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THE ANALYSIS OF TIED AID: SOME CONCEPTS AND METHODS

By Laurence E. Lynn

The Economics of Tied Aid

A tied aid policy is based on the presumption that a portion of those untied aid proceeds which are initially used by the recipient other than for purchases of goods and services from the donor ultimately finances increases in the gold and foreign exchange reserves of third countries.[1] That part of aid expenditures which finances foreign reserve accumulation represents the balance of payments cost to the donor of its aid programs. If countries receiving aid can be induced by a tied aid policy ceteris paribus to procure a greater proportion of their total imports from the donor, the cost of aid to the donor's balance of payments will be reduced.[2]

If that portion of the tied aid which the recipient would spend initially in third countries if free to do so is less than the amount of imports from the donor not financed by the donor's aid, the country is in a position to substitute tied aid for non-aid foreign exchange in financing its normal commercial purchases from the donor. Tied aid substitution frees the non-aid receipts for use to

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1. Some of the aid proceeds may finance increases in the recipient's reserves as well. For the United States, the magnitude of this drain is probably small relative to the industrial third country drain, and a foreign exchange reflection ratio of unity for aid recipients is an acceptable assumption.

2. Achieving a reduction in the balance of payments costs of aid programs by adopting a tied aid policy also involves a cost to the donor's budget--a given aid program becomes more expensive to the extent that the recipient must utilize the proceeds to purchase goods and services in dearer markets. In general, the cost to the donor's budget of the tied aid policy per dollar of increase in the donor's exports is greater the greater is the donor's competitive disadvantage in supplying the resource needs of the recipients. The cost of a tied aid policy also can be expressed as the opportunity cost to the national economy of retaining resources in inefficient employments. Alternative policies to alleviate balance of payments deficits ought to be compared at least in terms of the opportunity cost per dollar of reduction in the deficit to the government's budget and, if possible, in terms of the opportunity cost to the national economy.

finance the desired purchases from third countries. Tied aid substitution may occur to such an extent that tying aid has no effect on the donor's exports to recipients of its aid.

Aid may bulk so large relative to non-aid financed imports from the donor for some recipients that the scope for tied aid substitution is effectively limited. Even with an unlimited scope for tied aid substitution, moreover, some recipients may increase their total purchases from the donor because their priorities are flexible with respect to sources of supply, the administrative costs of more sophisticated planning are high, or it is deemed expedient to do so.

It will be helpful to describe this argument symbolically. Let us denote the amount of aid received by a given country as A; the proportion of this aid which is tied as γ, $0 \leq \gamma \leq 1$; the proportion of tied aid which the country would spend initially in third countries if the aid were not tied as δ, $0 \leq \delta \leq 1$; and the proportion of non-aid foreign exchange receipts, F, which would finance imports from the donor in the absence of a tied aid policy as α, $0 \leq \alpha \leq 1$. Theoretically, tied aid substitution can fully offset the trade shifting objective of the tied aid policy if $\alpha F/\delta\gamma A$, which we refer to as the scope for tied aid substitution, is greater than unity. On the other hand, if this ratio is less than unity, the scope for tied aid substitution is limited and some trade shifting in favor of the donor's exports is inevitable.[1]

The scope for tied aid substitution may be limited in practice even when $\alpha F > \delta\gamma A$. Institutional imperfections in the resource allocation mechanisms of developing countries may mean that it is not possible in practice for the government to shift commercially financed imports to an aid financed basis and to

1. For a similar discussion, see Charles Wolf, Foreign Aid: Theory and Practice in Southern Asia, (Princeton: Princeton University Press, 1960), pp. 418-419.

acquire the ordinary foreign exchange earnings necessary to finance the particular purchases for which it would have utilized untied foreign aid. The government may instead be forced to acquire these particular goods in the dearer donor's market if the desired activity is to be undertaken at all.

Tying aid for individually designated projects may reinforce these tendencies, constituting, in the words of Professor John P. Lewis, "double tying."[1] The result of the policy, according to Lewis, is that "(The buyer) has no discretion as to what he buys, and his choice of where to buy is limited in many cases quite literally to the two or three firms that are prepared to fill a large Indian order for highly specialized equipment within a stated period." The implication is that this particular project, evidently a high priority project, cannot in fact be financed other than by tied assistance. The example also suggests that the donor can influence the scope for tied aid substitution by defining its standards for aid financing in such a way that some portion of commercially financed imports is ineligible.

Scope for Tied Aid Substitution Limited. Assume that, for a given country, $\alpha F < \delta\gamma A$. The minimum increase in donor exports attributable to the tied aid policy is $\delta\gamma A - \alpha F$. If, for example, a country would prefer to spend $10 million of tied aid proceeds in third countries, and if αF is $8 million, the donor's exports must be higher by at least $2 million, since the recipient has only $8 million of imports from the donor for which the tied aid could substitute for non-aid sources of financing.

The maximum possible increase in donor exports is $\delta\gamma A$. Continuing the above example, if no tied aid substitution occurs, the country's imports from the donor

1. John P. Lewis, Quiet Crisis in India (Washington: The Brookings Institution, 1962), quoted by Hal B. Lary in The United States Balance of Payments, Hearings before the Joint Economic Committee, Congress of the United States, 88th Cong., 1st Sess., 1963, p. 308.

will increase by a full $10 million in addition to the $8 million in imports from the donor financed from other funds.

In general, the increase in the donor's exports attributable to the tied aid policy in countries with limited scope for tied aid substitution may be described as $\delta\gamma A - \theta\alpha F$, $0 \leq \theta \leq 1$. The parameter θ is an index of tied aid substitution, taking the value zero when no tied aid substitution occurs and unity when tied aid substitution occurs to the maximum extent possible.

Total donor exports to aid recipients characterized by limitations on the scope for tied aid substitution can be expressed as the sum of (1) exports financed by the tied aid which the aid recipient would have used to purchase the donor's goods even if the aid were untied, $(1 - \delta)\gamma A$; (2) the portion of untied aid which the country uses to finance imports from the donor, which we assume to be $(1 - \delta)(1 - \gamma)A$; (3) donor exports attributable to foreign exchange other than aid, αF; and (4) additional exports which take place because the scope for tied aid substitution is limited, allowing for the extent to which the recipient does substitute, $\delta\gamma A - \theta\alpha F$. Summing these elements and simplifying we obtain

$$E = (1 - \delta)(1 - \gamma)A + \gamma A + (1 - \theta)\alpha F \tag{1}$$

where E refers to the donor's exports to the aid recipient.

<u>Scope for Tied Aid Substitution Unlimited</u>. Assume that, for a given country, $\alpha F > \delta\gamma A$. Total donor exports to the aid recipient consist at least of components (1), (2) and (3) discussed in the preceding paragraph. This list is complete if tied aid substitution occurs to the maximum extent possible. If tied aid substitution does not occur to the maximum extent possible, the donor may gain some portion of the trade which the recipient would have conducted with third countries in the absence of a tied aid policy.

In general, the donor's exports will increase by some fraction λ, $0 \leq \lambda \leq 1$, of $\delta\gamma A$ because of the tied aid policy. To avoid confusion in comparing λ and θ, the value $1 - \lambda$ is used for analysis. If the value of $1 - \lambda$ is zero, all of the trade which the recipient would have conducted with third countries if the aid were untied is shifted to the donor. A value for $1 - \lambda$ of unity means that the donor's exports to the recipient are no higher than if the aid were completely untied. Hence λ is likewise an index of tied aid substitution for countries with unlimited scope for tied aid substitution. The equation is

$$(2) \qquad E = (1 - \delta)(1 - \gamma)A + (1 - \lambda)\delta\gamma A$$
$$= (1 - \delta)A + \alpha F + \lambda\delta\gamma A.$$

<u>The Extent of Tied Aid Substitution.</u> How much tied aid substitution will occur? If, prior to the implementation of a tied aid policy the preferences and priorities of the recipients were susceptible to modification in such a way as to favor the donor's exports as a result of the way in which aid programs were administered, such tendencies might be reinforced with specific policies on procurement in effect.

On the other hand, aid recipients have an incentive to substitute aid for non-aid financing to the extent that a tied aid policy necessitates increasing purchases in dearer markets. The likelihood that tied aid substitution will occur may be assumed to be related, <u>ceteris paribus</u>, to the degree to which the prices, quality and specifications of the donor's goods and services, together with the terms on which they can be obtained, meet the recipient's needs. The most desirable circumstance for a tied aid policy is for local priorities to be highly flexible with respect to sources of supply for goods for which the donor does not have a marked competitive disadvantage.

The trade shifting effects of a tied aid policy depend, therefore, on theoretical and practical limitations on the scope for tied aid substitution and on

"voluntary" shifts of the recipient's preferences and priorities in favor of the donor's goods. Arguments that the tied aid policy reduces the efficiency of a given aid level, acts as an indirect subsidy to the donor's export industries, thus protecting inefficient firms, or stimulates the entry of the donor's goods and services into markets which would otherwise remain closed assume that at least one of these conditions exists in at least some aid receiving countries.

Empirical Analysis

Preceding calculation of the scope for tied aid substitution and estimation of the parameters θ or λ, the parameters δ and α must be estimated and data on γ, A and F obtained. The necessary data on γ, A and F are assumed to be available from official publications and sources.[1] Discussion here centers on estimating the structural parameters. Particular reference is made to the research conducted by the author into United States economic aid programs and the U.S. tied aid polic

Many years' experience with untied economic aid programs is available for the United States. Data for (the more recent of) — 1958-1961 — these years were used to estimate the parameters δ and α. A single equation model was developed which described U.S. exports to countries receiving aid as dependent upon (1) the components of foreign exchange supply available to importers, including foreign exchange resources available under U.S. economic aid programs, and (2) the U.S. share of the country's total imports for the preceding year, which constituted a proxy variable or weight representing the set of factors which influence the direction of a country's imports.

1. Estimating non-aid foreign exchange receipts presents some problems. The author's approach in carrying out research on U.S. aid programs has been to assume for any given year that the total volume of foreign exchange available to importers in countries receiving U.S. aid is equal to total imports, M. Then F = M - A. The components A and F were further disaggregated. Other approaches to this particular problem have utilized data on various measurable components of foreign exchange supply without attempting to reconcile these into a total supply. Successfully estimating the scope for tied aid substitution requires reasonably accurate estimates of total non-aid financed imports from the donor.

The general form for the model was

$$E = a_o + \sum_m b_m F_m + \sum_m c_m F_m S, \quad m = 1, \ldots, M,$$

where S = the U.S. share of the country's market for the preceding year and F_m = the mth component of foreign exchange supply. This use of market shares to weight foreign exchange supplies greatly simplifies the empirical analysis. But it precludes explicit consideration of the effects of price variables and characteristics of economic structure on foreign aid allocation.[1]

Empirical analysis was based on the use of ordinary least squares estimation procedures with cross section data for 43 recipients of U.S. economic assistance. Regression coefficients obtained in this manner were combined to provide estimates of δ and α. It is to be emphasized, however, that other models may be utilized to generate such estimates.

The scope for tied aid substitution was computed for individual aid recipients for 1962 and 1963, years during which the U.S. tied aid policy was reflected in expenditures data. Such calculations are of considerable interest in themselves. Based on these computations, countries can be classified by whether the scope for tied aid substitution was limited or unlimited.

Several methods may be employed to test hypotheses concerning the impact of the tied aid policy on the donor's exports and to estimate the magnitude of the impact.

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1. Considerable discussion of the model is contained in the author's Ph.D. thesis (in preparation). Further information concerning the model, statistical assumptions and procedures, and problems encountered in the analysis as well as results obtained may be obtained by corresponding with the author.

(1) Coefficients of the regression models may be estimated using tied aid data. Hypotheses that the aid coefficients based on tied aid data are equal to those estimated with untied aid data may be formally tested. Residuals from such regressions may be examined to evaluate the prediction that a model relevant for untied aid will underestimate the donor's exports to countries characterized by a limited scope for tied aid substitution.

(2) Separate sets of coefficient estimates may be obtained (a) for countries with limited scope for tied aid substitution and (b) for countries with unlimited scope for tied aid substitution. Tests of the equality of regression coefficients may be performed with regressions (2a) and (2b) and between regressions (2a) and (2b) and regressions for earlier years.

(3) Explicit estimates of the parameters θ and λ may be obtained. These may be obtained using multiple regression procedures with cross section data if the investigator believes that the true magnitudes of these parameters are the same for a sufficiently large group of countries for each parameter. If, as seems likely, such an assumption cannot be sustained, an estimate of the appropriate parameter can be obtained for each country. Essentially this involves the use of already computed estimates of δ and α, information on γ and the amounts of foreign exchange available, and the observed volume of U.S. exports to the country as a priori information and the solution of equation (1) or (2) for the unknown

The major drawback to the country-by-country approach is that it posits exact relationships among the variables considered. Such a non-stochastic specification precludes establishing the degree of confidence with which the results can be accepted.[1] The estimates are subject to random error, however, and may, for this

1. The precision with which θ or λ can be estimated in this manner is related to the goodness of fit of the equations used in generating the a priori information. For aid donors whose aid has been tied for a longer period of time than has that of the U.S., time series analysis of tied aid substitution may be fruitfu

reason, exceed unity or be less than zero in magnitude. Nevertheless, the calculations can be of considerable use in suggesting patterns of tied aid substitution in particular groups of countries and indicating the magnitude of tied aid substitution in general.

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