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Adolescent Fertility in Sub-Sahara Africa

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FOOD AID IMPACTS ON COMMERCIAL TRADE: A REVIEW OF THE EVIDENCE

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EXECUTIVE SUMMARY

Despite more than 35 years of experience with U.S. food aid under PL 480 and literally thousands of studies, articles, and reports, the nature of food aid's impacts on commercial trade and development remains unclear.

This study reviews 24 studies that used quantitative analytic methods to explore food aid impacts on the recipient country's commercial trade. These studies were identified as the result of an intensive review of the literature and discussions with knowledgeable individuals in academia and government. While this study does not include every quantitative analysis carried out on this issue (and indeed a handful of studies were identified but could not be obtained for review),¹ we believe that it effectively covers the published literature on these issues. It is noteworthy that no quantitative studies were identified that attempted to confirm analytically the relationship between food aid and commercial trade in the Asian cases frequently cited as evidence of such a relationship (Korea and Taiwan). A second major gap in this literature is the failure to distinguish adequately among project, program, and emergency aid in measuring impacts.

Seventeen of the studies attempted to quantify the relationship between food aid and commercial imports, while the remaining studies used quantitative analysis of other variables to draw conclusions regarding impacts on commercial trade. With the exception of four studies on India and one on Colombia, all of the studies identified were published between 1980 and 1989. Because several of the studies conducted alternative analyses of the same data or reported analyses from several countries, estimates from a total of seventeen single-country and three multi-country studies were obtained from the literature (excluding studies that reported coefficients on food aid that were not statistically significant).

The balance of empirical evidence generated by these studies confirms that, in at least some cases, food aid partially displaces commercial imports in the short term. This finding is generally supported by a plurality of the

1. Please refer to Part 3 of the bibliography for a list of studies identified, including those that could not be obtained within the study period.

studies based on analysis of data on a country-by-country basis. Six of the 17 single-country analyses that directly measured this relationship² found that each ton of food aid displaces between 300 and 900 kilograms of commercial imports in the short term, and five found smaller displacement impacts.³ These findings were not unanimous, however: the three studies that pooled data from several countries found a positive relation between food aid and commercial imports in the short term, as did six of the country studies.⁴

The findings appear to cluster in two groups. In the first group are countries where food aid accounts for a relatively minor share of total availability (e.g., India and Brazil). Studies for these countries generally found substantial displacement of commercial imports. A second group consists of countries where food aid is a major source of both imports and total grain availability (primarily African countries). Studies for this second group tend to find a minor impact on commercial imports, either positive or negative, possibly suggesting that the income effect (increasing total imports) is outweighing the price effect (discouraging commercial imports). This conclusion is appealing intuitively but should not be considered definitive. The wide variation in the coefficients estimated and the low degree of statistical significance in many of the analyses (not included among the seventeen) suggest that coefficient estimates are sensitive to model specification.

A second major conclusion supported by the literature is that the short-term impact of food aid on commercial imports depends both on the design of the program and on the structure of the food market in the recipient country, both of which are in turn greatly influenced by the domestic policy environment in the recipient country. In particular, programs that direct food aid through channels that do not directly compete with the commercial market are less likely to displace commercial imports than are food aid programs that more closely resemble commercial imports in their design and operation. Because programs operating outside of commercial channels generally provide food at a below-market price, they have the potential to increase demand through income transfer effects, as well as through simple price effects (with the size of these impacts depending on the elasticities involved). This impact is directly related to the use of below-market-price channels, an approach that is being phased out in a number of

2. Clay's two for Sri Lanka estimates, Hall's estimates for Brazil and Colombia, one of Maxwell's estimates for Ethiopia, and Mann's estimate for India.

3. Bolling's estimates for Jamaica and Trinidad, Rogers's estimate for India (also reported in Srivastava), Shapouri and Rosen's estimate for the Sudan, and Rosen's estimate for Madagascar.

4. Maxwell's second estimate for Ethiopia; Rosen's estimate for the Sudan; Shapouri and Rosen's estimates for Liberia, Senegal, and Mali; and Bezuneh's estimate for Tunisia.

countries and one, moreover, that is less likely to translate into increased commercial sales over the longer term (due to the inability of the recipient to continue the program without concessional financing). Given the importance of the demand side of the food system, models that incorporate market duality where it exists, tend to perform better than those that look only at the supply side.

The findings of the single-country analyses on short-term trade impacts are contradicted by the three multi-country studies, however. The studies that combined data from several countries, rather than analyzing each or several countries separately, generally found a positive relationship between food aid and commercial imports. Although further analysis is needed to explain this result in light of the country work, it appears that this result captures inter-country differences in food self-sufficiency (overall import needs) rather than any connection between food aid and commercial trade as such. In other words, looking across countries, large quantities of food aid and large commercial imports tend to occur in the same countries: those with a large food deficit are more likely both to import greater quantities commercially and to receive large amounts of food aid.

Food aid's long-term impact on commercial trade development, including its effectiveness as a tool for expanding U.S. markets for agricultural commodities, remains unexplored territory. No studies were found that attempted to link food aid to import levels more than three years later or to match food aid donations with increased sales or donor market share (short-term or long-term). Thus, the studies available are silent on such vital issues as whether food aid "graduates" are more or less likely to import commercially, whether food aid recipients are more likely to become better commercial customers for the donor country (in terms of absolute levels or market share), whether food aid has a measurable impact on the commodity mix imported over time, or whether food aid recipients are more or less likely to increase their reliance on external trade rather than domestic production for their basic food supply. A possible explanation for the lack of analysis on this issue might be that academic interest regarding food aid has focused on possible production disincentives, rather than trade, while analysts interested in trade impacts have preferred to focus on pure trade interventions, such as the Export Enhancement Program, but this is only speculation.

Several recent studies provide a sound methodological basis for expanding the analysis of food aid's effects on commercial trade over the long term (particularly Lavy's two studies using pooled data and Rosen's study using single-country analysis, all of which use African data only). Using a similar approach, it would be a straightforward exercise to determine whether food aid recipients have turned into better customers than non-recipients, taking into consideration economic growth and other factors. It would clearly be more difficult to reach a definitive conclusion on food aid's role as a causal factor in the evolution of trade.

The quantitative studies carried out to date underscore the need to examine the experience across a wide range of countries, to look beyond the idiosyncracies of any single country's experience and derive conclusions of general validity. An analysis designed to produce such conclusions should, therefore, use data from a cross-section of major recipients of food aid, both current and past, incorporating information on trade, production, and, if possible, non-commercial food distribution channels for food aid and related commodities to draw a more complete and reliable picture of food aid-trade relationships.

INTRODUCTION: BACKGROUND AND SCOPE OF THE STUDY

The legislation governing U.S. food aid emphasizes both trade promotion and development assistance as objectives of the food aid program, while recognizing the need to avoid negative effects on either the recipient country's agriculture or commercial trade. Despite more than three decades of experience with food aid, the program's impacts on the recipient country and on international trade — both positive and negative — remain controversial and have been a continuing focus of attention both among academics and within the development community.

This attention has led to the development of an extremely large and diverse literature on food aid. The current literature on food aid runs to literally thousands of entries: indeed, it would be possible to assemble a fairly lengthy bibliography composed entirely of bibliographies on food aid. There have been numerous reviews of food aid literature, including the synthesis of over 80 A.I.D. evaluations of program food aid completed in 1989 by the authors of this report. Despite this interest, there have been few systematic or broad-based attempts to assess food aid's impacts on commercial trade, whether in the short-term or the long-term. Because food aid's impact on commercial trade is a continuing focus of controversy, most reviews of the literature touch on this issue to a greater or lesser degree (see, for example, Maxwell 1983, Clay and Singer 1985, and the Nathan Associates 1989 review of A.I.D.'s food aid evaluations), but the broad scope of these studies prevents them from dealing with this issue systematically.

This paper constitutes a first attempt to fill this gap. It focuses particularly on quantitative assessments of food aid's impacts with the aim of weighing the evidence, or the lack thereof, regarding food aid's impacts on commercial trade. This focus is appropriate for three reasons. First, the general literature has already been reviewed by a number of authors, as noted. These authors have done an excellent job of summarizing the arguments made both for and against food aid's having an impact on commercial trade. There is little point in repeating the points they have made.

Second, the quantitative evidence deserves special attention, not only to weigh the evidence thoroughly but also to separate the wheat from the chaff.

Given the diversity of experience with food aid worldwide, it is possible to identify a subset of quantitative studies that support almost any point. Only by a thorough and systematic review of the studies is it possible to arrive at an unbiased conclusion regarding the evidence. The food aid literature is replete with writings aimed at making a case for or against food aid, many of which offer only a limited factual basis for the arguments made. One finds the same quantitative studies referenced repeatedly, moreover, often without a full presentation of the model used or the findings.

Finally, a review of the quantitative literature is necessary to assess whether the question of food aid's impact on commercial imports has been answered or whether important gaps remain in our understanding of this question, requiring further study. To serve this purpose, the review must examine not only the findings reached but also the methodologies used, as the basis for extending or updating the work already done.

Given the decision to focus on the quantitative evidence, it is necessary to ask, what is included in the universe of quantitative studies? This question is not as easy to answer as it might first appear. If we imagine a continuum with wholly non-quantitative studies on one end (nary a number in view) and studies based on multiple equation systems on the other, then it is clear that a very large number of studies occupy the middle ground. Nearly all food aid studies provide some data, even if it is only a table showing food aid levels over time. To term this entire literature quantitative would clearly distort the meaning of the word. We have used two basic criteria in deciding whether to include or exclude a given study:

- Studies that used an identifiable quantitative analytic technique to attempt to measure or verify the relationship between food aid and another variable (commercial imports, production, consumption, etc.) have been included. Given the nature of the question being studied, it is not surprising that most of the studies identified used econometric techniques, but several studies used other techniques, ranging from correlation analysis to input-output analysis.
- Studies that did not base their analysis on actual historical data at the country or multi-country level were excluded. In other words, studies that projected impact on commercial trade from a theoretical model of international or national behavior were not included. (Several studies included both a theoretical analysis and an historical analysis based on one or more country experiences; these were included.)

Our criteria generally excluded studies where the analysis was limited to a non-rigorous interpretation of the data,⁵ for two reasons. First, because the validity of such analyses depends largely on the skill and judgment of the author, the quality and utility of such studies is highly variable and difficult to assess second-hand. Second, the very large quantity of such studies — literally hundreds of food aid studies consider commercial imports and attempt to discern the relation between the two to a greater or lesser degree — made it impossible to include this entire literature with the resources available.

The study also excluded studies based on theoretical models of international trade or country-level behavior, rather than analysis of historical behavior. Although such studies are useful in improving understanding of trade issues, they cannot by definition be used to prove or disprove the connection that may exist between food aid and commercial trade. Readers interested in exploring this literature are referred to a recent study by Seitzinger and Paarlberg, which reviews this literature in detail. The overall conclusion of this literature is that subsidies to international trade, including food aid, are likely to increase total imports, but by less than the amount of subsidized food provided. In other words, food aid may be expected to partially displace commercial imports, with the degree of displacement depending on the price elasticity of demand for the commodity and how this elasticity is affected by program design (particularly the degree of subsidization).

Finally, this study does not encompass the large and growing literature that seeks to draw a connection between foreign aid (as distinct from food aid) and increased import demand caused by economic growth and development. This literature is excluded because it touches on food aid only peripherally and because the studies that have appeared to date, almost without exception, do not incorporate quantitative analyses (or, if they do, do not separate food aid from other aid). A recent discussion of the pros and cons of foreign aid, with a strong focus on food aid and agricultural exports, may be found in *How U.S. Food Aid Programs Help American Agricultural Exports*, published by the International Trade and Development Education Foundation in 1988.

In sum, this paper focuses primarily on studies that have sought to measure or verify the relationship between food aid and commercial imports based on rigorous analysis of historical data. The paper begins with a brief review of the main issues surrounding food aid's impacts on international trade. It then reviews the formal analytic literature on these issues,

5. Such a study might present, for example, a table or graph showing food aid and commercial imports over time as the basis for a discussion of their relationship, but it would not attempt to measure this relationship or confirm it analytically by controlling for other variables.

compares the models used in the analysis, and synthesizes the findings reported in this literature. Based on this review, the report concludes with an assessment of which questions remain unanswered, and it suggests future directions for analysis. The report includes an annex providing detailed annotations on each of the studies synthesized.

Although the study focuses on commercial trade impacts, the discussion will from time to time discuss impacts on consumption and production in the recipient country as well. These issues are germane to a review of the literature on trade impacts for three reasons. First, commercial imports, food aid, and local production constitute closely related elements of the food supply system. Together with consumption and income on the demand side, they jointly determine how much will be consumed and from what sources. When a change takes place in the economic environment in a given country, such as a sharp downturn in local production, it affects income levels and availability of foreign exchange, and therefore affects international trade and food aid as well. Second, much of the literature on food aid is designed to address both trade and other issues. It is difficult to discuss this literature fully without considering both trade and non-trade issues. Finally, interest in production and consumption impacts of food aid remains strong, particularly with regard to possible disincentive effects. A review of these issues is therefore an appropriate element of this study. For these reasons, we have included all of the quantitative studies of food aid located by the team in the overall bibliography, and we have provided a review of the findings regarding production in Annex 3 to this report.

The study's authors are indebted to many of the authors cited in the bibliography, who generously provided copies of unpublished studies and helped to identify additional sources. The support and assistance of the Office of Program, Policy, and Evaluation in A.I.D.'s Bureau for Food for Peace and Voluntary Assistance is also acknowledged with gratitude.

FOOD AID IMPACTS ON COMMERCIAL TRADE: WHAT ARE THE ISSUES?

Questions have been raised regarding food aid's impacts on the donor, on the recipient, and on world markets since the inception of surplus disposal programs in the interwar period. The initiation of serious analytic efforts to assess food aid's impacts can be traced to Schultz's seminal article in 1960 (see the annotated bibliography in Annex 1). The academic response to the questions raised by Schultz and others was initially muted by the lack of readily available data and analytic techniques with which to assess the impacts hypothesized. As developments in computerized analysis removed this constraint, there was a spate of studies attempting to measure food aid's impacts in quantitative terms.

Much of this formal analytic literature focuses on food aid's impacts on the domestic economy of the recipient country, particularly the potential for disincentive effects on production. Analysis of food aid impacts on commercial trade has largely been carried out in the context of efforts to understand the food economy in order to determine impacts on local production. In addition, a substantial literature has developed to explore the determinants of food aid itself. Much of this literature — but by no means all — sets out to prove that food aid is not determined solely by need (which should be self-evident to all but the most naive observer).

Despite the importance of market development as a primary rationale for U.S. food aid programs, relatively few analyses have been carried out to measure or document impacts on commercial trade, whether short-term or long-term. No studies at all could be identified that examined food aid's impact on the agricultural exports of the recipient country, either long-term or short-term. Given the complete absence of rigorous analysis on possible recipient country export impacts, this report will focus entirely on analysis of food aid impacts on recipient country imports, and in particular on the degree to which food aid substitutes for commercial imports that would have taken place in any case (often referred to in the literature as the additionality question).

Given the paucity of studies on this issue, it is necessary to develop a framework to discuss the issues surrounding food aid's potential impact on

commercial trade and market development. The literature on food aid and commercial trade suggests a number of alternative mechanisms through which food aid may affect commercial import levels. These impacts can be divided into short-term and long-term impacts:

Short-term Impacts

- *Direct displacement of commercial imports:* Food aid may replace commercial imports that would otherwise have taken place, particularly where the central government exercises substantial control over imports.⁶
- *Increased effective demand through macro-level income transfers:* Food aid provides a direct resource transfer to the recipient, and thus may encourage the country to expand its purchases of all goods, including imported food. Given that the income elasticity for food is generally below one, this expansion would generally result in some substitution of food aid for commercial imports.
- *Relief of a balance of payments constraint:* Food aid helps a country to finance its foreign exchange requirements, enabling it to implement a level of imports that might not have been feasible otherwise (this impact would presumably imply a reduction in commercial imports, but not a one-for-one replacement with food aid, due to the country's presumably positive propensity to spend the additional foreign exchange on food as well as non-food items).
- *Short-term income transfers at the micro level:* Food aid programs may be used to transfer income to population groups with a high propensity to raise food consumption and expenditures on food, leading to increased demand for food in the recipient country as a whole.
- *Short-term price effects:* Food aid may be used to subsidize domestic consumption of foodstuffs, leading to increased demand and, depending on how macroeconomic policy measures affect the commodity market, to increased imports.

6. This displacement may or may not be on a ton-for-ton basis, and therefore total imports may increase even if there is some displacement. To the extent that food aid replaces commercial imports from another source, moreover, total exports by the donor country may even increase.

Long-term Impacts

- ***Development of commercial ties:*** Food aid programs may strengthen trade linkages between importers (public or private) in the recipient country and U.S. suppliers, encouraging these importers to turn to U.S. suppliers for commercial imports in the future. Alternatively, food aid may actually disrupt or hinder development of these linkages, either by replacing commercial transactions with government-to-government food aid programming or by damaging the reputation of U.S. commodities and suppliers. The latter effect may occur if, for example, the food aid commodities delivered are of low quality or if program procedures are unnecessarily cumbersome.
- ***Changes in taste preferences:*** Food aid may encourage the local population to develop a taste for the commodities provided through the program. This change can take place through a variety of mechanisms, including introduction of commodities that have not traditionally been part of the diet (e.g., wheat, and, more recently, maize, in the case of Bangladesh); increased availability of a well-known commodity at a reduced price, leading to expanded use in the diet (e.g., rice in West Africa); or through introduction of new varieties of an established commodity (e.g., red sorghum in West Africa).
- ***Agricultural development:*** Food aid resources may have a positive or negative impact on the recipient country's agricultural system, altering domestic production of similar commodities or affecting the aggregate production in the sector as a whole. These effects may lead in turn to changes in import patterns and increased or decreased opportunities to market U.S. agricultural products.
- ***International relations:*** Food aid may help to cement relations between the U.S. and recipient countries, helping to promote U.S. trade across the board. On a more pragmatic level, food aid may be used as a bargaining chip in trade discussions, encouraging the recipient government to direct a greater share of its commercial purchases to U.S. suppliers.
- ***Income growth and diversification:*** Food aid may contribute to national development, leading to rising income levels, rising consumption, and expanded demand for food, which may in turn fuel increased commercial imports.

The extent to which these various impacts arise in a given situation depends on the local market structure and the nature of the food aid program. Clearly, each of these impacts is more likely to occur in some program designs than in others. A number of large food aid programs have historically been based on distribution of the commodity to low-income consumers through government channels at a highly subsidized price. This type of program is unlikely to lead to long-term income growth or to development of commercial trade linkages; nor is it likely to displace commercial imports over the short-term to the extent that the food is channeled to consumers who increase their consumption by the full amount received.

Differences in food aid program design, and consequently in the mechanisms governing import impacts which correspond only loosely to the formal distinction between project and program food aid. Program food aid may be distributed through governmental channels that effectively target low-income consumers, reducing the trade impact, or it may flow directly into market channels. Similarly, project food aid may be distributed to low-income consumers or it may be sold to generate revenues to support the program. In both cases, the potential impact on trade depends on the extent to which distribution of the food aid commodity departs from an open-market pattern, that is, on the extent to which food aid is distributed through separate channels that do not compete with food being sold in the marketplace.

In any case, the distinction between program and project food aid is poorly recognized in the literature on food aid impacts. As further discussed below, some of the studies reviewed identified the programs analyzed as Title I programs, historically the most common form of U.S. program food aid. Most of the studies, however, either combined all food aid together or failed to make clear the nature of the food aid programs involved.

STUDY METHODOLOGY AND HYPOTHESES REVIEWED

The literature on food aid impacts falls well short of addressing the full range of issues identified in the previous section. On the contrary, only a few of the available studies discussing food aid's trade impacts go beyond measurement of the impact to consider the factors underlying the impact or the interaction between food aid program design and impact on commercial trade. No study was identified that attempted to examine long-term impacts (the longest lag examined between food aid input and changes in any dependent variable being three years). For this reason, a limited set of hypotheses was formulated for use in reviewing the literature:

- Food aid increases total imports of the programmed commodity in the short run.
- Food aid increases the value of commercial imports of the programmed commodity in the short run.
- Food aid increases the quantity of commercial imports of the programmed commodity in the short run.

To assemble the information available regarding these hypotheses, the team reviewed the literature to identify analyses that attempted to quantify the relationships between food aid and the food economy of the recipient country. Some of the studies identified focused on trade, but many dealt with trade impacts only incidentally.

For each quantitative study identified, the team prepared a detailed annotation summarizing impacts on trade and production. The quantitative results were summarized in three tables, presented below:

- Table 1 describes the studies reviewed in terms of the countries and time period covered, the methodology used, and the type of food aid program concerned.

- Table 2 presents additional information on the structure of the models estimated; it is organized in terms of the dependent variables, identifying the independent variables used to explain each one.
- Table 3 presents the findings regarding the direct impact of food aid and other explanatory variables on trade levels.

In order to present a complete picture of the analysis reported, the study team also prepared a table summarizing the studies' findings regarding the relationships linking food aid to production, consumption, and other variables of interest. This summary is presented in Annex 2. It should be noted that several of the estimated equations summarized in this table include commercial imports and/or world prices as explanatory variables, although they do not link these variables to food aid.

OVERVIEW OF THE LITERATURE

Because the purpose of the present study is to review the concrete evidence on food aid's impacts on commercial trade, the review emphasized those studies presenting quantitative analyses of food aid's impacts. The broad literature providing impressionistic or theoretical analyses of food aid impacts was reviewed by the team, and the principal conclusions of this literature are summarized later in this report. Readers interested in a review of the broader literature are referred to Clay and Singer's excellent literature survey, completed in 1985. (Clay and Singer's findings on the commercial trade issue are further discussed below.)

The review covered the full range of literature available in published (and to the degree possible, unpublished) sources that measures the relationship between food aid and commercial imports of food. As further discussed below in the section reviewing the studies' methodologies, nearly all of the quantitative studies identified consisted of single or multi-country econometric studies.

From bibliographic listings and printouts of over 500 entries, the team located and reviewed over 100 documents to identify quantitative analyses for detailed review. This search was supplemented by interviews with many of the leading authorities on food aid, including both academics and practitioners in A.I.D. and USDA to identify additional studies. (A list of individuals contacted is included in Annex 2.) Although many of the studies identified presented quantitative data, use of rigorous quantitative analytic techniques to examine food aid's trade, production, and consumption impacts was surprisingly rare. Only 29 of the studies used such techniques to analyze impacts, of which only 24 examined trade effects. The remainder either did not present data or limited their analysis to qualitative methods or nonrigorous techniques, as discussed above.

This finding confirms the conclusion reached by Elaine Grigsby and Praveen Dixit in their study of U.S. agricultural export programs (1986):

Empirical studies on the impact of export credit sales programs are virtually nonexistent. This is especially true of targeted export credit programs [such as PL 480 Title I]. (page 22)

Although a thorough literature search was conducted, it is inevitable that some quantitative studies escaped the team's attention, either because they do not appear in any bibliography and were not known to the individuals contacted, or because copies could not be obtained. Dissertations (e.g., Grigsby) and unpublished conference papers proved particularly difficult to obtain, given the limited time and resources available. Part 3 of the bibliography presents the working list of studies developed by the team, and it indicates those that could not be obtained by the team. This list includes analytic studies that discussed food aid impacts, but did not include food aid as a variable in the model actually estimated. In some cases, the exclusion of food aid resulted from an analytic focus on other aspects of the food economy, in other cases the rationale for excluding food aid was not always clear in the analysis as reported. In any case, such studies were not generally annotated by the team or included in the analysis below, as it is clearly impossible to discuss the findings regarding food aid impact from analyses that do not include food aid as a variable. (An exception is the Dudley and Sandilands study of Colombia, which was included because it is frequently cited in the literature.)

Detailed bibliographic annotations were completed for 32 documents, including 29 quantitative studies and 3 others included because of their importance to the evolution of the field.⁷ The results from the 24 quantitative studies dealing with trade effects form the basis for the discussion in the remainder of this report. The results of these studies are tabulated and presented in matrix form later in the report.⁸

The group of 24 studies includes 14 single-country quantitative studies, covering 13 countries. (Two of these studies constitute separate reports on the same analysis — Srivastava et al., and Rogers et al.) In addition, five worldwide multi-country studies, three regional multi-country studies (all

7. Four of the quantitative analyses and two of the other analyses do not deal with international trade impacts; these annotations are found in Annex 3.

8. The team was able to obtain nearly all of the studies identified from the bibliography as likely to include quantitative analyses of the issues under study. Several studies could not be obtained by the team in time for inclusion in the review, however, primarily dissertations, journal articles from developing countries, and unpublished papers. While it may be assumed that not all of these studies include quantitative analysis, some are known to contain such analysis (because articles referencing their findings have been reviewed), and additional efforts to obtain these works should be made if a follow-on study is implemented.

focusing on Africa), and two limited multi-country studies (one for Latin America and one for Asia/Near East) were reviewed. Thirteen of these analytical works used single or multiple regression analysis techniques (including vector autoregression), while nine developed systems of simultaneous equations (which were then generally estimated using econometric techniques), two employed comparative statics (including one that used both regression and comparative statics), and one used both correlation analysis and regression.

Many of the studies examined were undertaken in the years following the publication of Schultz's seminal article in 1960, which focused academic attention on possible disconcertive impacts on the recipient country's agricultural sector. Few of these studies used econometric techniques, however, which were still too costly at that time. The earliest studies in the set reviewed date from 1968, coinciding with advances in computer technology that made econometric studies practical for such analysis, and a number of the studies reviewed were completed before 1980. It appears that there has been a revival of interest in the topic, however, with about five of the studies completed since 1987.

The studies are equally divergent with regard to the period covered. Most of the studies cover a period of at least ten years, with one study (Hall, 1980/2) covering a 25-year period. Despite the long time series used, only the two studies by Lavy used lags of more than two years to try to capture long-term impacts. The reasons behind this failure to examine long-term effects remain unclear.

The studies are well distributed geographically. India received the greatest attention, with three studies identified (counting Srivastava et al., and Rogers et al., as a single study). Excluding the 4 worldwide studies (which covered between 33 and 77 countries), 7 studies focused on Asian or Near Eastern countries, 7 on Latin American countries, and 5 on African countries. Interestingly, four of the five studies focusing on Africa were regional studies (covering between 17 and 36 countries each), but only two other multi-country studies were identified in the other regions (Hall, 1980/2, covering Colombia, Peru, and Brazil, and Von Braun, covering Egypt and Bangladesh).

It is interesting to note that no quantitative studies were identified that dealt with the Asian cases most frequently cited in the general literature as PL 480 market-building success stories, that is, South Korea, Taiwan, and Japan. (A qualitative study on Korea was identified (Mason) and is discussed below.)

Table 1 presents basic descriptive information on the 24 studies included in the review.

Table 1. Overview of the Literature

Key: Type of Analysis

Statistical Technique

1-VAR Single variable regression
 MULTVAR Multiple variable regression
 SIMUL Simultaneous equation system
 VECTOR Vector autoregression
 STATIC Comparative static analysis

OLS Ordinary least squares (a regression technique)
 GLS Generalized least squares (a regression technique)
 2SLS, 3SLS Two-stage or three-stage least squares (regression techniques)
 COCH Cochrane - Orcutt (a regression technique)
 INST Instrumental variables estimation (a regression technique)
 CORR Simple correlation analysis

| Country or Region | Author | Year Published | Period Covered | Type of Aid | Commodities Studied | Type of Analysis | Statistical Technique | Comments |
|--------------------|---------------------------|----------------|----------------------|------------------|--------------------------|------------------|-----------------------|--|
| Brazil | Hall | 1980/1 | 1954-1970 | PL480 | wheat | SIMUL | OLS 2SLS | System of seven simultaneous equations including supply and demand equations for wheat, corn, rice, and soybeans; examines PL480 impacts on wheat prices, dom. prodn., and comm. imports; same analysis as reported in 1980/2. |
| Colombia | Dudley & Sandilands | 1975 | 1951-1971 | PL480 Title I | wheat | MULTVAR | OLS | Multiple variable equation used to explain fall in domestic production by lagged response to fall in producer prices caused by increased PL480 imports; no direct empirical estimates of PL480 as explanatory variable. |
| Colombia, Brazil | Hall | 1980/2 | 1950-1975 | PL480 | wheat & others | SIMUL | OLS 2SLS | System of simultaneous equations testing impact of PL480 imports of wheat on prices, domestic production, and quantity of commercial imports. |
| Dominican Republic | Bolling | 1983/1 | 1960-80 | PL480 | all food | MULTVAR | OLS | Analyzed determinants of commercial food imports |
| Egypt/Bangladesh | von Braun | 1982 | 1976-78 | PL480 | wheat | STATIC | OLS | Estimates impact based on elasticities estimated econometrically. |
| Egypt | Scoble | 1981 | 1949-79 | PL480 | wheat | SIMUL | OLS 2SLS 3SLS | System of 20 import demand equations to estimate the allocation of total import expenditures between wheat and other imports. Used three statistical techniques. |
| El Salvador | Della Torre & Norton | 1988 | 1971-1986 | Title I | all ag imports | MULTVAR | OLS | Three models presented to explain changes over time in level of agricultural imports, real farmgate price levels, & domestic agricultural production. |
| Ethiopia | Maxwell | 1988 | 1975/76 - 1983/84 | food aid | wheat and subst crops | 1-VAR MULTVAR | OLS | |
| India | Blandford & von Plockl | 1977 | 1952-68 | PL480 | cereals | SIMUL | OLS 2SLS | |
| India | Mann | 1967 | 1952-63 | PL480 | cereals | SIMUL | 2SLS | |
| India | Rogers et al | 1972 | 1956-1967 | PL480 | all cereals | SIMUL | OLS 2SLS | System of seven simultaneous equations incorporating distribution of food aid through differentiated market channels (fair price shops); same study is reported in Srivastava, et al. |
| India | SeEVERS, G. | 1968 | 1956-57 1961-62 | PL 480 | cereals | STATIC | | Estimates are obtained for price-output effects of PL 480 shipments -- first, for a "theoretical country" under varying supply & demand (price) elasticities, then for India using estimates derived in another study. |
| India | Srivastava et al | 1975 | 1956-67 | PL480 | wheat, rice | SIMUL | 2SLS | See Rogers et al. |
| Jamaica | Bolling | 1983/2 | 1960- 1980 | PL480 | all food | MULTVAR | OLS | Multiple variable equation used to model changes in food imports, with explanatory variables which included real food import prices, real income, domestic food production, population, food aid, and foreign reserves. |
| Sri Lanka | Clay | 1983 | 1970-1981 | Title I & EEC | wheat & wheat flour | MULTVAR | OLS | Two models, one using wheat demand and food aid imports to predict commercial imports, and the other expanding on that basic model to include a dummy variable for election years and a time trend variable. |

Table 1. Overview of the Literature

Key: Type of Analysis

1-VAR Single variable regression
 MULTVAR Multiple variable regression
 SIMUL Simultaneous equation system
 VECTOR Vector autoregression
 STATIC Comparative static analysis

Statistical Technique

OLS Ordinary least squares (a regression technique)
 GLS Generalized least squares (a regression technique)
 2SLS, 3SLS Two-stage or three-stage least squares (regression techniques)
 COCH Cochrane - Orcutt (a regression technique)
 INST Instrumental variables estimation (a regression technique)
 CORR Simple correlation analysis

| Country or Region | Author | Year Published | Period Covered | Type of Aid | Commodities Studied | Type of Analysis | Statistical Technique | Comments |
|--------------------------|------------------|----------------|----------------|--------------|---------------------|------------------|-----------------------|---|
| Trinidad and Tobago | Bolling | 1983/3 | 1960-78 | PL480 | all food | MULTVAR | COCH | |
| Tunisia | Bezuneh et al | 1983 | 1960-1979 | all food aid | all food grains | SIMUL | 2SLS 3SLS | System of four simultaneous equations and one market-clearing identity with nine variables in total. |
| Worldwide (33 countries) | Abbott | 1979 | 1951-1973 | all food aid | food grains | SIMUL | INST | Generalized reduced form net trade equation derived from system of 13 equations; instrumental variables estimation used to estimate trade price elasticities. |
| Worldwide (42 countries) | Morrison | 1984 | 1979/80 | all cereals | cereals | MULTVAR | OLS | Two models investigating both structural long-term factors and short-run temporary factors; multi-country pooled data. |
| Worldwide (77 countries) | Vengroff et al | 1982 | 1962-1978 | PL480 | all food | MULTVAR | OLS CORR | Correlation analysis and OLS regression used to test six hypotheses regarding motivation for and prediction of food aid shipments |
| Africa (26 countries) | Lavy | 1989/1 | 1979-87 | food aid | cereals | VECTOR | GLS | Model used to measure which factors determine donor's food aid response to production shortfalls in African countries |
| Africa (36 countries) | Lavy | 1989/2 | 1970-87 | food aid | cereals | VECTOR | OLS/GLS | Estimates seven equations separately to measure impacts on production, food aid and imports. Examines 36 countries as a group and analyzes several subgroups (socialist/non socialist; high/low income). |
| Africa (17 countries) | Rosen | 1989 | 1966-86 | food aid | cereals | MULTVAR | OLS | Two models using food aid and other variables to model domestic production, commercial imports in 17 African countries - model run separately for each - 34 sets of coefficients developed |
| Africa (25 countries) | Shapouri & Rosen | 1987 | 1966-84 | | cereals, milk | MULTVAR | OLS | Separate regressions run for each of the 25 countries, using import value & commercial food import elasticities as the 2 dependent variables. Coefficients for all 25 countries are shown in a table in annotated bibliography. |

COMPARATIVE ANALYSIS OF MODELS USED

The analyses used a wide variety of model structures to explore the relationship between food aid and impact variables, both trade-related and otherwise. This variety in structure and estimating technique must be borne in mind when comparing the coefficient estimates obtained. Table 2, presented at the end of this section, summarizes the models used, showing the structure of the equation for each dependent variable. Studies using methodologies that are not suited to this presentation format are noted in the table comments; the reader should refer to the detailed annotations in Annex 1 for more complete information on the methodology of these studies.

Taken as a group, the models show a high degree of similarity, but no single methodology emerges as the standard. Reflecting the lack of an established methodology, several studies presented more than one model, either to test alternative specifications to see which gave the best fit or to explore alternative facets of the issue. In considering the diversity of methodologies used, it must be recognized that the various authors were seeking to answer a wide range of questions, and that this inevitably led them to use dissimilar methodologies. To say that the methodologies differ does not imply that some were correct and others not.

Ordinary least squares (OLS) was by far the most common methodology, used in 17 of the studies, alone or in combination with other techniques.⁹ Nearly all of the models using this technique relied on multiple explanatory variables, but two studies used simple single-variable models. Several studies developed a system of simultaneous equations, which was then generally estimated using two-stage least squares (2SLS) or three-stage least squares (3SLS), often in combination with OLS. A handful of studies used other estimating techniques, such as generalized least squares (GLS), instrumental variables, or vector autoregression (VAR). Only one study relied exclusively on techniques other than econometrics, and this study used

9. For technical reasons, simultaneous equation systems require that OLS be combined with two-stage or three-stage least squares to give reliable results.

comparative statics based on elasticity estimates obtained from an earlier econometric study.

Despite the fact that all of the studies reviewed were designed, at least in part, to address the relationships among food aid, on the one hand, and commercial imports, domestic agricultural production, and/or consumption, on the other, not all of the models included food aid as a variable.

Figure 1 summarizes the range of models and their use of food aid as an explanatory variable. It should be noted, however, that several of the simultaneous equation models used food aid as an explanatory variable for one equation in the system, and thus captured food aid's indirect impact on other dependent variables. For example, food aid might be included in the demand equation, while prices might appear as an explanatory variable for imports. Food aid's impact on imports would therefore be modeled indirectly, through its affect on prices. Altogether, 17 of the 24 studies reviewed included equations designed to measure the determinants of import levels in recipient countries. All but two of these used food aid as one of the explanatory variables. The remaining studies did not include food aid as an explanatory variable for trade, but examined import impacts indirectly, generally in the context of a simultaneous equation system.

None of the studies differentiated among different types of food aid to compare the effects of project, program, or emergency aid. Some of the studies were limited to Title I assistance, as shown in Table 1, but few of the studies provided full information on the types of food aid included and the rationale for this decision. Nearly all of the studies focused on cereals.

In addition to food aid, the most commonly used independent or predictor variables were world prices, GNP or GDP, quantity of local production (generally lagged), quantity of commercial imports, foreign exchange availability or reserves, and domestic prices. Other variables used included withdrawals from government stocks, government procurement, and quantities distributed through subsidized channels. Several of the studies included variables designed to reflect specific country conditions, such as dummy variables to capture the impact of internal disruption or a major policy shift. Use of a time trend variable was also a feature common to several models. In most cases, the variables were included as values (e.g., tons), but use of indices was also common. Relatively few of the models used other transformations, such as logarithms (see Table 2).

Taking the body of literature as a whole, it is fair to say that models that attempted to explain variation in commercial or total imports most commonly included the quantity of food aid, domestic production, and foreign exchange availability as independent variables.

As argued by several authors (see Srivastava et al., for example), models appear to perform better if they capture the differentiation of the

Figure 1. Summary of Models Used

| Dependent Variable | Number of Models | Number Using Food Aid |
|------------------------------|------------------|-----------------------|
| <u>Domestic impacts</u> | | |
| Consumer prices | 3 | 1 |
| Producer prices | 6 | 4 |
| Domestic consumption | 4 | 4 |
| Domestic production | 10 | 5 |
| National income | 2 | 2 |
| Concessional food sales | 2 | 2 |
| <u>Trade impacts</u> | | |
| Commodity imports (quantity) | 5 | 3 |
| Commercial imports | | |
| Quantity | 16 | 15 |
| Value | 1 | 1 |

Note: For purposes of this summary, Rogers et al. and Srivastava et al. are counted separately, although it should be noted that they report on the same analysis. Counts include alternative models presented in the same analysis.

country's food market into an open or free market channel and a subsidized, targeted channel, such as India's fair price shops. This distinction continues to be important in analysis of historical data, but is less important operationally, because the roster of countries with such systems is rapidly diminishing. As noted elsewhere in this report, however, such systems have the potential to transfer income to low-income consumers, thereby increasing effective demand and avoiding possible disincentive and import displacement effects.

A final methodological distinction worth noting among the country studies is the choice between a simultaneous equation system and a multivariable regression analysis. As shown in Table 1, 8 of the 17 single-country studies used a simultaneous equation system, while the remainder used a single equation. The simultaneous equation approach has theoretical advantages in that it permits demand and supply to be treated separately, making it possible to treat price endogenously. Estimation of a simultaneous equation system is methodologically more complex, however, and it remains unclear whether the results obtained are more reliable than those generated by a single-equation system. It may be indicative that the analysts from an academic tradition have tended to use a simultaneous equation system (e.g., Hall, Blandford and von Plocki, Rogers), whereas the applied analysts have tended to rely on multivariable regression (e.g., Clay, Della Torre and Norton, and Maxwell). On balance, we might conclude that the most important consideration appears not to be which method is used, but whether the model specification includes the correct variables to serve the purpose for which it is intended.

Turning to the multi-country studies, it is noteworthy that some of the studies pooled the data from the countries studied (notably the two studies of Africa by Lavy and the worldwide study by Morrison), while others conducted separate analyses for each country (e.g., Shapouri and Rosen's study of Africa and von Braun's study of Egypt and Bangladesh). Studies in the latter group are more directly comparable to the single country analyses in both methodology and interpretation of findings. None of the multi-country studies used simultaneous equation systems, which are not suited to cross-sectional analyses at the country level.

Table 2. Comparison of Methodologies Used

Key:

Type of Variable

Form of Variable

AIDQUAN Quantity of food aid
 PRIWRLD World price of commodity
 GNP Gross national product
 PROD Domestic production
 COMIMP Imports of commodity
 FOREX Foreign exchange
 PRIDOM Domestic price of commodity
 GDP Gross Domestic Product

VAL Value in absolute terms
 LN Natural log of the value
 SQ Square of the value
 LAG1 Lagged 1 year, etc.
 DEV Deviation from the mean
 PC Per capita
 INDX Index
 DEF Deflated
 DIFF1 Difference from previous period, etc.

Note: a number following the author's name identifies multiple models presented in the same study; a number following the study date identifies different studies by the same author published in the same year.

| Dependent Variable | Author | Country | Date | Explanatory Variables | | | | | | | | Comments |
|--------------------------------|----------------------|--------------------|----------------|-----------------------|---------|-----|---------------------|--------|-------------|---------------------|------|---|
| | | | | AIDQUAN | PRIWRLD | GNP | PROD | COMIMP | FOREX | PRIDOM | GDP | |
| Quantity of commodity imports | Bolling | Dominican Republic | 1983/1 | PC, IND (value) | IND | | PC, IND | | | PC, IND | | Dependent variable is food imports less PL-480; aid variable expressed in value terms of assistance Aid variable expressed in value terms; FOREX is per capita FX reserves in 1960 J\$; model also includes dummy for policy change See comments for Dominican Republic study FOREX = lagged degree of overvaluation of XR PROD and FOREX expressed as 1979 value as % of period mean |
| | Bolling | Jamaica | 1983/2 | PC (value) | INDX | PC | PC | | | PC | | |
| | Bolling | Trinidad & Tobago | 1983/3 | PC (value) | PC, IND | | PC, IND | | | PC, IND | PC | |
| | Della Torre & Norton | El Salvador | 1988 | | | | LAG1 INDX DEV | | | LAG1 INDX DEV | | |
| | Lavy Morrison | Africa Worldwide | 1989/1 1984 | PC | | PC | DEV LAG2 | | | DEV LAG2 | | |
| Value of commercial imports | Shapouri & Rosen | Africa | 1987 | VAL | VAL | | VAL | VAL | VAL | | | |
| Quantity of commercial imports | Bezaneh et al | Tunisia | 1983 | PC | | | PC | | | | INDX | Model 2 includes dummy variable for election years & time trend variable Also includes a time trend variable and CPI Also includes a time trend variable and CPI Also includes withdrawal from stocks Same variables used as in model above, predicting total imports |
| | Clay (1) | | 1983 | VAL | | | | VAL | | | | |
| | Clay (2) | | 1983 | PC | | | | | | | | |
| | Hall | Brazil | 1980/1 | VAL | | | VAL | | | VAL | VAL | |
| | Hall | Brazil, Colombia | 1980/2 | VAL | | | VAL | | | VAL | VAL | |
| | Lavy | Africa | 1989/1 | | | | | | | | | |
| | Lavy (1) | Africa | 1989/2 | DIFF123 | | | DIFF123 | | DIFF123 | | | |
| | Lavy (2) | Africa | 1989/2 | DIFF12 | | | | | DIFF123 | | | |
| | Mann | India | 1967 | PC | | | | | | | | |
| | Maxwell (1) | Ethiopia | 1986 | VAL | | | | | | | | |
| Maxwell (2) | Ethiopia | 1986 | LAG1 | | | | LAG1 | | | | | |
| Morrison | Worldwide | 1984 | PC | | PC | | DEV LAG2 | | DEV LAG2 | | | |
| Rogers et al | India | 1972 | PC | | | | | | | INDX | | |
| Rosen | Africa | 1989 | LN | LN | | LN | | | LN | | | |

Table 2. Comparison of Methodologies Used

| | | |
|-------------|------------------------------------|---|
| Key: | Type of Variable | Form of Variable |
| | AIDQUAN Quantity of food aid | VAL Value in absolute terms |
| | PRIWRLD World price of commodity | LN Natural log of the value |
| | GNP Gross national product | SQ Square of the value |
| | PROD Domestic production | LAG1 Lagged 1 year, etc. |
| | COMIMP Imports of commodity | DEV Deviation from the mean |
| | FOREX Foreign exchange | PC Per capita |
| | PRIDOM Domestic price of commodity | INDX Index |
| | GDP Gross Domestic Product | DEF Deflated |
| | | DIFF1 Difference from previous period, etc. |

Note: a number following the author's name identifies multiple models presented in the same study; a number following the study date identifies different studies by the same author published in the same year.

| Dependent Variable | Author | Country | Date | Explanatory Variables | | | | | | | | Comments |
|----------------------|----------------------|--------------------|--------|-----------------------|---------|-----|------|--------|-------|--------------|-----|---|
| | | | | AIDQUAN | PRIWRLD | GNP | PROD | COMIMP | FOREX | PRIDOM | GDP | |
| Consumer prices | Srivastava et al | India | 1975 | | | | | | | | | Same analysis as reported in Rogers et al. |
| | Rogers et al | India | 1972 | PC | | | | | | INDX LAG2 | | |
| | Seevers | India | 1968 | | | | | | | | | |
| | Srivastava | India | 1975 | | | | | | | | | |
| Producer prices | Blandford & v.Plockl | India | 1977 | VAL | | | | | | | | Elasticity analysis, non-econometric Same analysis as reported in Rogers et al. Uses simultaneous equation system to estimate impact on prices indirectly Also includes a time trend variable and CPI Also includes a time trend variable and CPI Model measures consumer-producer price wedge ; also includes dummy variables for war years and a variable measuring real import capacity Estimates impact on prices based on econometrically estimated elasticities |
| | Della Torre & Norton | El Salvador | 1988 | | INDX | | LAG1 | | INDX | | | |
| | Hall | Brazil | 1980/1 | VAL | VAL | | | | | VAL | | |
| | Hall | Brazil, Colombia | 1980/2 | VAL | VAL | | | | | VAL | | |
| | Scoble | Egypt | 1981 | INDX | VAL | | | | | INDX | | |
| | VonBraun | Egypt/Bangl. | 1982 | | | | | | | | | |
| Domestic consumption | Blandford & v.Plockl | India | 1977 | VAL | | | | | | | | Uses simultaneous equation system to estimate impact on consumption indirectly Also includes time trend variable. Two measures of domestic demand estimated - Q demanded in open market, and Q sold concessionally Same analysis as reported in Rogers et al. |
| | Hall | Brazil, Col., Peru | 1980/2 | VAL | | | | | | | | |
| | Rogers et al | India | 1972 | PC | | | | | | INDX LAG2 | | |
| | Srivastava et al. | India | 1975 | | | | | | | | | |
| Domestic production | Blandford & v.Plockl | India | 1977 | VAL | | | | | | | | Uses simultaneous equation system to estimate impact on production indirectly Model includes dummy variable |
| | Della Torre & Norton | El Salvador | 1988 | | | | LAG1 | INDX | | LAG1 | | |

Table 2. Comparison of Methodologies Used

| | | |
|-------------|------------------------------------|---|
| Key: | Type of Variable | Form of Variable |
| | AIDQUAN Quantity of food aid | VAL Value in absolute terms |
| | PRIWRLD World price of commodity | LN Natural log of the value |
| | GNP Gross national product | SO Square of the value |
| | PROD Domestic production | LAG1 Lagged 1 year, etc. |
| | COMIMP Imports of commodity | DEV Deviation from the mean |
| | FOREX Foreign exchange | PC Per capita |
| | PRIDOM Domestic price of commodity | INDX Index |
| | GDP Gross Domestic Product | DEF Deflated |
| | | DIFF1 Difference from previous period, etc. |

Note: a number following the author's name identifies multiple models presented in the same study; a number following the study date identifies different studies by the same author published in the same year.

| Dependent Variable | Author | Country | Date | Explanatory Variables | | | | | | | | Comments |
|-------------------------|---------------------|--------------------|--------|-----------------------|---------|-----|--------------------|---------|-------|------------|--------------|--|
| | | | | AIDQUAN | PRIWRLD | GNP | PROD | COMIMP | FOREX | PRIDOM | GDP | |
| National Income | Dudley & Sandilands | Colombia | 1975 | | | | INDX LN LAG1 | | | INDX LN | | for years of social turmoil in 80s Coefficients estimated are elasticities. |
| | Hall | Brazil, Col., Peru | 1980/2 | VAL | | | | | | | | Also includes a time trend variable |
| | Lavy (1) | Africa | 1989/2 | DIFF123 | | | DIFF123 | | | | | Also estimates relation between yield and food aid, and versions of equations 1 and 2 with only 2 lags |
| | Lavy (2) | Africa | 1989/2 | DIFF123 | | | DIFF123 | DIFF123 | | | | |
| | Rogers et al | India | 1972 | PC | | | | | | | INDX LAG2 | |
| | Rosen | Africa | 1989 | | | | LAG1 LN | | | | LAG1 LN | |
| | SeEVERS, G. | India | 1968 | | | | | | | | | |
| | Srivastava et al. | India | 1975 | | | | | | | | | |
| | Rogers et al. | India | 1972 | PC | | | | | | | INDX LAG2 | |
| | Srivastava et al. | India | 1975 | | | | | | | | | |
| Concessional food sales | Rogers et al. | India | 1972 | PC | | | | | | | DEF INDX | Also includes price in concessional outlets |
| | Srivastava et al | India | 1975 | | | PC | | | | | | Same analysis as reported in Rogers et al. |
| Quantity of food aid | Lavy | Africa | 1989/1 | | | | DIFF123 | | | | | |
| | Scoble | Egypt | 1981 | | VAL | | VAL | | | | | Model included dummy variables for war years and variable measuring import capacity |
| | Vengroff et al | Worldwide | 1982 | | | PC | VAL | | | | | Model included variables for agric |

SYNTHESIS OF FINDINGS

The coefficients estimated in the studies reviewed are presented in Table 3 at the end of this section.¹⁰ Although we have made an effort to present findings as completely as possible, the findings from several of the studies were too complex to be presented in table form (please refer to the comments presented in the tables). More complete information on study findings is presented in the annotated bibliography annexed to this report.

Findings with Respect to Food Aid's Impact on Trade

Given the longstanding interest in food aid's interaction with commercial trade, it is perhaps surprising that only 24 studies were identified that attempted to measure this relationship quantitatively. Taken as a whole, the studies tend to support the view that increases in food aid are associated with decreases in commercial imports. This general conclusion stands, whether imports are measured in terms of total food imports (Bolling in the Dominican Republic and Trinidad), the value of commercial food imports (Shapouri and Rosen in 19 of the 20 African countries they studied although 4 of the coefficients were statistically significant), or the quantity of commercial imports (several studies covering countries including Brazil, Colombia, Sri Lanka, and Jamaica). The results for Africa suggest a caveat to this general conclusion: in countries where food aid accounts for a large share of total imports and total food availability, displacement of commercial imports is less likely to occur, and food aid may even be associated with slightly larger commercial imports.

10. In both tables, a number after the author's name (e.g., Lavy (1)) identifies one of several equations in a given study, whereas a number after the study date (e.g., 1989/1) identifies one of several studies by the same author published the same year.

Review of the Qualitative Literature

The qualitative literature generally confirms the finding that food aid is not wholly additional, that is, that it substitutes for commercial imports. Authors have varied in the estimated degree of additionality, however. This conclusion is reached by Clay and Singer in their review of recent food aid literature, one of the best of the recent reviews of food aid issues. Writing in 1985, they conclude their discussion of the additionality issue with the following comments:

Has food aid actually substituted for commercial imports? A number of recent studies have explored this question through econometric modelling and careful statistical analysis for individual countries. The balance of evidence suggests that food aid did *de facto* substitute to a significant degree for commercial imports in a number of important importing countries such as Egypt, Sri Lanka, and South Korea, whereas in India, for over 20 years the largest recipient, less than a quarter of cereals food aid has substituted for commercial purchases. Broad estimates that more than half of cereals food aid has substituted for commercial imports, whilst supported by case study data, ultimately nevertheless continue to rest on a judgment about what would have been the importing country's response in the longer run to sustained and radically different donor policies. The interpretative case histories and quantitative estimates on the substitution issue are both heavily dependent on observed importing country behavior in response to relatively short run, but large, changes in overall food aid availabilities (such as the cut-back which occurred in the early 1970s) and also to unilateral donor decisions to suspend aid to particular countries. (page 16; emphasis in the original; bibliographic references omitted)

Cathie's review of food aid issues reaches a similar conclusion, differing on the degree of substitution. Citing the use of special outlets for food aid to divert supplies away from the market (India's fair price shops, for example), he concludes:

About three-quarters of bilateral food aid does not satisfy the additionality principle, if this principle is strictly applied, which would include almost all of PL 480 Title I donations.... Whether open market sales of food aid have caused the displacement of commercial sales or indigenous production of staple foodstuffs is an empirical question.... Unfortunately, empirical evidence on this question is not plentiful. (pages 61-2)

Cathie also cites Asian experience as evidence of food aid's mixed effects on commercial imports and production, making the interesting point that food aid may have displaced traditional LDC exports, as well as commercial imports from industrial countries:

...South East Asia, once a net agricultural exporting region, has changed to a net importing region while receiving large volumes of food aid. This is especially so of rice-exporting countries (such as Thailand) whose "traditional" markets have been displaced by concessional sales of wheat. In contrast to the view that food aid has displaced local production and is therefore harmful to the long-term development of the recipient, is the example of Japan. The evolution of Japan from a concessional sales recipient to that of a hard currency purchaser of wheat is considered by the PL 480 administration to be a model example of the benefits of donations without the disruption of indigenous production, since Japan increased her own production while receiving food aid. (page 62)

Another recent review of food aid experience, Maxwell's evaluation of European food aid programs (1983), lends further support to the view that food aid is not fully additional in the typical case:

With regard to additionality, most observers have concluded that in practice there is a substantial trade-off between commercial imports and food aid, increasingly so as the balance of payments burden of food aid imports rises. Between a half and three-quarters of all food aid may substitute for commercial imports that would have been made anyway. (page 2.4)

It must be emphasized that each of these statements is based primarily on prima facie reasoning and the extensive experience of the authors, rather than on quantitative measurement of food aid impacts on trade. In particular, the often-cited estimate that approximately half of food aid is additional (Maxwell's study is the source for Clay's estimate, cited above) appears to rest on differences in food aid programming, rather than on comparison of commercial import levels with and without food aid. The logic underlying these estimates is that food aid that is distributed free (as is most project food aid) is more likely to be additional, whereas food aid that is sold in the country (such as U.S. Title I imports and most other program food aid) is not

usually additional. Maxwell's study, which is based on country case studies,¹¹ presents an example of this approach:

The country studies show an interesting difference between cereal aid and dairy aid and between direct aid and indirect aid. In general, dairy aid was far more likely to represent additional imports than was cereal aid, and indirect aid through the World Food Program or non governmental organizations was far more likely to be additional than was aid provided directly by the Community to recipient governments.... If we can generalize to say that cereal aid provided for sale is a substitute for commercial imports and therefore provides balance of payments support, whereas the rest of the program does not, then it appears that about a quarter of the Community programme by value is in effect direct balance of payments support.... (page 3.5)

These estimates therefore shed little empirical light on the degree of additionality for program food aid such as the U.S. Title I program, because they assume that such aid is additional.

Review of the Quantitative Literature

The quantitative literature supports the view that program food aid is only partly additional, but the degree of substitution for commercial imports varies greatly from country to country. Before turning to the results of the specific studies reviewed, two points that emerge from the literature as a whole deserve emphasis:

- Country policies play an extremely important role as an intermediating variable between food aid and its impact on commercial trade. Many of the studies deal with cases where commercial food imports are largely determined by the government, rather than responding directly to market forces, and/or where the domestic food market is decoupled from the international market by a range of food market interventions. It is important to note that the rapid evolution in agricultural and trade policies under way

11. Studies were completed for ten countries: Bangladesh, Egypt, Ethiopia, India, Mali, Pakistan, Peru, Tanzania, Senegal, and Somalia. Although copies of the studies could not be obtained, the description of the methodology provided by Maxwell suggests that the studies did not include quantitative analysis.

in the developing world has dramatically changed the policy framework since the time when most of these studies were completed. Market forces now play a much larger part, both in the domestic food market and in developing country trade.

- The interactions between food aid, the domestic market, and international trade are shaped and influenced by the individual country situation. The findings from analysis of a specific country experience may not apply to another country with a radically different context, nor even to the same country in a different time period.

The second factor has led several authors to comment on the indeterminacy of the formal quantitative literature and the sensitivity of the results obtained to the model and the specific data used. Clay and Singer cite one of the several Indian studies in concluding:

Blandford and Plocki show the importance of clear specification of the way in which government intervention through dual price operations affects price determination and output. They also demonstrate the sensitivity of results to analysts' choices, such as the sample periods and specifications, underlining the lack of robustness of such models. The issue cannot be determined on a head-count of modelling exercises, therefore.... (page 34)

This study confirms the diversity of results that have been obtained in the empirical analyses of individual country experience, and it highlights the absence of studies taking a broader view of experience across countries (whether such a study is possible in view of the major differences among countries is an issue that will be revisited in the final section of this report).

An interesting difference emerges between the single-country studies and those combining data from several countries in a single analysis. Whereas the single-country (pure time-trend) studies found negative impacts on commercial trade, the multi-country (cross-sectional and time-trend) studies tended toward the opposite result. Thus Lavy (1989/2) found that increases in food aid had a positive impact on commercial imports the next year and the year following, but a negative impact in the third year, while Morrison found a positive impact both on total imports and commercial imports.

The reasons for this difference are unclear, but at least two possible explanations can be suggested:

- The single-country models tend to be more sophisticated than the multi-country models, using more explanatory variables, and thus they may do a better job of measuring the true relationship.
- The multi-country models may be reflecting the fact that countries with high structural food deficits tend both to receive food aid and to import commercially, in comparison to countries that are comparatively self-sufficient. Thus, both food aid and commercial imports are related to a third variable, the overall food deficit.

These two points deserve further elaboration. With respect to the comparative sophistication of single-country studies, it is evident that the narrower focus of these studies permits the analysts to include a wider range of variables (because comparable cross-country data for many economic variables are extremely difficult to compile) and to adjust the model to reflect local conditions (by including dummy variables to reflect exogenous factors such as wars). Development of a simultaneous equation system for a multi-country analysis is also impractical and of questionable theoretical validity, limiting this useful technique to single-country studies.

Turning to the second point, it would appear logical to expect countries with a large food deficit both to import more commercially and to receive more food aid. Moreover, countries with a large food deficit in a given year are also more likely than countries without such a deficit to have a history of deficits. Given this relationship, there would be a tendency for countries receiving a large quantity of food aid in a given year to be the same countries as those receiving comparatively large quantities of commercial imports the next year. In this situation, an econometric estimate would tend to find a positive relationship between commercial imports and food aid (lagged or otherwise), even if it included production.

In this regard, it is interesting to note that Lavy's coefficient estimates for Africa are relatively unaffected by whether production changes are included as a variable explaining trade. In other words, variation in production within a given country over time (as contrasted to variation in self-sufficiency across countries) had little explanatory power regarding variation in imports. In the case of Africa, this relationship may also reflect the segmentation of the cereals market into an urban market dependent on an imported product (often wheat or rice) and a rural market dependent on a local grain (such as sorghum or maize). The literature generally does not examine these market structure or cross-product relationships in depth.

The coefficients estimated to measure food aid's impact on commercial import quantities in single-country studies do not show a tendency to cluster around a single level, but several of them are concentrated in the range

between -0.30 and -0.90. These include Clay's two estimates for Sri Lanka, Hall's two estimates for Brazil and Colombia, Mann's estimate for India,¹² and one of Maxwell's estimate for Ethiopia.¹³ Several studies found a negligible impact, however, including another study of India by Srivastava et al., Bezuneh's study of Tunisia, and Rosen's estimate for Madagascar. A small but positive relationship between food aid and commercial imports was found by Rosen in the Sudanese case (with an estimated elasticity of 0.09) and in several worldwide or regional studies using pooled data (two estimates developed by Lavy from African data and Morrison's estimate using worldwide data).

A summary of the estimates reported is shown in Figure 2, included at the end of this section. In this figure, estimates are quantity-based coefficients, unless otherwise identified.¹⁴

The three studies by Bolling (covering Jamaica, the Dominican Republic, and Trinidad and Tobago) are not included in the table because the methodology used produced coefficient estimates that are not comparable to the others, for several reasons. Bolling used total food imports (all commodities) rather than limiting the analysis to the commodity provided as food aid or to the commodity group affected (e.g., cereals). Moreover, the units of measure in this study were somewhat unusual (food aid is expressed as the real per capita value in local currency terms, while commercial food imports are expressed as a per capita quantity index, calculated based on the 1975 market basket of imports), making it difficult to interpret the coefficients. Bolling also reports elasticity estimates, calculated at the mean of the variable. The estimated elasticities are low but negative (-0.03) for Jamaica and low but positive for the Dominican Republic (0.054)

12. The reestimation of food aid's impact in India, reported in Rogers, et al., and Srivastava, et al., found a much lower coefficient, -0.01.

13. The estimate derived from the simple (single-variable) regression is -0.49, but the estimate derived from the multiple regression including production is positive (0.79).

14. The interpretation of these two types of estimates is somewhat different. A quantity-based estimate of -0.50 suggests that each additional ton of food aid reduces commercial imports by 0.5 tons. By contrast, an elasticity estimate of -0.50 suggests that a 1 percent increase in food aid causes a 0.5 percent drop in commercial imports. If food aid and commercial imports are roughly equal in quantity (each accounting for half of total imports), the two estimates give similar results: commercial imports would drop by about one-half ton for each ton of food aid if the estimated elasticity is -0.5. If, however, food aid is much smaller than commercial imports, the estimated impact of an additional ton of food aid would be much greater than one-half ton in the case of the elasticity estimate (and conversely if food aid is large relative to commercial imports).

(no estimate is reported for Trinidad and Tobago, which received relatively little food aid in the period studied).

Overall, the models performed well in explaining the variation in commercial imports over the time periods studied. Where the authors report the R^2 , it is generally in the respectable range for economy-wide studies, indicating that the models have included many of the variables that explain changes in commercial imports over time. It is not possible to determine the extent to which variations in food aid account for variation in commercial imports, however, because none of the authors presents the results of the modeling exercise with and without food aid. Moreover, where measures of the validity of the food aid estimate are reported by the authors,¹⁵ the results are mixed. Only 4 of the 25 country estimates derived by Shapouri and Rosen from African data were statistically significant at the 10 percent level or higher, suggesting that the linkage between food aid and commercial imports in Africa is weak as discussed above.

The studies examining trade impacts are noteworthy for their failure to differentiate among different types of food aid programs or to examine long-term effects. In this regard, it is noteworthy that none of the quantitative studies used lags of more than three years. Indeed, Morrison used only one year of data for his multi-country study (although he attempted to distinguish between long- and short-term impacts through selection of appropriate explanatory variables, including GNP, degree of urbanization, agricultural population density, and production).

By contrast, some of the non-econometric studies made an attempt to examine long-term impacts, although the lack of rigorous analysis makes it difficult to judge the validity of the analysis. Mason's non-econometric study of Korea, for example, demonstrates that the proportion of agricultural output accounted for by grain declined between 1955 and 1974 and that commercial imports rose dramatically over the same time period (increasing five-fold). He concludes that food aid contributed to the rise of commercial imports over time by depressing grain prices, encouraging farmers to shift to other, higher-value products.

Given the limited attention to long-term impacts, it is not surprising that the quantitative studies give very little consideration to the relationship between the source of food aid and the source of commercial imports. Vengroff demonstrates a positive relationship between a country's food aid receipts and the likelihood that it has a balance of payments deficit with the United States. Although he interprets this as evidence that food aid contributes to the recipient's dependency, it could also be seen as evidence that food aid is used as balance of payments support for customers of the United States, thereby indirectly underwriting not only U.S. commercial food

15. That is, standard errors or T-statistics.

sales but other exports as well. Political factors would appear to have played a role in the relationship between food aid levels and the source of commercial imports. Blue, for example, cites the sudden shift in Egyptian commercial wheat imports from European sources to the United States when a cut in PL 480 levels appeared imminent.

A final conclusion to be drawn from the studies is the extent to which the findings are sensitive to the modeling technique used. In both Colombia and India, longstanding controversies have arisen regarding food aid's impacts on the recipient country, both in terms of agricultural production and import levels. The analysis of the Colombian case has focused primarily on production impacts, but the more extensive Indian literature discusses both trade and production impacts. Analysts examining food aid's impacts on the Indian economy ((Blandford and von Plocki, 1977); (Mann, 1967); (Srivastava et al., 1975); and (Rogers et al., 1972)) differed greatly in the extent to which they found significant food aid impacts. Using identical data, (Mann, 1967) and (Srivastava et al., 1975) reached very different conclusions. Whereas Mann found that each ton of food aid displaced approximately one-third ton of commercial imports, Rogers et al. measured only a one-hundredth ton decline for each ton of food aid. The two analyses differed primarily in the assumptions made with regard to the demand system. Mann did not differentiate the market to reflect the large proportion of food aid moving through the subsidized government distribution system, whereas Rogers et al. did. As a result, Mann's model gave less emphasis to any potential increases in demand generated by food aid, which would have the effect of counterbalancing the increase in supply caused by food aid. (With regard to the other studies, Srivastava et al. reports the same analysis as Rogers et al.; the other authors did not measure food aid-trade interactions directly.)

Alternative estimates of the impact of food aid in Ethiopia (Maxwell, 1986) provide another example of the sensitivity of estimates to model specification. When the model is estimated with commercial imports as the dependent variable and food aid the previous year as the only independent variable, the result is a negative relationship between the two, but when production in the previous year is also included, the estimated coefficient on food aid is positive (and not significantly different from zero). Given that the R^2 is higher in the latter model (75 percent versus 37 percent), the latter estimate would appear more reliable.¹⁶

16. In effect, the R^2 measures the percentage of the variation in the dependent variable that is explained by the independent variables. Thus, in this case, food aid alone "explains" 37 percent of the variation in commercial imports, whereas the variables in the larger model account for 75 percent of the variation.

Implications for Food Aid Policy and Practice

The analytic studies of food aid's impact tend to support the widespread view that this impact is largely determined by the policy environment within which food aid programming is implemented and, in particular, by the degree to which the government intervenes to support producer prices or lower consumer prices. The studies highlight the extent to which interventions in the consumer market (such as subsidized distribution) can play a role in reducing or eliminating possible negative impacts on both imports and domestic production by increasing demand or by channeling food aid to recipients who are not a significant source of market demand in the absence of such aid.

Several examples of the role of policy in shaping food aid's impact on trade may be drawn from the literature studied:

- The Indian literature — particularly Srivastava et al. — demonstrates that policy interventions that partition the food market to channel food aid to individuals outside the commercial market greatly reduce the potential for negative impacts on commercial imports, and on domestic production.
- Dudley and Sandilands' study of Colombia argues that misguided policies in the agricultural sector inhibited domestic production, making both concessional and commercial imports larger than they would have been had domestic price signals been more efficient.
- Clay argues that commercial imports, rather than food aid, have been used by the Government of Sri Lanka as the swing variable, providing supplies to balance shortfalls in local production and unexpected changes in concessional aid. In the absence of food aid, commercial imports would presumably have been greater.
- Della Torre and Norton's study of El Salvador suggests that policies regulating the exchange rate and foreign exchange availability have been the driving force behind domestic agricultural performance, depressing production and making it necessary to rely on both commercial and concessional imports.
- Hall finds that Brazilian commercial exports were reduced both directly and indirectly by PL 480, with the latter impact due to use of PL 480 revenues to support local

prices, leading to increased production, and therefore reduced commercial imports.

- Maxwell concluded that food aid was compensating for the shortfall in domestic marketing that resulted from the poor performance of the agricultural marketing parastatal, rather than driving out commercial imports.

The studies confirm that food aid does displace commercial imports to a greater or lesser extent, at least in the short run. They provide little explanation for the variation in this impact across countries, although variability in access to foreign exchange appears to play a major role (and should be incorporated into future analysis). In other words, as common sense would suggest, countries with limited capacity to import commercially are unlikely to increase their commercial imports if food aid is reduced. Further analysis would be necessary to determine the factors that increase or decrease food aid's impact on private trade and how these factors might be incorporated into food aid planning to minimize negative trade impacts.

The conclusion that food aid's disincentive impact is lessened by use of below-market-price distribution channels, which must be regarded as highly tentative, suggests a need to reexamine the trend toward sale of food aid into market channels (and away from subsidized or targeted distribution programs). As noted by Isenman and Singer¹⁷ and Schultz in the context of possible disincentive effects, programs that provide a net increase in consumption by low-income consumers are less likely to reduce demand in market channels. Whether such programs can be implemented effectively (without substantial linkage into upper income levels) or sustained financially is another question, of course.

It must be emphasized that program design characteristics that appear likely to limit short-run negative impacts on commercial imports are, to a large extent, the same characteristics that would appear least likely to lead to positive long-term impacts on commercial trade. In other words, food aid programs that use food aid to subsidize consumption in the low-income population are not likely to lead to the types of structural changes that would support commercial import expansion. These programs are almost always implemented through government channels, and thus do not help to build up private channels either domestically or internationally. They are at least partially dependent on the subsidy element inherent in food aid (whether Title I or Title II) and would be difficult to sustain based on commercial imports. They reduce the pressure to raise local agricultural production or

17. Annotated in the supplemental bibliography on production effects in Annex 3.

find other ways of sustainably raising rural and urban incomes, thus delaying policy and programmatic actions needed to speed economic growth.

On the other hand, the income transfer provided may help to fuel demand-led growth in other sectors of the economy (including non-staple crop agriculture, as may have been the case in Korea), leading to broad-based economic expansion, increased demand for food, and expanded import opportunities. The complexity of the linkages among local production and incomes, consumption, food aid, and trade argue for a more focused examination of these issues and how the relationships among them have evolved in fact, rather than in theory.

Table 3. Summary of Quantitative Findings on Trade Impacts

Key:

AIDQUAN Quantity of food aid
 PRIWRDL World price of commodity
 GNP Gross national product
 PROD Domestic production
 COMIMP Imports of commodity
 PRIDOM Domestic price of commodity
 FOREX Foreign exchange
 AIDVAL Value of Food Aid
 GDP Gross Domestic Production

Note: a number following the author's name identifies multiple models presented in the same study; a number following the study date identifies different studies by the same author published in the same year.

| Dependent Variable | R sq | Author | Country | Date | Coefficients on Explanatory Variables | | | | | | | | Comments | |
|--------------------------------|--------|----------------------|--------------------|------------------|---------------------------------------|----------|-------|------------------|----------|--------|----------|--------|----------|---|
| | | | | | AIDQUAN | PRIWRDL | GNP | PROD | COMIMP | PRIDOM | FOREX | GDP | | |
| Quantity of commodity imports | 0.924 | Bolling | Dom.Rep. | 1983/1 | -6.899 | -2.187 | | -0.223 | | | | 8.495 | 133.738 | Elasticity of imports w.r.t. food aid 0.054; T-stat. on food aid 0.807 (not significant at 5% level) All but PROD significant at 95%; t-stat on food aid 1.195; elasticity of imports w.r.t. food aid -.030 F-stat = 37.7311; DW stat = 2.152 Forex was excluded due to multicollinearity w/ reserves; t-stat on food aid = 2.125 (signif. at 95%); elast. = -.016 F-stat = 49.384 DW stat = 2.0408 4 years of lag coefficients calculated sum of lag = -0.38 T-stat on AIDQUAN = 8.28 |
| | 0.921 | Bolling | Jamaica | 1983/2 | -5.969 | -0.411 | 0.235 | 0.494 | | | 0.343 | | | |
| | 0.883 | Bolling | Trinidad | 1983/3 | -2.337 | -0.311 | | 0.365 | | | *comment | 0.037 | | |
| | 0.9251 | Della Torre & Norton | Salvador | 1988 | | | | -0.2711 | | | | 1.5653 | | |
| | 0.42 | Lavy | Africa | 1989/1 | | | | *coef 11 | | | | | | |
| | 0.82 | Morrison | Worldwide | 1984 | 1.96 | | 0.06 | -20.5/ | | | | -4.36 | | |
| Value of commercial imports | | Shapouri & Rosen | Africa | 1987 | *comment | *comment | | *comment | *comment | | *comment | | | All coefficients for each of 25 countries reported in annotated biblio Countries shown are those where food aid variable is significant at 10% level. Estimates are elasticities |
| | | | Liberia | | 0.07 | -0.34 | | -3.45 | | | 1.23 | | | |
| | | | Mali | | 0.13 | NA | | -2.34 | | | 0.46 | | | |
| | | | Sudan | | -0.06 | -0.21 | | -0.35 | | | 0.1 | | | |
| | | | Senegal | | 0.17 | -0.26 | | -0.4 | | | 0.21 | | | |
| Quantity of commercial imports | 0.9382 | Bezuneh | Tunisia | 1983 | 0.0002 | | | 0.8678 | | | -0.0001 | | | DW stat = 1.44 Coefficient on DUM = 5.87; on time trend = 0.70; all but dummy are significant at 5% level. Reduced form multiplier = -.809 Reduced form multiplier = -.404 Each 1 MT decr in dom grain prodn is met by .38 MT in imports, over 4 yrs. |
| | 0.582 | Clay/1 | Sri Lanka | 1983/1 | -0.67 | | | | 0.91 | | | | | |
| | | Clay/2 | Sri Lanka | 1983/2 | -0.76 | | | | | | | | | |
| | | Hall | Brazil | 1980/2 | -0.8935 | | | -0.839 | | | 2.1811 | 0.1008 | | |
| | 0.424 | Hall Lavy | Colombia Africa | 1980/2 1989/1 | -0.5226 | | | -1.6722 -0.38 | | | -15.4932 | 0.2245 | | |

Table 3. Summary of Quantitative Findings on Trade Impacts

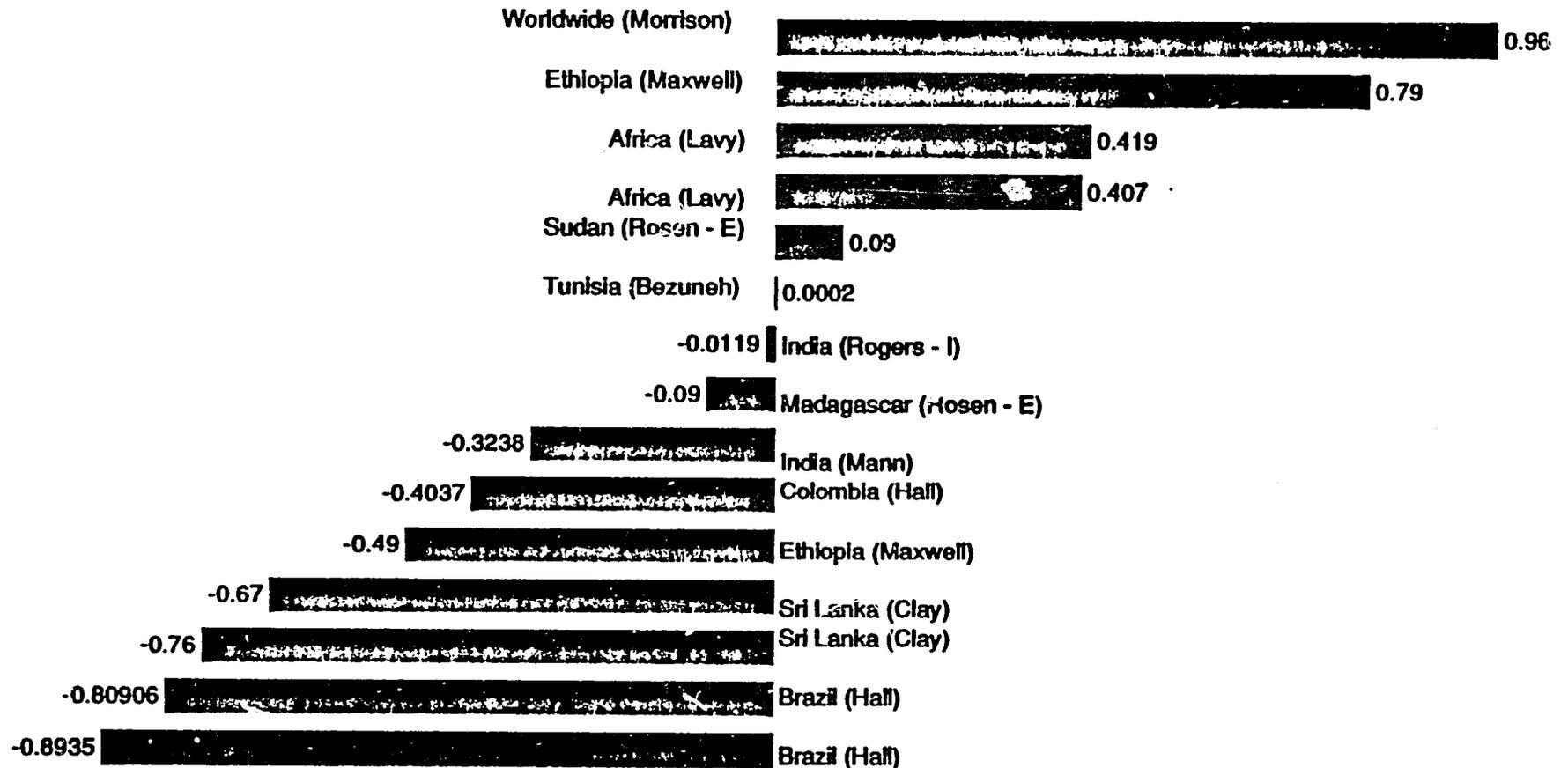
Key:

AIDQUAN Quantity of food aid
 PRIWRLD World price of commodity
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Note: a number following the author's name identifies multiple models presented in the same study; a number following the study date identifies different studies by the same author published in the same year.

| Dependent Variable | R sq | Author | Country | Date | Coefficients on Explanatory Variables | | | | | | | Comments | |
|--------------------|-------|--------------|-----------|--------|---------------------------------------|----------|------|----------|--------|----------|-------|----------|--|
| | | | | | AIDQUAN | PRIWRLD | GNP | PROD | COMIMP | PRIDOM | FOREX | | GDP |
| | | Lavy/1 | Africa | 1989/2 | 0.407 | | | -0.015 | -0.59 | | | | Impact of variable lagged 1 yr Impact of variable lagged 2 yr Impact of variable lagged 3 yr Impact of variable lagged 1 yr Impact of variable lagged 2 yr Impact of variable lagged 3 yr Also includes a supply variable, with estimated coefficient of -0.354 T-stat on AIDQUAN = 4.06 Impact multipliers calc. from reduced form 17 sets of coefficients reported, one for each country studied— see biblio Countries shown are those where food aid coefficient significant at 5% or higher. Coefficients are elasticities. Same analysis as in Rogers et al. |
| | | | | | 0.128 | | | -0.004 | -0.318 | | | | |
| | | Lavy/2 | Africa | 1989/2 | -0.012 | | | 0.005 | -0.095 | | | | |
| | | | | | 0.419 | | | | -0.6 | | | | |
| | | | | | 0.112 | | | | -0.327 | | | | |
| | | Mann | India | 1967 | -0.3238 | | | | -0.083 | | | | |
| | 0.37 | Maxwell/1 | Ethiopia | 1986 | -0.49 | | | | | | | | |
| | 0.747 | Maxwell/2 | Ethiopia | 1986 | 0.79 | | | -0.0605 | | | | | |
| | 0.66 | Morrison | Worldwide | 1984 | 0.96 | | 0.06 | -20.57 | | -4.36 | | | |
| | | Rogers et al | India | 1972 | -0.0119 | | | | | -0.0424 | | | |
| | 0.61 | Rosen | Africa | 1989 | *comment | *comment | | *comment | | *comment | | | |
| | 0.41 | | Madagas. | | -0.09 | -0.23 | | -6.21 | | 1.03 | | | |
| | | | Sudan | | 0.09 | -0.41 | | -0.32 | | -0.2 | | | |
| | | Srivastava | India | 1975 | | | | | | | | | |

Figure 2. Coefficient Estimates of Food Aid Impact on Commercial Imports



Coefficients shown estimate change in commercial import tonnage per ton of food aid, except entries designated E (which are elasticities) and entry designated I (which is an impact multiplier)

QUESTIONS REMAINING TO BE ANSWERED

Gaps in the Literature

Taken as a whole, the evidence presented in the formal literature tends to confirm the common-sense expectation that food aid displaces commercial trade in the short term, at least in part. As the foregoing discussion makes clear, however, several major issues are left unexplored by the studies completed to date, making it difficult to draw firm conclusions for programming. The direction and nature of food aid's long-term effects on commercial trade is scarcely addressed by currently available studies, nor are the short-term impacts fully explored.

Turning first to the long-term impacts on trade, the basic issue that emerges is how food aid recipients' participation in international markets evolves over time, and how this evolution is related to food aid. Within this broad issue, we can identify four questions where further information would be highly desirable in understanding food aid's role in development and trade:

- Are food aid recipients more or less likely to become commercial importers as their economies grow, compared to economies with similar growth performance but not receiving food aid?
- Whether or not commercial imports expand, is the food aid donor more or less likely than other suppliers to capture a share of any market growth that may occur, or to increase its share of the total import level?
- Do shifts in demand or supply patterns take place as the result of food aid that increase consumption of imported commodities at the expense of local commodities (the taste preference issue)?
- What role does food aid play in promoting or accelerating the growth of income and agricultural

production, leading to changes in import patterns over time?

As further discussed below, the first three questions appear readily subject to quantitative analysis with the information available. The fourth question, however, is extremely complex and, as noted above, may be inherently indeterminate on a global level.

Fewer gaps remain in our overall understanding of short-term impacts, but the picture at this level is far from complete, in four respects. First, it should be noted that, although three analyses have been undertaken using cross-sectional data from a large sample of countries, each of these studies is flawed with respect to its methodology or its relevance to food aid programming. Morrison uses a data set with only one year of observations (and, moreover, the year selected — 1979/80 — was the year of the second oil shock and thus may not be representative). Vengroff's study shows a clear bias toward a view of food aid as a tool of economic dependency and, in any case, does not directly link food aid and commercial imports. Abbott's study appears to be sound methodologically, but the data set used does not extend beyond 1973. The substantial changes that have occurred in both world grain markets and food aid programming since that time, as well as both oil price shocks and the emergence of the debt crisis, suggest that this analysis should be updated. In sum, there is not an up-to-date, methodologically sound analysis of the interaction of food aid and trade levels in the short run across the full range of countries.

Second, this gap is only partially filled by the country and regional studies. Although the single-country literature that was identified by the team covers a wide range of countries and time periods and produces generally consistent results, it falls well short of providing a comprehensive overview of experience. Several of the major recipients of food aid, particularly the important Asian "graduate" group, are overlooked in the current literature. This gap could usefully be filled by a small group of well-chosen and methodologically consistent case studies, providing a sound basis for determining whether the studies cited in the non-analytic literature that argue for additionality stand up to closer scrutiny.

Third, the literature does not effectively differentiate impacts by type of program. With increasing emphasis on program food aid and on the sale of food aid of all types, this differentiation should be made to clarify how program design affects food aid's impact on trade and production. Here again, a limited set of case studies using a consistent methodology offers the most direct means of filling an important gap.

A fourth gap in the literature on short-term impacts exists with respect to the incorporation of the effect that alternative food aid distribution systems (targeted/untargeted, subsidized/unsubsidized) have on the presence

or absence of trade impacts. Although the literature (and in particular the series of articles on India, where such programs play a major role) suggests that the incorporation of the domestic market's structural features would add to the power of the analysis, a further review of data availability would be necessary to determine whether this refinement could be included. In the absence of such information, we would suggest that this feature could be included in a series of country case studies, but it would be very difficult to include in a worldwide model, due to the difficulty of assembling reliable information on the scale and targeting of such programs over time in a large number of countries. As noted earlier in this report, large food subsidy programs are being phased out in a growing number of developing countries for reasons of cost that are only indirectly related to food aid programming. The evolution toward market systems makes it less important to include this feature as a guide to future programming, although it may still be useful in understanding the historical experience.

What Is the Next Step?

Major gaps clearly exist in the formal literature, making it impossible to draw firm conclusions regarding food aid's long-term impacts on commercial trade and market shares. Given these gaps, it is appropriate to ask whether these gaps can be filled and, if so, whether an effort should be made to find the answers to the questions outlined above.

The answer to the first question is a guarded "yes." The body of single-country and multi-country literature provides a sound methodological basis for a more comprehensive and updated analysis of the data. This task could best be approached along two parallel tracks:

- A worldwide analysis using a methodology based on that used by Lavy, but modified if data permit to capture longer-term impacts, to differentiate among types of food aid programs, and possibly to incorporate macroeconomic variables, such as changes in national income and/or the trade balance. Additional methodological work is necessary to decide whether to pool data or examine major recipients individually, focusing on the countries with a 30 year history as food aid recipients. To keep the number of variables within acceptable limits, it would be necessary to combine food aid levels in earlier periods (average receipts over each five-year period, for example), but the appropriate methodology for doing so requires further examination.

- Selected country case studies for countries with a long history of food aid, using an expanded methodology based on the models developed by Abbott, Shapouri and Rosen, Clay, and others. Several approaches should be examined to deal with the question of domestic market differentiation, including expansion of the model to include data on the proportion of food moving through such channels (if available), or countries with large targeted subsidy programs could be excluded from the analysis. Like the cross-country model, the country models would incorporate world price levels and basic macroeconomic information.

These complementary analyses would greatly clarify the relationship between food aid and trade over time, including the link, if any, between the food aid donations and later commercial sales, the evolution over time in the commodity mix of imports and local production, and other specific issues of interest. The analysis proposed would move the debate on food aid impacts beyond the level of anecdote, providing a broad-based and definitive answer to the four questions cited above.

It is more difficult to predict whether the study proposed would demonstrate a causal linkage between food aid and the evolution of the commercial market, as opposed to an association between food aid and subsequent increases in commercial imports. Even if such a causal linkage cannot be demonstrated, the study would constitute a major addition to current understanding of food aid's role in long-term market development.

The primary value of the study for food aid planning would be to clarify food aid's role in long-term market development. Market development considerations have been a central part of the food aid program rationale since its inception, and they have been an important element of food aid decision-making. The appropriateness of including such considerations in food aid allocation and management decisions clearly depends on the validity of the food aid-trade relationship. If, in actual fact, food aid does not appear to have a significant market development impact, then market development should not be a factor in these decisions. Conversely, if food aid does appear to be linked to the later evolution of commercial markets, then a better understanding of these linkages should lead to better food aid policy from the perspective of both the recipients and the donors.

Both parts of the analysis would draw primarily on information that is readily available in published sources, including food aid levels, commercial import levels by source, agricultural production, foreign exchange position, and income. In order to finalize the methodology outlined above and to determine the appropriate scope and scale of an expanded analysis of food aid impacts, it would be necessary to reach a more complete understanding

of the resources required to carry out the analysis. This understanding would require a review of the availability of the information needed for the study in more detail, to confirm which data are available and to consider alternative model structures based on data availability and comparability.

The next step in the analysis of food aid impacts is therefore to review this information and to develop a model structure that is both methodologically sound and feasible, taking into consideration both the information available and the nature of the issues to be studied. Whether or not the decision is made to go forward with the analysis at this time, such a data review would serve a valuable secondary purpose for food aid planning, making it a useful exercise in itself.

ANNEX 1. ANNOTATED BIBLIOGRAPHY

This bibliography consists of three sections. The first section lists the studies referenced in the text, including both those that provide a rigorous examination of food aid impacts and other key references on this issue. The second section provides fully annotated entries for the analytic studies. (Studies in the first bibliography that are annotated but do not include quantitative analyses are indicated with a +; non-quantitative studies that were not annotated are marked with an asterisk.) The third section provides a bibliography of food aid studies, developed by the team as the basis for identifying quantitative studies. Most of these studies were obtained and reviewed by the team, but a few could not be located due to time and resource constraints; some of the studies in the latter group undoubtedly contain quantitative analyses of food aid impacts on trade, but these could not of course be reviewed by the team.

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Part 2. Annotated Bibliography

- Abbott, Philip C. *Modelling International Grain Trade with Government Controlled Markets*. Volume 61, Number 1. American Journal of Agricultural Economics. February 1979.

Nature of the document: A model of international grain trade, treating government as an endogenous variable rather than an exogenous influence, used to interpret parameters in a net import demand model.

Country or countries covered: Worldwide, 33 countries

Time period covered: 1951 - 1973

Summary of findings on production impacts and interactions: Estimates tentatively support the hypothesis that there is not a one-to-one correspondence between trade and production, as suggested by the USDA-type models. Government self-sufficiency policies and segmentation of domestic markets are cited as causing variation in net import demand to be substantially less than variations in production.

Summary of findings on trade impacts and interactions: The linear price response coefficients obtained in estimations were used to determine consumption-based net import demand price elasticities. The econometric estimates obtained are weak, but some consistent results have been obtained. The data does support the hypothesis that importing countries that must allocate limited foreign exchange to payments for grain may be influenced by export receipts and foreign capital inflows, or by the receipt of foreign aid in kind, when they make import decisions.

Summary of other findings: None discussed

Methodology used: A generalized reduced form net trade equation derived from a system of 13 equations; instrumental variables estimation techniques used.

Formula or model presented: Reduced form net trade equation derived from system of equations:

$$\begin{aligned}
 XT = & c' - d \cdot PW \frac{XC_0}{PW_0} + bXA - a'XP + j'FX + k'XS + g_2POP \\
 & + g_3INC + g_4T + g_5AN
 \end{aligned}$$

The food aid equation in the underlying equation system is expressed as:

$$XT = XC - XQ + bXA$$

Where

- XT = net imports
- d = short-run adjustment to the world price (change in the consumer price, given a change in the world price)
- PW = world market price
- XC = consumption
- XQ = domestic marketed supply
- XP = production
- FX = foreign exchange inflows
- XS = stocks on hand
- POP = population
- INC = national income at constant prices
- T = time trend
- AN = stock of animals in relative feed units
- XA = aid in kind received
- b = fraction of aid in kind which becomes additional demand

NOTE: The published version of the study, which is based on the author's dissertation, does not report the coefficients for XA (aid).

- Bezuneh, Mesfin and B. J. Deaton. *Food Aid Disincentives and Economic Development: Some Reconsiderations of the Tunisian Experience*. Virginia Polytechnic Institute and State University. 1983.

Nature of the document: An econometric analysis of the developmental impact of food aid to Tunisia.

Country or countries covered: Tunisia

Time period covered: 1960 - 1979

Summary of findings on production impacts and interactions: The model predicts impact multipliers which indicate that an increase in one metric ton of food aid in the current year has no effect on domestic supply and real income in the current year, but is expected to result in a reduction of 1.0 unit in the value of the price index (thus an increase in real incomes) in the same year. The authors suggest that food aid may not have a significant disincentive effect in either short-run or long-run time periods.

Summary of findings on trade impacts and interactions: The model predicts that one metric ton of food aid in the current year results in an increase of 0.0003 MT of commercial imports, thus an increase in total food supply.

Summary of other findings: The authors view the effects on Tunisia's agricultural sector as ambiguous. The greater demand for food resulting from growing real incomes and the income effect of cheaper food may stimulate demand -- on the other hand, the negative multiplier of food aid for domestic supply could dampen production incentives.

Methodology used: A system of four simultaneous equations and one market-clearing identity, with a total of nine variables.

Formula or model presented:

$$IC = a_0 + a_1Q_s + a_2PQ + a_3FA$$

Where

IC = per capita commercial imports of grains
 Q_s = per capita domestic production
 PQ = wholesale price index of food grains
 FA = per capita food aid imports

- Blandford, David, and Joachim A. von Plocki. *Evaluating the Disincentive Effect of PL 480 Food Aid: The Indian Case Reconsidered*. Cornell University, Department of Agricultural Economics, July 1977.

Nature of the document: This study was completed by the authors while affiliated with Cornell University's Department of Agricultural Economics. The study seeks to identify and remedy deficiencies in previously completed econometric studies that attempted to calculate the disincentive effects of food aid. The authors review previous quantitative models, namely those of Mann (1967); Rogers, Srivastava, and Heady (1972), and Barnum (1971) and specify a new model, based on various assumptions and parameters of the earlier models, to estimate the disincentive effects of food aid imports. The authors' model estimates the effect of PL 480 imports on production during a single time period; a series of time periods, and over time using various impact multipliers.

Country or countries covered: India

Time period covered: 1952 - 1968

Summary of findings on production impacts and interactions: The study found that, during a single time period, a unit increase in PL 480 (1 million tons) decreases the cereal price index by 2.25 units. Using a long-run multiplier, the study estimated the production impact of a sustained increase of 1 million tons of PL 480 imports to be -0.149. Therefore, sustained increases in food imports of 1 million tons would reduce domestic production by 149,000 tons over the seven-year long-term period. The results indicate that the greatest impact of food aid imports on domestic production occurs in the next year with a long-run equilibrium reached in the seventh year.

Summary of findings on trade impacts and interactions: The study found that, during a single time period, roughly 81 percent of a hypothetical 1-million ton increase in food aid would displace commercial imports, leading to a decline of 12.9 percent in such imports.

Summary of other findings: For a single time period, the study found that a unit increase in food aid imports increases consumption by 1.86 kg per capita, replaces withdrawals from government stocks by 6 percent, and decreases the food gap by the amount of the additional aid.

Methodology used: A simultaneous equation model was used employing impact multipliers.

Formula or model presented: