notes (continued)

^j32-, 33, and 50-country totals include, in addition to the regional subtotals shown, the following amounts of Special Category goods and other goods transferred under military grants:

	Total Special Category Ex- clusions (col 2)	Exclusions from "Total, Excluding Military Grants" and from "Commercial" (cols 3 and 6)
1957-58	\$76 m.	\$17 m.
1961-62	99.	48
Change	+23	+31

Table 2
 CHANGES IN FOREIGN CURRENCY AVAILABILITY BY REGIONAL GROUPS OF
 50 PRINCIPAL AID-RECEIVING COUNTRIES,^{a/} 1957-58 to 1961-62
 (Values in annual averages, millions of U.S. dollars)

Region & Year	U.S. Economic Assistance			U.S. Military		U.S. Investment		Country Exports (f.o.b.)			Change in Gold & Dol- lar Reserves (R) (where known)	Total Shown, Excl. U.S.- Procured Commodity Aid	Total From U.S. Only, Excl. Com- modities
	Gross	Net (A _i)	Net, minus U.S.-pro- cured com- modities	Commod- ity Grants (E _{ui})	Overseas Expendi- tures (M _i)	Direct (I _{ui})	Other (F _{ui})	Net IBRD, IDA, and IDB (O _i)	To U.S. (X _{iu})	To all Other Countries (X _{io})			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
<u>Near East and South Asia (12 Countries)</u>													
1957-58	780	676	164	318	82	10	-21	178	491	3582	-572	3914	726
1961-62	1403	1311	315	125	85	36	-37	92	551	4026	47	5115	950
Change	+623	+635	+151	-193	+3	+26	-16	-86	+60	+444	+619	+1201	+224
<u>Africa (6 Countries)</u>													
1957-58	71	69	44	6	51	14	-	1	81	683	-28	846	190
1961-62	218	220	108	8	26	98	-	11	82	828	-38	1115	314
Change	+147	+151	+64	+2	-25	+84	-	+10	+1	+145	-10	+269	+124
<u>Europe (4 Countries)</u>													
1957-58	383	325	-25	43	98	3	3	11	149	2715	88	3042	228
1961-62	278	252	-6	11	60	12	-2	13	205	3954	437	4673	269
Change	-105	-73	+19	-32	-38	+9	-5	+2	+56	+1239	+349	+1631	+41
<u>Japan</u>													
1957-58	99	20	-99	97	437	2	59	48	638	2229	-77	3237	1037
1961-62	80	42	-40	31	382	40	286	58	2991	3342	-1	7058	3659
Change	-19	+22	+59	-66	-55	+38	+227	+10	+2353	+1113	+76	+3821	+2622
<u>Other Far East (10 Countries)</u>													
1957-58	868	853	456	487	189	27	124	13	533	2199	=17	3524	1329
1961-62	704	669	275	328	204	-13	86	9	734	2349	-94	3550	1286
Change	-164	-184	-181	-159	+15	-40	-38	-4	+201	+150	-77	+26	-43
<u>Latin America (17 Countries)</u>													
1957-58	514	386	59	31	n.a.	695	164	56	3101	4250	-249	8076	4019
1961-62	781	613	120	27	n.a.	67	260	17	3133	4941	-231	8307	3580
Change	+267	+227	+61	-4	n.a.	-628	+96	-39	+32	+691	+18	+231	-439

Table 2 (continued)

Region & Year	U.S. Economic Assistance			U.S. Military		U.S. Investment			Country Exports (f.o.b.)		Change in Gold & Dol- lar Reserves (R _i where known)	Total Shown, Excl. U.S.- Procured Commodity Aid	Total From U.S. Only, Excl. Com- modities
	Gross	Net A _i	Net, minus U.S.-pro- cured com- modities	Commod- ity Grants (E _{m_i})	Overseas Expendi- tures (M _i)	Direct (I _{ui})	Other (F _{ui})	Net IBRD, IDA, and IDB (O _i)	To U.S. (X _{iu})	To all Other Countries (X _{io})			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Subtotal, excluding Latin America (33 Countries)													
1957-58	2201	1943	540	1010	857	56	165	251	1892	11408	-606	14563	3510
1961-62	2683	2494	652	554	757	173	333	183	4563	14499	351	21511	6476
Change	+482	551	+112	-456	-100	+117	+168	-68	+2671	3091	+957	+6948	+2968
Subtotal, excluding L.A. and Japan (32 Countries)													
1957-58	2102	1923	639	913	420	54	106	203	1254	9179	-529	11326	2473
1961-62	2603	2452	692	523	375	133	47	125	1572	11157	352	14453	2819
Change	+501	+529	+53	-390	-45	+79	-59	-78	+318	+1978	+881	+3127	+346
Total (50 Countries)													
1957-58	2715	2329	599	1041	857	751	329	307	4993	15658	-855	22639	7529
1961-62	3464	3107	772	581	757	240	593	200	7696	19440	120	29818	10058
Change	+749	+778	+173	-460	-100	-511	+264	-107	+2703	+3782	+975	+7179	+2529

n.a. = not available

^a/ See Table 1, note a, for details.

Sources: Col(2): Equals col(3) before exclusion of reverse grants and repayments of credit. Source was U.S. Department of Commerce, Foreign Grants and Credits, op. cit., and records of Office of Business Economics, Balance of Payments Division. Equals gross non-military grants, new credits, and net accumulation of foreign currencies for all major U.S. assistance programs, including A.I.D. (and predecessors), PL-480, and Export-Import Bank.

Cols (3), (5) through (12): See text, following equation (3), for description and source of these foreign currency or resource variables (F_{ji} in eq. 3).

Col(4): Equals col(3) minus U.S. commodities procured and paid for by U.S. economic assistance programs (from A.I.D., Statistics and Reports Division). These commodities include the "U.S. Share"

Table 2 (continued)

Sources (continued)

of surplus agricultural products but exclude Export-Import Bank commodities initially financed by the Bank but for which the Bank was later reimbursed by private participants. The commodity totals used for this column, therefore, are slightly smaller than those of Table 1, column (4).

Col (12) : Equals cols (4) + (6) + (7) + (8) + (9) + (10) + (11) + (12).

Col (13) : Equals cols (4) + (6) + (7) + (8) + (10).

Table -
 HYPOTHETICAL CONSTRUCTION OF TRUE VERSUS APPARENT U.S. COMMODITY EXPORTS
 ASSOCIATED WITH U.S. ECONOMIC ASSISTANCE, BY REGIONAL GROUPS OF
 50 PRINCIPAL AID-RECEIVING COUNTRIES, 1957-58 AND 1961-62
 (EXCLUDING THIRD COUNTRY RESPONDING EFFECTS)

(Values in millions of constant dollars, annual averages)

Region	Gross Economic Aid	Gross Com- modities ^a and Cash	Apparent Commodity Exports	Estimated Substitution Loss	Estimated Gain From Responding ^b	Estimated True Com- modity Exports ^c	Ratio to Col (2)	
							Apparent Exports	True Exports
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1957-58								
WESA	780	713	512	49	30	-93	.72	.69
Africa	71	44	25	3	3	25	.57	.57
Europe	383	370	352	21	4	335	.75	.91
Japan	99	156	156	34	11	133	1.00	.85
Other FE	868	730	397	64	74	-07	.54	.56
LA-								
-dollar	218	166	109	14	40	135	.66	.61
-other	296	275	228	46	36	216	.83	.79
Total	2715	2454	1779	231	198	17-6	.72	.71
($\frac{1}{2}$ of col. 3)	(153)	(138)	(100)	(13)	(11)			

Table 1 (continued)

<u>Region</u>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<u>1961-62</u>								
NESEA	1403	1222	996	108	14	932	.82	.76
Africa	218	156	112	9	6	109	.72	.70
Europe	278	281	264	19	4	249	.94	.93
Japan	80	85	85	10	6	72	1.00	.85
Other Far East	704	611	394	59	59	394	.64	.64
LA -dollar	298	225	164	31	47	180	.72	.79
-other	<u>482</u>	<u>444</u>	<u>331</u>	<u>58</u>	<u>48</u>	<u>321</u>	<u>.75</u>	<u>.72</u>
TOTAL	3464	3024	2346	303	214	2257	.78	.75
(% of col 3)	(148)	(129)	(100)	(13)	(9)	(96)		
<u>Change 1961-62^d</u>								
50-country TOTAL	+749	+570	+567	+72	+16	+511	.99	.90
(% of col 3)	(132)	(100)	(100)	(13)	(3)	(90)		

Source: Text equations (7) and (8) applied to A.I.D. export and aid data for each of 50 principal aid-receiving countries. (See Table 1 for country detail.)

Table 4 (continued)

Footnotes:

^a Including offshore commodity purchases.

^b Excluding exports indirectly financed through third country responding effects. Estimated third country responding would have increased the 1957-58 50-country totals for columns (5) and (6) by \$139 millions and the 1961-62 totals by \$145 millions.

^c Equals columns (3) minus (4) plus (5).

^d Columns (2) and (3), but not column (1), contain commodities related to but not ultimately paid for by economic aid. These are surplus agriculture products whose local sales proceeds are earmarked for non-aid uses and Export-Import Bank-financed commodities for which the Bank is reimbursed by private participants. If these commodities had been eliminated from columns (2) and (3), the 50-country totals would have been altered approximately as follows, and the changes in these totals would have differed only slightly from those shown in the table.

<u>50-country totals</u>	<u>Commodities and Cash</u>	<u>Apparent Exports</u>	<u>Substitution Loss</u>	<u>Responding Gain</u>	<u>Estimated True Exports</u>
	(2)	(3)	(4)	(5)	(6)
1957-58	2298	1623	210	182	1595
1961-62	2873	2195	283	200	2112
Change	+575	+572	+73	+18	+517

Table 5

ALTERNATIVE ESTIMATES OF U.S. COMMODITY EXPORTS RESULTING FROM
A.I.D. AND EXPORT-IMPORT BANK DISBURSEMENTS, 1959-1962
(All values in millions of current dollars)

Observed Expenditures			Substitution- Responding Model			Lynn Statistical Estimates of Direct and Indi- rect U.S. Commodity Exports Associated With Aid						
Gross	Commodities	U.S. Com-	Subst.	Respond.	Net	Lagged Model			Average Share Model			
and Cash	and Cash	modities	Effect	Effect	Exports	Lower	Upper	Mean	Lower	Upper	Mean	
(1)	(2)	(3)	(4)	(5)	(6)	Limit	Limit	Value	Limit	Limit	Value	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
<u>A.I.D. Only^a</u>												
<u>33-Country Sample^b</u>												
1959	998	747	284	-25	105	364	272	376	324	350	471	410
1960	990	772	275	-24	115	366	366	478	422	414	554	484
1961	1072	871	373	-37	119	455	249	262	256	460	602	531
1962	1276	941	611	-70	88	629	681	865	773	785	995	890
<u>A.I.D. plus Export-Import Bank Loans</u>												
<u>33-Country Sample^b</u>												
1959	1362	1079 ^c	577	-81	147	643	376	474	425	548	708	628
1960	1227	994	479	-68	131	560	450	602	526	530	744	637
1961	1685	1446 ^c	813	-124	202	891	622	622	622	819	974	896
1962	1692	1364 ^c	903	-124	156	935	826	1058	942	1061	1306	1183

Sources:

Col (1), (2), (3): U.S. Department of Commerce, Foreign Grants and Credits, op. cit., and records; and A.I.D., Statistics and Reports Division.

Col (4), (5), (6): Regional subtotals were computed using regional totals of the variables and equations (7) and (8) in the text. The regional estimates were then combined to give the 33-country totals shown.

Table 5 (continued)

Col (7), (10): Equals Col(1) times annual estimates of Lynn's coefficient b_3^* , computed first using historical U.S. market share of preceding year and then for the period 1949-1953.

Col (8), (11): Equals Col(1) times annual estimates of Lynn's coefficient b_3 , as computed in equations using historical U.S. market share of preceding year and of the period 1949-1953.

Col (9), (12): In each case equals the arithmetic mean of the preceding two columns.

Footnotes:

^aAgency for International Development and predecessor agencies.

^bIncludes Burma, China (Taiwan), Korea, Philippines, Thailand, Bolivia, Colombia, Costa Rica, Ecuador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Venezuela, Argentina, Brazil, Chile, Paraguay, Peru, Uruguay, Ceylon, Greece, India, Iran, Israel, Jordan, Pakistan, Syria, Turkey, U.A.R. (Egypt), Ethiopia, Libya.

^cExport-Import Bank-financed commodities do not include those purchased in earlier years (i.e., those for which Ex-Im refinancing was made available in the year shown.)

Table 6

ESTIMATED NET (ACTUAL) EFFECT ON U.S. EXPORTS (INCLUDING
RESPENDING IN THIRD COUNTRIES) OF APPLYING 80% AND 90%
"TYING" TO FY1964 PATTERN OF A.I.D. OBLIGATIONS
(All values in millions of dollars)

Region	FY1964 A.I.D. Program (1)	Estimated U.S. Exports in Absence of Tying			Estimated Actual U.S. Exports with Tying of	
		1957-59 Average (2)	1964 Apparent (3)	Export Values Actual (4)	80% (5)	90% (6)
NESA	808	32.5%	295	400	650	702
Africa	202	9.9	20	73	164	177
Far East	338	33.7	114	211	279	293
Latin America -						
Dollar	441	35.0	154	331	367	376
Non-dollar	<u>225</u>	<u>60.8</u>	<u>137</u>	<u>172</u>	<u>191</u>	<u>200</u>
TOTAL	2014		720	1187	1656	1748
% of total obligations	100%		36%	59%	82%	87%

SUMMARY

Gain from 80% tying over no tying	\$469 mil.	(+40% above no tying)
Gain from 90% tying over 80% tying	92	(+6% above 80% tying)
Gain from 90% tying over no tying	561	(+47% above no tying)

Sources:

- (1) A.I.D., "Front Lines," vol. II, no. 7 (Feb.15, 1964), p. 12. Program totals are given as a range, and the lower of the two numbers has been shown here. The Latin America figures exclude the Social Progress Trust Fund and are based upon country figures underlying the regional totals given in the source. ("Non-dollar" countries in LA consist of Argentina, Brazil, Chile, Paraguay, Peru and Uruguay.)

Table 6 (continued)

- (2) Based upon 3-year averages, 1957-59, for 50 principal aid-receiving countries. In computing the U.S. procurement share, agricultural commodities purchased under Sections 402 and 550 have been eliminated from both numerator and denominator. (See text, equation 13.)
- (3) Column (1) x (2) ÷ 100
- (4), (5), (6) Based on relationship between actual and apparent U.S. procurement shown in Figure 1.

Table 7
 ALTERNATIVE ESTIMATES OF U.S. COMMODITY EXPORTS RESULTING
 FROM 1961 A.I.D. EXPENDITURES, BY REGIONAL GROUPS
 OF LYNN'S 33-COUNTRY SAMPLE

Region	A.I.D. Expenditures (\$ millions)				Estimated Ultimate Net U.S. Commodities Attributable to A.I.D. as a Per Cent of Gross Aid Expenditures		
	Gross	Commodity Purchases in U.S.		Offshore Commodity Procurements plus Cash Grants	Brookings-based Estimate	Lynn Estimate	Substitution-Responding Model
		Irrevocable Letters of Credit	All Other				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	
Near East & South Asia	549	-	165	282	41%	34%	42%
Africa	30	-	0	4	3	28	4
Far East	295	-	130	148	59	76	66
Latin America	198	72	6	64	42	70	56
(Developing Africa)	(74)	(3)	(6)	(36)	-	-	(44)
(Other)	(124)	(69)	(0)	(28)	-	-	(62)
33-country Total	1072	72	301	498	45 ^a	52 ^a	50 ^a

^aAverages using values in column (1) as weights.

Sources:

Column (1): U.S. Dept. of Commerce, Foreign Grants and Credits, December 1961 Quarter (Washington: July 1962), Table 3 ("American Aid" grants) and Table 6 ("American Aid" country program loans).

Columns (2)-(4): A.I.D., Statistics and Reports Division. Taken from worksheets underlying Table 5.

Column (5): Equals $\left[\bar{r}_i \right]$; col (4) + $(1 - s_i' + s_i' r_i)$ col(3) + $(1 - s_i'' + s_i'' r_i)$ col(2) \div col(1), where r_i , s_i' and s_i'' are from Walter Salant, et al., op. cit., pp. 171-172, and equal:

Table 7 (continued)

	Unfied Feedback Ratio, r_i	Subs. Against U.S. Procurement, S_i	Subs. against Irrevocable Let- ters of Credit, S_i
Near East & South Asia	.31	.25	.75
Africa	.15	.20	.70
Far East	.47	.35	.85
Latin America	.55	.40	.90

Column (6): Based on Lawrence E. Lynn, "U.S. Foreign Economic Assistance and the Balance of Payments," *op. cit.*, Tables 4-6. Lynn's estimates before third country respending were based on his two-stage Aitken results and were as follows:

Near East & South Asia	26%
Africa	11%
Far East	64%
Latin America	65%

Lynn's estimates were adjusted to include third country respending by adding $(r_i - F_i)(1 - x_i + S_i x_i - S_i a_i)$. A description of these parameters is found under equation (12) in the text, and the values used were those underlying Figure 1. Values for x_i , nominal tying level excluding services, equal $\text{col}(2) + (3)$ divided by $\text{col}(2) + (3) + (4)$.

Column (7): Based on Figure 1 or equation (12) and parameter values used for constructing Figure 1. Direct and indirect commodity exports were first found and then divided by total A.I.D. expenditures to get the percentages shown.