UNIVERSITY OF CALIFORNIA DIVISION OF AGRICULTURAL SCIENCES
GIANNINI FOUNDATION OF AGRICULTURAL ECONOMICS

CONDITIONAL PROJECTIONS OF CALIFORNIA ECONOMIC GROWTH

Ivan M. Lee

Giannini Foundation Monograph Number 19 • February, 1967

CALIFORNIA AGRICULTURAL EXPERIMENT STATION

Conditional projections of California economic activity to 1975, based on a 28-sector input-output model, are presented. The projections are not to be interpreted as forecasts but rather as outcomes reflecting sensitivity of sectoral growth to explicitly imposed alternative conditions. Alternative conditions here specified relate directly to the structure of California's trade with the rest of the world, with projections generated for each of three different external trade constraints. The base year for the projection model is 1954, and projections are summarized for the reference years, 1965, 1970, and 1975.

Overall growth rates in California economic activity corresponding to alternative trade constraints are not materially different. This is as expected since domestic (California) sectoral final demands to be met by the system are the same under each alternative. Sectoral composition of state output on the other hand is more sensitive. Trade constraints more demanding on manufacturing sectors accelerate growth in manufacturing's share in output, while a structure of trade more demanding on agriculture retards agriculture's relative decline.

Historical data for most of the 1954–1965 period were available at the time the projections were made, thus permitting comparisons between observed and "projected" growth rates during this period for selected minor sectors and for major sector aggregates. For all economic sectors combined, the projected growth rate compares well with the observed rate. Selected individual sectors and sector subaggregates show marked divergence between projected and observed. A notable result of these comparisons is the apparent overprojection of growth rates for primary agricultural sectors under each projection alternative.

Total state water requirements implied by each projection alternative are also developed. Due to the importance of agriculture as a water user, overprojection of growth rates for primary agriculture implies also significant overprojection of state water requirements. Still, even though projected levels of state water requirements appear excessive, the differences in water requirements under different external trade constraints retain validity as indicators of the sensitivity of water requirements to the product composition of external trade. Comparing extremes in the alternative projections generated, differences in implied water requirements are substantial, amounting to over 3,000,000 acre-feet for the 1965 projections and more than 6,000,000 acre-feet for 1975.

THE AUTHOR:

Ivan M. Lee is Professor of Agricultural Economics and Agricultural Economist in the Experiment Station and on the Giannini Foundation, Berkeley.

Ivan M. Lee

CONDITIONAL PROJECTIONS OF CALIFORNIA ECONOMIC GROWTH[1,2]

INTRODUCTION

THIS REPORT summarizes some comprehensive projections of economic activity in California under explicitly specified conditions. An intersectoral input-output model is used, permitting examination of the implications of conditions imposed for sectoral as well as aggregate growth. Magnitudes projected are subject to the usual qualifications of conditional projections. Given the constraints implicit in the projection scheme adopted, the magnitudes which result for a specified future time point are a direct consequence of critical exogenous conditions imposed.

The projections generated are not to be interpreted as forecasts. "Realistic" forecasts with our projection model would require the imposition of realistic conditions and constraints, and the development of such conditions itself would present a substantial forecasting problem. The purpose of this research project is much less ambitious: to examine implications for California economic growth as certain important conditions change—in particular, conditions relating to California's balance of trade with the rest of the world. It cannot be claimed that the trade constraints imposed represent the trading patterns most likely to emerge as the state's economy develops. In the absence of a firm basis for predicting realistic patterns of external trade, it is proposed to examine outcomes under a set of alternative trade patterns. Such an approach has merit because it does not lose sight of the conditional character of the projections and keeps in sharp focus the fact that assessment of realism of projections does involve, as an important ingredient, assessment of validity of conditions. But, beyond this, examination of the sensitivity of projections to alternative conditions may often be more informative than the projections *per se*. Assume, for example, that the major interest in projections for a region lies in their implications for future water resource development in that region. Now projected economic activity under a wide range of alternative conditions may exhibit widely varying patterns, but the implied water requirements might be relatively insensitive to them. If so, the specific conditions which are to emerge in the future become much less critical in the assessment of future water demand. If, on the other hand, future water demands turn out to be sensitive to specific conditions, an approximate quantitative measure of this sensitivity is to be preferred as a basis for decisions to decision frameworks which allow this critical dimension of the problem to remain submerged.

The ideal goal would be a substantial number of alternative trade patterns,

[1] Submitted for publication June 24, 1965.

[2] This report is based on research supported in part by the Water Resource Center, University of California.

with alternatives evolved in a framework that facilitates systematic sensitivity analysis of outcomes. The present work falls somewhat short of this. Empirical projections have been generated for only three specific trade constraint alternatives, although auxiliary measures are presented which have suggestive value for examining certain implications of a broader range of alternatives. Projections are presented for 1965, 1970, and 1975. The projection model at best gives an approximation to the path of long-run growth under the conditions imposed. As implied above, the multitude of factors which give rise to variation in annual magnitudes around the long-run path are not represented in the model, and hence, are not operative in generating the empirical results. Accordingly, the years chosen should be regarded simply as reference years along a smooth path. The number of reference points and the particular years selected are choices arbitrarily made to simplify the framework for implementing projections and summarizing results.

In the empirical input-output construct used in implementing these projections, agricultural sectors are represented in somewhat more detail than are nonagricultural sectors. Of the total of 28 endogenous sectors, 10 represent primary agricultural activity (farm production) and 5 secondary agricultural activity (processing of agricultural products). Empirical sections of the report summarize the main results depicting sectoral growth rates under the conditions imposed as well as related measures bearing on other dimensions of California economic growth. Meaningful summary of the mass of numerical results generated is difficult in this instance, but the following selected summary observations will help to place the nature of the study in clearer perspective.

1. Overall growth rates in California economic activity corresponding to the different trade-balancing constraints examined are not materially different. This is as expected since domestic (California) sectoral final demands to be met by the system are the same in each alternative.
2. The sectoral composition of total state output is sensitive to the higher income elasticity for nonagricultural (particularly manufacturing) relative to agricultural products and further to the specific external trade constraint adopted. Thus, the manufacturing sector's share in total output increases relative to primary agriculture's share through time. Furthermore, external trade constraints which are more demanding on manufacturing sectors accelerate the growth in manufacturing's share in output, while trade constraints more demanding on agriculture retard agriculture's relative decline.
3. Because agriculture is an important user of water, the sensitivity of the composition of output to external trade patterns results in aggregate water requirements also being highly sensitive to external trade. Accordingly, implied water requirements corresponding to the external trade constraint most demanding on agriculture are substantially higher than those for the trade constraint least demanding on agriculture. The difference in implied requirements is over 3 million acre-feet for the 1965 projections and more than 6 million acre-feet for 1975.
4. Compatibility of projected aggregate state output with independently projected labor force is examined by comparing rates of growth in state labor productivity implied by the projections with observed and projected rates of productivity growth in the United

States. "Projected" rates of growth in California for the period 1954–1965 are higher than, but not inconsistent with, observed United States rates of productivity growth for the period 1954–1962. Beyond 1965, implied productivity growth rates projected for California fall off somewhat faster than productivity growth rates projected independently for the United States. If the growth rates projected for the United States are realistic also for California, levels of economic activity projected here will provide employment opportunity short of the labor force presently projected for the state.

5. Projected growth rates in California output for 1954–1965 compare well with observed growth rates during 1954–1962 for all economic sectors combined and for the subaggregate consisting of service and construction sectors. However, projected growth rates for primary agriculture are greater than observed, and those for manufacturing are less than observed, comparing these same periods. This does not make the *comparison* of results under different alternatives less meaningful but does provide convincing evidence that none of the alternatives projected can be regarded as a realistic "forecast" for this period. The hazards of regarding the projections beyond 1965 as forecasts are obvious.
6. Because agriculture is a large water user, overprojection of primary agriculture implies significant overprojection of total water requirements. Projected aggregate output relative to projected total water requirements reflect the not surprising result that state water requirements are much more sensitive to growth in the agricultural sector than is state output. Still, even though projected levels of state water requirements appear excessive, the differences in water requirements under different external trade constraints retain validity as indicators of the sensitivity of water requirements to the product composition of external trade.

In the following report, a statement on the projection model precedes the summary of empirical results. Some well-known mathematical forms of expression are employed in this discussion with a minimum of elaboration. Certain points are developed in more detail in a series of three notes in Appendix A. In the empirical sections, many results are summarized by four major sectors—primary agriculture, agricultural processing, manufacturing, and other. In all such instances, results by 28-sector detail are included in Appendix D. The remaining appendices contain empirical detail supporting or amplifying textual summaries and exposition.

THE PROJECTION MODEL

The projections have been generated by a Leontief-type open input-output model for the California economy. The essential features of the Leontief input-output construct are generally known and need only brief description here.[3] A more precise statement appears in Appendix A-1.

In broad outline, the aggregate economy of California is divided into a num-

[3] For more complete statements and description of the model, the reader is referred to Leontief (24) and to standard sources such as Chenery and Clark (15); Dorfman, Samuelson, and Solow (19); and Allen (1). Treatments specifically focusing on input-output as a technique for regional analysis may be found in Leontief *et al.* (25), Chenery and Clark (15), Chenery (14), Isard *et al.* (21), and Moses (28).

TABLE 1

INTERSECTORAL PRODUCT FLOWS

	Indogenous sector							Exogenous sector					Total supply		Row sum
	1	2	3	⋯	j	⋯	n								
1	X_{11}^{g}	X_{12}^{g}	X_{13}^{g}	⋯	·	⋯	X_{1n}^{g}	Y_{1h}	Y_{1s}	Y_{1f}	Y_{1e}	ΔK_1	X_1^{g}	$-M_1 - \Delta U_1$	X_1
2	X_{21}^{g}	X_{22}^{g}	·····	·	⋯		X_{2n}^{g}	Y_{2h}	Y_{2s}	Y_{2f}	Y_{2e}	ΔK_2	X_2^{g}	$-M_2 - \Delta U_2$	X_2
i	·	·		X_{ij}^{g}		·		·	·	·	·	·	·	· ·	·
·	·	·		·		·		·	·	·	·	·	·	· ·	·
n	X_{n1}^{g}	X_{n2}^{g}	·····	·	⋯		X_{nn}^{g}	Y_{nh}	Y_{ns}	Y_{nf}	Y_{ne}	ΔK_n	X_n^{g}	$-M_n - \Delta U_n$	X_n
	Z_{m1}	Z_{m2}	·····	Z_{mj}	⋯		Z_{mn}	Z_{mh}	Z_{ms}	Z_{mf}	⋯	Z_{mk}			$\bar{Z}_m$
	Z_{s1}	Z_{s2}	·····	Z_{sj}	⋯		Z_{sn}	Z_{sh}	Z_{ss}	Z_{sf}	⋯	Z_{sk}			$\bar{Z}_s$
	Z_{f1}	Z_{f2}	·····	Z_{fj}	⋯		Z_{fn}	Z_{fh}	Z_{fs}	Z_{ff}	⋯	Z_{fk}			$\bar{Z}_f$
	Z_{h1}	Z_{h2}	·····	Z_{hj}	⋯		Z_{hn}	Z_{hh}	Z_{hs}	Z_{hf}	⋯	Z_{hk}			$\bar{Z}_h$
Column sum	X_1	X_2	·····	X_j	⋯		X_n	$\bar{H}$	$\bar{S}$	$\bar{F}$	····	ΔK			

ber of sectors. They are classified into two groups, one group regarded as endogenous and the other as exogenous. In crude terms, the endogenous sectors in the model on which the present projections are based contain classes of products normally produced by private firms in a private enterprise economy. The exogenous sectors cover households, government, external trade, and private capital formation. A full listing of endogenous sectors in the California model follows, and a complete description indicating product detail of each sector is to be found in Martin and Carter (26) and (27):

1. Meat animals and products
2. Poultry and eggs
3. Farm dairy products
4. Food and feed grains
5. Cotton
6. Vegetables
7. Fruit (excluding citrus) and nuts
8. Citrus
9. Forage
10. Miscellaneous agriculture
11. Grain mill products
12. Meat and poultry processing
13. Dairy products
14. Canning, preserving, and freezing
15. Miscellaneous agricultural processing
16. Chemicals and fertilizers
17. Petroleum
18. Fabricated metals and machinery
19. Aircraft and parts
20. Primary metals
21. Other manufacturing
22. Mining
23. Utilities
24. Selected services
25. Trade and transportation
26. Unallocated
27. Scrap and by-products
28. Construction

To help identify terms and concepts introduced in this section, certain relationships are discussed in greater detail in Appendix A. The Leontief input-output model is regarded as a "useful" device for projecting economic activity essentially because it takes account of sectoral interdependence among the (endogenous) sectors. The intersectoral flow table (table 1) helps to clarify the sense in which interdependence is taken into account.

In this table the first n rows and columns represent endogenous sectors. The column headed "total supply" represent total supply of product of the corresponding endogenous (row) sector in a given year required to support the level of economic activity of that year. Thus, X^g_i represents the total supply of product of sector i. The columns to the left of the total supply column tell us how this total supply was "used" in the regional economy represented by this table. The entries X^g_{ij} in the upper left partition denote, for given row sector i, the amounts of product i used by column sector j as inputs in producing that year's output of sector j. In the upper left partition then, the entries in a given row indicate how the product of the sector represented by that row is distributed over producing sectors (columns 1 through n) for use as inputs.

The empirical counterpart of table 1 appears in Appendix B as table B-1. This empirical table is based on the year 1954; the entries expressed in units of $1,000. To relate table 1 to its empirical counterpart, sector 1 in table B-1 represents meat animals and products (beef, hogs, sheep and lambs, and wool and mohair) measured at the farm level. Total supply of meat animals appears in column 34—$584,715,000 in 1954. Sector 12 in table B-1 deals with the processing of agricultural products, specifically meat and poultry processing. A glance across row 1 of table B-1 will show that most of the total supply of meat animals goes to sector 12 as input ($562,638,000), that is, for further processing before moving on into final consumption.

Columns in the exogenous sector in

table 1 represent exogenous final demand. The first four of these may be regarded approximately as purchases for current consumption, while the last includes for each row sector capital goods produced over and above that required for replacement of capital used by the economy during the year. That part of total supply not used as input in the endogenous sectors flows to these final demand sectors. That is, the entry in each row of the total supply column is simply the sum of all entries in the corresponding row appearing in columns to the left. The five exogenous columns in table 1 are designated by h, s, f, e, and ΔK, respectively, in the empirical table B-1. From sector 1 of table B-1, only a very small amount flows to final demand component Y in 1954, and a larger but still small amount appears as an increase in inventories in the component ΔK. For a more complete descriptive interpretation of measured flows, see Martin and Carter (26) and (27).

The discussion above pertains to a distribution of the *total supply* of product of a given endogenous sector over the set of endogenous producing sectors and exogenous final demand sectors. But in an "open" regional economy like that of any state, a significant proportion of the total supply of certain sector products may be imported. Thus, in California, total supply of product of a sector may be somewhat larger than "gross domestic output" (GDO) of the sector. The M's appearing in the column to the right of total supply in table 1 represent imports of products of the corresponding row sectors, and the next column of ΔU's represent net withdrawals from inventory. These are entered with negative signs to indicate that they are subtracted from total supply to get gross domestic output, which appears for each endogenous row in the column headed "row sum."

The importance of imports is exemplified again by sector 1 of table B-1 in the column headed "competitive imports." Net imports in 1954 of meat animals and products are estimated at $247,834,000, more than 42 per cent of total supply of products of this sector. It should be noted that only *net* imports appear in the import column of table B-1 (and, correspondingly, in table 1). That is, sectors which show net exports in 1954 show zero entries in the import column. Thus, some of the M_i in the import column of table 1 are zero. The 1954 net import or net export position of a sector was maintained in the projections generated for the California economy. That is, a sector that was a net exporter (net importer) in 1954 was not permitted to become a net importer (net exporter) in the period covered by the projections.

The four rows of Z entries appearing in the lower left partition of table 1 represent "inputs" purchased by endogenous sectors from exogenous sectors. The exogenous sectors represented by these rows are, respectively, noncompetitive imports, state and local government, federal government, and households. Noncompetitive imports refer to imports of products not produced in the California economy. They represent imports over and above those included in the import column described above. The latter are competitive imports, i.e., imports of products produced in the California economy. Inputs from government sectors are not inputs in the usual sense of the term. Empirically, they are measured by the tax receipts from sectors indicated (conversely, by sector tax payments to government). The household component of input includes payments to households by sectors for services provided by households, aggregating all types of household income. Thus, from the household point of view, row entries are household income received from different sectors. The same interpretation of inputs supplied by exogenous sectors may be extended to the Z entries in the exogenous columns of

table 1. These entries represent direct purchases by exogenous final demand sectors from the exogenous supplying sectors.

Looked at in another way, a column of table 1, say column j, may be viewed as the purchases by sector j from each of the endogenous sectors and the exogenous supplying sectors of the inputs required to produce the output X_j. If payments to all exogenous supplying sectors are included in the four rows of Z entries, the value of output will be exhausted in payments for inputs. Accordingly, the sum of inputs in column j will equal the entry for the corresponding row in the row sum column. This equality holds for the empirical measures used in the present projections.

The System of Projection Relations

The arrangement of flows depicted in table 1 may be represented by a system of linear relations and interpreted as describing the production system of an economy. The transformation from tabular to algebraic form is outlined in Appendix A, and only minimum comment is included here. Central to the interpretation as a representation of a production system is the technical coefficient, defined for each cell in the upper left partition of table 1. The technical coefficient for cell ij (denoted a_{ij} in Appendix A-1) is defined as the amount of product of sector i required as input by sector j per unit output of the latter. In table 1, it is the entry X^g_{ij} divided by X_j. In the present context of the California model, these coefficients are referred to as gross technical coefficients because the input X^g_{ij} comes from a distribution of total supply over sectors and a part or all of the input in a particular cell may be imported.

The gross technical coefficients arrayed in n rows and n columns corresponding to the upper left partition of table 1 is the matrix of technical coefficients, designated by A in Appendix A-1. Without reproducing the algebraic manipulation outlined in that appendix note, we write here in matrix form for year T the system of linear relations equivalent to what appears in the first n rows of table 1.

$$(1.1) \quad [I - A]\,X_T = Y_T + \Delta K_T - M_T$$

where the matrix $[I-A]$ is $(n \times n)$, and the remaining symbols, X_T, Y_T, ΔK_T, and M_T, each denote n element column vectors. This is the system from which the projection scheme here employed is derived. Put in another way, the projections generated were such that they satisfy for each projection reference year T the set of constraints represented by the system (1.1).

But the system as written in (1.1) is not in suitable form for direct generation of projections. If all of the vectors appearing on the right of (1.1) were given (or, more relevant in the projection context, could reasonably be projected independently of X_T on the left), the domestic outputs X_T compatible with the given "final demands" (Y_T, ΔK_T, and $-M_T$) could be determined in a straightforward way by solving (1.1) for X_T. The solution is:

$$(1.2) \quad X_T = [I\text{-}A]^{-1}(Y_T + \Delta K_T - M_T)$$

where superscript -1 denotes inverse. The solution (1.2) assumes that the base year technical coefficients A are valid without change in the projection year. The difficulty is that, while one can hope to develop meaningful independent projections of the final demand component Y_T, the levels of imports and the levels of capital increments cannot be dealt with very meaningfully unless they are related to the levels of projected sector outputs represented by X_T. To handle this in the projection system, import and capital coefficients (which in effect relate import and capital requirements

to domestic output) are defined and introduced in the system. In this process M and ΔK disappear from the right of (1.1) and through the import and capital coefficients adopted become embodied in the endogenous mechanism on the left. Specifically, the matrix $[I-A]$ is modified in a manner such that, for given import and capital coefficients determined exogenously, the levels of these requirements will be determined simultaneously with the projected vector of sector outputs. The level of final demand, Y_T, is still projected independently.

The modifications incorporating imports in matrix $[I-A]$ are noted first. Information was not available to permit the separate allocation of imports from other regions and domestic output over producing sectors of the California economy for use as inputs. What was determined empirically was the column of M_i in table 1, and total supply of product i was distributed over purchasing sectors. As the California economy grows, total supplies of product required to support the higher levels of activity increase. These increased requirements are reflected by the interdependence coefficients in the matrix $[I-A]^{-1}$. However, it is not realistic to require that the full increase in supplies be met by corresponding increases in California domestic production. Imports into the state in the future, as in the past, will contribute to meeting supply requirements in certain import sectors.

To deal with imports in the projection scheme, import coefficients have been defined for each sector representing the proportion of that sector's total supply imported. Denoting the import coefficient for sector i by m_i and defining the $(n \times n)$ diagonal matrix D_m, incorporating the import coefficients in the endogenous mechanism has been accomplished by suitable adjustment in the matrix $[I-A]$ (see Appendix A-1). We write the result directly from (A.1.8) and (A.1.9):

$$\{[I - D_m]^{-1} - A\}X_T = Y_T + \Delta K_T \tag{1.3}$$

$$CX_T = Y_T + \Delta K_T \tag{1.4}$$

where C in (1.4) represents the matrix in brackets on the left of (1.3).[4] The adjustment in (1.3) replaces the identity matrix in $[I-A]$ by the reciprocal matrix $[I-D_m]^{-1}$, a diagonal matrix with $1/(1-m_i)$ as the entry in the ith row. At the same time, the vector of import levels, M, disappears from the right of (1.1). In effect, the adjusted matrix C takes into account the fact that a certain proportion of requirements of product of importing sectors will be imported and not produced domestically. (Import coefficients for net exporting sectors are zero.)

For given import coefficients (i.e., given C matrix) and for given Y_T and ΔK_T, projected sector outputs X_T must satisfy the constraints represented by the system (1.4). But the appropriate import coefficients which are to enter in C do not need to be determined exogenously, and their determination does introduce difficult problems, particularly for an open regional economy where net imports constitute an important component of total supply in some sectors. The difficulty is rather less with the A term in (1.3) than with the term $[I-D_m]^{-1}$. The coefficients in A

[4] Expression (1.3) differs from (A.1.8) in that the term D_u, representing inventory withdrawal coefficients in the base year, has been set equal to zero in (1.3). This imposes on the projection scheme the condition that supply requirements may not be met by withdrawals from inventory. In the long-run context of the projection model, this is a reasonable simplifying condition.

reflect total input requirements of product i per unit output of sector j. Although the validity of assuming stable technical coefficients for purposes of projection remains open to question, the assumption of stable import coefficients is still more questionable. Technical transformation rates over time would be expected to be somewhat more rigid than trade flows; and, in a situation in which the requirements reflected by the technical coefficients are stable, a large number of alternative patterns of domestic output versus trade with other regions would meet these requirements.

In the present projections for the California economy, the assumption of stable import coefficients (that is, carrying over the fixed base year import coefficients to the projection period) has not seemed tenable. At the same time, the problem of determining a "most plausible" set of import coefficients for a particular projection year is most difficult. The trade constraints introduced in the present work do not deal adequately with this problem. The procedure followed is outlined in more detail in Appendix A-3. Briefly, it imposes the condition that California's trade with the rest of the world must balance in respect to "current account" but not necessarily in respect to capital formation. Projections presented are then projections for three specific alternative trade patterns which meet this condition.

If independently projected Y_T and ΔK_T were available, the projected output vector X_T could be readily obtained from the solution of (1.4).

$$X_T = C^{-1}(Y_T + \Delta K_T) \,. \tag{1.5}$$

But, as indicated above, the increment in capital (ΔK_T) required to sustain growth cannot reasonably be projected independently of growth in output itself. To take account of this, a further modification has been made on the left of (1.4) to incorporate capital growth in the endogenous mechanism.

The algebraic manipulation is outlined in Appendix A-1. The result, written in partitioned matrix form, is:

$$\begin{bmatrix} C & \vdots & -E_k \\ \cdots & \vdots & \cdots \\ K & \vdots & -I \end{bmatrix} \begin{bmatrix} X_T \\ \cdots \\ \Delta K_T \end{bmatrix} = \begin{bmatrix} Y_T \\ \cdots \\ \overline{K}_0 \end{bmatrix} . \tag{1.6}$$

Terms entering (1.6) are fully defined in the appendix. Noted here is merely the role of the added terms appearing in this form. Performing the multiplication, we may write:

$$\begin{aligned} &\text{(a)}\quad CX_T - E_k(\Delta K_T) = Y_T \\ &\text{(b)}\quad KX_T - (\Delta K_T) = \overline{K}_0 \,. \end{aligned} \tag{1.7}$$

In (1.7a) the role of $-E_k$ is to assign a certain proportion of the capital goods increment generated during the projection span to projection year T. When this part of the capital increment is subtracted from CX_T, remaining supplies go to meet final demand Y_T.

The matrix K is a matrix of capital "requirement" coefficients. An element k_{ij} represents product of sector i required as capital goods per unit of capacity of sector j. Only sectors producing capital goods are represented by rows in K.[5] In the California model, the

[5] Although Zusman and Hoch (72) developed coefficients for both "expansion" capital and for inventories, only expansion capital has been included in the empirical projections. The effect of omission is small in relative terms since the inventory coefficients are very much smaller than the expansion capital coefficients.

K matrix is (15×28). In the projections, the coefficients in K are applied directly to sector outputs in generating capital requirements. This implies that, if there existed excess capacity in the base year 1954, this excess capacity is carried along in the projected capital stock requirements for reference year T. In (1.7b) the term KX_T represents total stock of capital goods which it is required to have on hand at the close of projection year T if capital stocks to sustain growth are to be maintained. The vector $\overline{K}_0$ on the right, on the other hand, represents stock of capital goods on hand in the year on which the projection is based. Subtracting the capital goods increment produced during the period 0 to T from capital goods on hand at T leaves capital goods on hand at base point 0.

The vector of capital goods on hand initially, $\overline{K}_0 = KX_0$, is given for the projection since the matrix K and the vector X_0 are both given. Hence, for independently projected Y_T, X_T and ΔK_T are projected by:

$$\begin{bmatrix} X_T \\ \cdots \\ \Delta K_T \end{bmatrix} = \begin{bmatrix} C & \vdots & -E_k \\ \cdots & \cdots & \cdots \\ K & \vdots & -I \end{bmatrix}^{-1} \begin{bmatrix} Y_T \\ \cdots \\ \overline{K}_0 \end{bmatrix}. \tag{1.8}$$

Projections so generated satisfy the constraints (1.6).

Base year (1954) empirical measures of matrices C and K and of the column vector $\overline{K}_0$ based on Zusman and Hoch (72) and Martin and Carter (26) are reproduced in Appendix B. The appropriate operator E_k depends only on the span covered by a particular projection. Therefore, if base year import coefficients were to be employed in projection, conditional projections of X_T and ΔK_T are directly obtainable from (1.8), given independently projected final demand Y_T. Actually, import coefficients have been adjusted for different T by a procedure described in a subsequent section. The next section considers independent projection of the final demand vector Y_T.

Final Demand Projections

The empirical final demand projections adopted and more details on specific procedures used are summarized in Appendix C. The comments here present a brief general statement of what was done.

The vector Y_T in (1.8) is actually an aggregate of four components—household purchases, state and local government purchases, federal government purchases, and net exports from California. Empirical measures of the separate components are available for the base year 1954, and each component is projected separately for year T. For each component, projections are tied directly to other generally available projected aggregates of related magnitudes for the California and United States economies. Accordingly, United States per capita personal income has been projected, based on per capita gross national product projections available in Landsberg *et al.* (23). Per capita personal income in California has then been projected from the United States projections, based on the relationship between California and United States per capita incomes as estimated from postwar data. California Department of Finance population projections (11) have then been adopted as a basis for deriving aggregate income measures. The convenience of taking advantage of the rather considerable work underlying these related projections is obvious. But, in addition, some gain is achieved from seeking this kind of overall control and

maintaining a degree of compatibility with projected incomes at the national level as well as the commonly accepted projections of population at the state level.

In view of the controls imposed by such independently projected aggregates, the present projections of growth of the California economy relate to the following question: Accepting the independently projected California population estimates and assuming that California per capita incomes keep pace with projected United States per capita incomes, what is implied for the sectoral composition of total California output as we look ahead to 1975?[6] The procedure has been to start from exogenous projections of final demands and determine the vector of sector outputs required to meet the projected demand. The solution is then examined for its implications for total employment in relation to prospective labor force as suggested by projected population and by reasonable expectations of trends in labor productivity. Of course, other aspects of the projected California economy are also examined, including the implied water delivery requirements in each projection reference year.

As to the independently projected final demands, one of the forces contributing to a changing composition of total product in an advanced economy, as it continues to develop, is the variation in income elasticity of demand among products. In particular, the mass of empirical evidence over the years points to relatively low income elasticities of demand for different categories of agricultural products at levels of per capita income characteristic of advanced economies. In contrast, demands for certain convenience or luxury items, including many consumer durables, show somewhat higher income elasticities. This is commonly recognized as an important force leading to a declining relative importance of the agricultural sector as per capita incomes increase. To allow such effects to influence directions of projected growth in the California economy, income elasticities varying over sectors have been applied in projecting certain components of final demand, namely, the domestic household and export demand components.

The sectoral income elasticities adopted are summarized in table C-3, and the main sources drawn upon are cited in that table. The particular numerical coefficients chosen cannot be strongly defended as "best" on clearly definable objective citeria, but they are regarded as reflecting demand characteristics somewhat more closely than would the assignment of unit elasticity to each sector. Some quite arbitrary judgments are apparent. For example, elasticities assigned to agricultural processing sectors differ from corresponding primary agricultural sectors only because of the weights employed in deriving macro (sectoral) elasticities from micro (product) elasticities. In other sectors, unit elasticities have been assigned not so much from positive evidence that this is appropriate but because there was inadequate basis for doing otherwise. In these cases, unit elasticity has at least the advantage of being neutral, in the sense that it does not disturb the weighted average elasticity of unity which was preserved in projecting domestic household demand to maintain the "adding up" property of expenditures, i.e., to ensure that the sum of sector expenditures will conform to total expenditure projected independently.

Unit elasticity of total per capita expenditures with respect to the various measures of per capita income was assumed throughout. Therefore, sector elasticities are at the same time income

[6] Actually, the historical relationship adopted for projecting California per capita income from United States per capita income preserves a higher per capita income in California but converging on the United States average as income increases.

and expenditure elasticities and can be employed accordingly in projection. For the California domestic household demand sector, total per capita expenditures have been projected directly and total expenditures then derived by multiplying by projected population. Sector elasticities then enter in allocating total expenditure over sectors.

The same sectoral income elasticities are applied in projecting the export demand vector. However, positive exports were projected only for those sectors that were net exporters in the base year. Base year net importing and balanced sectors were projected to continue as such and were, accordingly, assigned export demand values of zero. Preserving the base year net export or net import position of each sector was regarded as compatible with fixed relative prices assumed throughout in projection. Fixed (1954) relative prices are implied in the measurement of all values in constant 1954 dollars.

In the case of exports, the relevant related measures are per capita incomes and population in the rest of the United States, and the corresponding United States magnitudes have been employed in implementing export projections.[7] This is not a completely satisfactory method for generating independent projections of export demand. One questionable result is that submerged in the procedure lies an implied rigidity which preserves, sector by sector, California's share in the total market outside California. Extensive supporting analysis would be required as a basis for imposing specific assumptions reflecting changing shares in the external market, but changing shares do need to be accepted as the more realistic prospect. Actually, where adjustments were subsequently made in export demands to take account of trade balance, the resulting projected exports no longer imply fixed shares. But these adjustments cannot be regarded as being based on adequate supporting analysis of the type mentioned.

The remaining two final demand vectors independently projected are purchases by government sectors from the California economy—state and local government on the one hand and federal government on the other. In both cases, the equivalent of unit income elasticity of purchases from each sector was applied. State and local government purchases were projected for each sector in proportion to projected state personal income. Federal government purchases were projected for most of the projection span in proportion to projected United State gross national product (see table C-6).

For state and local government purchases, the procedure entailed a straightforward application of the appropriate projection coefficient uniformly to base year (1954) sector purchases; that is, the relative allocation over sectors conforming to that originally developed in (26) is preserved. Federal government purchases in California, on the other hand, were only partially allocated to sectors in (26) and (72), the bulk of federal purchases being in effect classified as exports from California and not distinguished from other exports in the exporting sector. In view of the importance of federal purchases as a component of final demand, it seemed desirable to attempt for the present work a more complete sector allocation of this category, even though the basis for doing so is on the whole rather nebulous. There is also basis for concluding that total federal purchases in California and its sectoral allocation have changed in important ways since the base year, and it seemed desirable to allow this change, regardless of what the future may hold, to be reflected in the projection base.

[7] This procedure, of course, disregards the component of California exports moving into foreign markets.

Accordingly, sectoral allocations have been developed not only for 1954 but also for 1958 on the basis of such independent information as could be assembled. The resulting measures are summarized in table C-6 along with projections for 1965, 1970, and 1975. Thus, 1958 serves as the base for federal expenditure projection, and the uniform projection coefficient applied to each sector preserves the 1958 sector allocation in the projections.

EMPIRICAL RESULTS

As noted, straightforward projections employing base year import coefficients would be expected to generate an increasing trade deficit for the California economy with the rest of the world. To deal with this in empirical projections, adjustments in import coefficients of net importing sectors have been introduced to force what has been called a balance in California's accounts with the rest of the world "on current account" (see Appendix A-3). The part of California gross domestic output required to support economic activity on current account (GDO component X^1) is simply projected GDO by sectors based on independently projected final demands which disregard capital growth requirements (i.e., disregarding the second term on the right of A.3.2). Three alternative sets of adjusted import coefficients, each representing extreme assumptions on changing trade patterns, have been derived on the basis of these initial projections, and modified projections, including allowance for capital growth, generated for each alternative. The trade constraints imposed are each arbitrary in an important sense. They are regarded as relevant and informative for exploring sensitivity of the state economy to different external trade patterns. But at the same time, these constraints do not rest on sufficient supporting analysis to claim that they somehow represent "realistic" alternative patterns of external trade. This failure of trade constraints to capture external trade patterns is an important reason why the projections are to be viewed with considerable caution as realistic projections of growth rates, particularly at the detailed sector level. The partial comparisons with observed experience summarized in a subsequent section provide more concrete support for this observation.

In the results presented here, initial projections of GDO component X^1 are first summarized to give a clearer indication of the mechanism generating the trade deficit and the magnitude of the gap to be closed by trade balance adjustment. Following this, results under the alternative trade-balancing adjustments are summarized. Although all projections have been generated by the more detailed 28-endogenous-sector model previously described, the main results have been aggregated by four major sectors for summarization here.[8] In these cases, comparable tables for the 28-sector classification appear in Appendix D.

Initial Projections—GDO Component X^1

The major purpose of initial projections of this component was to obtain a quantitative indication of the implied trade deficit under the assumption that base year import coefficients for net importing sectors carry over unchanged to the projection period. Directly relevant results are summarized in table 2.

[8] Consolidation of detailed sectors into major sectors was as follows: primary agriculture [1–10], agricultural processing [11–15], nonagricultural manufacturing [16–21], and other [22–28]. The numbers in brackets refer to detailed sector numbers in table B-1.

TABLE 2

IMPLIED TRADE BALANCE, INITIAL PROJECTIONS, GDO COMPONENT X[1]

Year	GDO-X[1]	Federal receipts	Federal expenditures	Exports			Imports			Trade surplus or deficit
				Net excess federal expenditures	Goods and services	Total	Competitive	Noncompetitive	Total	
	1	2	3	4	5	6	7	8	9	10
	thousand 1954 dollars									
1954	53,153,961	5,350,913	9,362,800	4,011,877	3,451,776	7,463,663	6,095,224	523,656	6,618,880	844,783
1965	91,658,985	9,782,821	11,234,886	1,452,065	5,027,580	6,479,645	10,332,982	881,395	11,214,377	−4,734,732
1970	117,295,056	12,672,310	13,803,832	1,021,522	5,889,082	6,910,604	13,120,584	1,106,626	14,227,210	−7,316,606
1975	145,706,966	15,847,526	16,368,511	520,985	7,056,257	7,577,242	16,172,258	1,351,793	17,524,051	−9,946,809
	Average annual growth rates (per cent)									
1954–1965	5.08	5.64	1.73	....	3.48	....	4.91	4.85	....	....
1965–1970	5.06	5.31	4.04	....	3.21	....	4.90	4.66	....	....
1970–1975	4.43	4.56	3.63	....	3.68	....	4.28	4.09	....	....

SOURCES:

Col. 1: Table D-1.

Cols. 2 and 8: Projections based on fixed base year coefficients in table B-2 and GDO in table D-1.

Col. 3: Table C-6.

Col. 4: Column 3 minus column 2.

Col. 5: Table D-3.

Col. 6: Column 4 plus column 5.

Col. 7: Table D-2.

Col. 9: Column 7 plus column 8.

Col. 10: Column 6 minus column 9.

The 1954 measures which appear there have been generated from 1954 "current" final demands (that is, disregarding capital formation ΔK) by the same system of relations used to obtain the projections for 1965, 1970, and 1975. Accordingly, for present purposes, the 1954 aggregates are comparable to the projected magnitudes. Mainly to be noted from these initial projections is the rapidly accumulating deficit in California's trade with the rest of the world. The characteristics of the projection scheme responsible for this growing imbalance are suggested by looking briefly at the components of external trade recognized by the projection model.

As previously noted, federal expenditures in California may be regarded as appearing on the export side of the trade balance accounts, while federal receipts from California constitute an offset on the import side. Federal receipts have been projected using fixed base year coefficients defined in Appendix 1-A and, hence, federal receipts from each sector are directly proportional to projected GDO for the corresponding sector. Federal expenditures, on the other hand, have been projected independently by procedures outlined in Appendix C. The net excess of federal expenditures over receipts appears as "net exports" and is combined with independently projected exports of goods and services to give total exports. Attention is called to the steady decline in excess federal expenditures through the projection span and, particularly, to the fairly marked decline between 1954 and 1965. Although total federal expenditures and receipts both increase steadily over the projection span, the latter is projected to grow at a faster rate than the former, thus resulting in a declining contribution from this source to the trade balance. The average annual growth rates appearing in the lower panel of the table bring this out clearly.

Imports of goods and services are the sum of competitive and noncompetitive imports. Each of these categories is projected on the basis of fixed (base year) import coefficients varying over sectors. Sector by sector (for importing sectors), imports grow in proportion to projected GDO. The average annual growth rates for the import categories in table 2 differ from those for GDO only because of the different sector weighting implicit in the computed measures.

As to the average annual growth rates, each of the items entering the export side of the accounts (goods and services exports and federal expenditures) grows at a somewhat slower rate than the items entering the import side (competitive and noncompetitive imports and federal receipts). This, of course, reflects forces operative in the projection scheme. Federal expenditures and exports of goods and services are each the result of independent projections which depend in an important sense on growth rates in United States regions other than California. In addition, agricultural products, with low expenditure elasticities of demand, are an important component of exports. Federal receipts and other imports, on the other hand, are tied much more closely to the growth rate of the domestic California economy, and products of nonagricultural manufacturing sectors dominate the demand for imports projected at base year rates per unit of GDO. The distribution of GDO-X^1 and the imports and exports implied by this component for the four major sectors mentioned are shown in table 3.[9]

[9] In the detailed 28-sector model employed in projection, competitive imports were projected at zero level for net exporting sectors and exports were projected at zero level for net (competitive) importing sectors. However, each major sector contains both net importing and net exporting sectors. Positive competitive imports and positive exports appear for each major sector, the former obtained by summing over net importing sectors and the latter by summing over net exporting sectors within the respective major sectors.

TABLE 3
INITIAL PROJECTIONS, GDO COMPONENT X^1, COMPETITIVE IMPORTS AND EXPORTS, BY MAJOR SECTORS

Major sector*	1954	1965	1970	1975	1954	1965	1970	1975
	thousand 1954 dollars				*per cent of total*			
	GDO component X^1							
Primary agriculture	2,836,216	4,299,334	5,084,937	5,950,389	5.34	4.69	4.34	4.08
Agricultural processing	4,906,875	7,643,920	9,114,129	10,709,462	9.23	8.34	7.77	7.35
Manufacturing	16,864,593	27,135,055	34,734,242	43,336,250	31.73	29.60	29.61	29.74
Other	28,546,277	52,580,677	68,362,259	85,710,867	53.70	57.37	58.28	58.82
Total†	53,153,961	91,658,985	117,295,565	145,706,966	100.00	100.00	100.00	100.00
	Competitive imports							
Primary agriculture	263,707	444,475	546,654	655,963	4.33	4.30	4.17	4.06
Agricultural processing	521,506	852,444	1,033,043	1,226,745	8.56	8.25	7.87	7.59
Manufacturing	5,245,613	8,917,112	11,385,158	14,092,966	86.06	86.30	86.77	87.14
Other	64,398	118,951	155,728	196,585	1.06	1.15	1.19	1.22
Total†	6,095,224	10,332,982	13,120,583	16,172,250	100.00	100.00	100.00	100.00
	Exports							
Primary agriculture	573,446	734,870	814,163	915,694	16.61	14.62	13.82	12.98
Agricultural processing	821,868	1,010,131	1,099,988	1,213,734	23.81	20.09	18.68	17.20
Manufacturing	1,181,121	1,963,037	2,417,395	3,052,202	34.22	39.04	41.05	43.25
Other	875,506	1,319,784	1,557,819	1,874,964	25.36	26.25	26.45	26.57
Total†	3,451,941	5,027,822	5,889,365	7,056,594	100.00	100.00	100.00	100.00

* Primary agriculture: Sectors 1-10. Agricultural processing: Sectors 1-15. Manufacturing: Sectors 16-21. Other: Sectors 22-28.
† Entries may not add to totals due to rounding.
SOURCES: Tables D-1, D-2, and D-3.

The result of the relatively more rapid rate of growth in import aggregates as compared with exports shows up in the final column of table 2 as a substantial and growing trade deficit in projection reference years 1965, 1970, and 1975. This contrasts with a trade surplus corresponding to GDO component X^1 for the base year 1954. Of course, the heavy net excess of federal expenditures over receipts is clearly responsible for the surplus position showing in the accounts for the base year. Be that as it may, the growing deficit appearing for 1965, 1970, and 1975 was regarded as "unacceptable," and the magnitudes of the deficits appearing in table 2 are the basis for the alternative trade balance adjustments incorporated in the projections presented in the next section.

Alternative Projections Under Trade Balance Constraint

Although the trade deficits emerging in the initial projections suggest that fixed base year import coefficients cannot be accepted for projection, a satisfactory basis for developing specific empirical adjustments in these coefficients and specific adjustments in export final demands leading to "more

realistic" projections is lacking.[10] The burden of closing the trade gap would be expected to fall disproportionately on different sectors. It is possible, of course, to define a large number of different adjustment schemes for imports and exports which would meet the mathematical requirements of the projection system here employed for removing the trade deficit in table 2. But many such adjustments would have little relation to reality. Clearly, the changes in California's pattern of trade with other regions which will emerge as the California economy develops are constrained by potential for development in the state. And this potential is not distributed uniformly over sectors.

Only three alternative trade constraints for closing the external trade gap are examined in this report. The first (A-I) distributes the burden of closing the gap over all importing and exporting sectors in proportion to their respective importance in trade in 1954. The second (A-II) places the entire burden on three important manufacturing net importing sectors. And the third (A-III) includes the major agricultural processing export sector, along with the importing sectors in A-II, to share in the role of closing the gap. Major differences in rate of overall growth of California economic activity would not be expected under these alternatives. The domestic (California) sectoral final demands to be met in each case are the same. What is of primary interest is the implied relative importance of different sectors under the different alternatives. Trade constraint A-I is fairly neutral in this respect. There are, of course, smaller imports by importing sectors and larger exports from exporting sectors than would be the case without trade balance constraint, but percentage distributions of imports over importing sectors and exports over exporting sectors are similar to what they would be without trade adjustment. A-II and A-III are less neutral in their effects. This shows up under A-II as a very marked decline in the manufacturing sector's share in competitive imports. Under A-III, on the other hand, manufacturing imports are somewhat larger absolutely and relatively than in A-II, compensated by a substantial increase in exports of processed agricultural products. Of course, the differential sector incidence of the trade-balancing burden shows up also in the sectoral composition of the state's aggregate output. Manufacturing GDO grows relative to primary agriculture and agricultural processing under each alternative due to growth in extraneously projected final demand for products of the former sector relative to the latter two. Trade constraints A-II and A-III exhibit the expected effects. The relative importance of manufacturing GDO is highest under A-II. And, in view of the external trade demands on agricultural processing under A-III, this sector's share in state GDO, although declining in future time, is highest under this alternative. These major characteristics of the alternative projections and other points related to overall balance are elaborated in more detail in the summary tables and supporting exposition later in this section.

Analyses of regional location of economic activity at the level of sector detail adopted in this study are not available in a form which gives very reliable guides for imposing "realistic" empirical adjustments in projected trade patterns. Indeed, historical measures of interstate trade flows, an essential ingredient of any systematic analysis, are lacking; and construction of such measures, even at a highly aggregative level, from such data as are available would

[10] Import coefficients here refer to competitive imports. Competitive imports represent imports of goods produced in the California economy; noncompetitive imports refer to goods not produced in the state. Accordingly, it is assumed that California's potential for achieving trade balance through reduction in imports lies entirely in competitive imports.

represent a substantial undertaking. A recent comprehensive study focusing on regional development represents an important contribution in its attempt to describe and interpret in a systematic way observed regional shifts in economic activity (Perloff *et al.*, 30). Following earlier work on the economics of location, the combined role of the familiar major locatonal factors is recognized in the interpretation of historical experience. The important factors may be classified as: (1) accessibility to resource supplies, due either to natural endowment within the region or to more convenient accessibility to foreign supplies of imported resource materials; (2) accessibility to markets for final products, either within the region or in nearby external regions; and (3) the complex of intersectoral relationships which, from the point of view of an individual sector, improves access to supplies of intermediate inputs or access to markets for intermediate outputs, usually referred to as "agglomeration effects." The relevance of such factors is plausible enough from a priori considerations and also finds support in historical observation. However, empirical implementation which gives appropriate weights to such factors in projection of sectoral economic activity in the California economy is another matter. Detailed empirical industry studies should be helpful in forming conjectures about the future which would more fully recognize the factors listed.

The three alternative trade constraints imposed in this study have each been determined on the basis of the trade deficit appearing in table 2. Each constraint imposes an extreme (though not the most extreme) form of trade pattern on the California economy. The factors bearing on potential for regional development noted above enter in only a general way into the particular constraints selected. The constraints imposed are to an important extent hypothetical. In view of this, interpretation of results should avoid focusing on the levels of projected magnitudes as such. The more meaningful analysis in this instance comes from comparison of results generated under different constraints. The alternatives adopted are made explicit below.

The competitive import breakdown by detailed sectors (table D-8) for 1954 shows that miscellaneous manufacturing [21], fabricated metals and machinery [18], primary metals [20], and chemicals and fertilizers [16] are the four leading sectors, together accounting for slightly less than 87 per cent of the total.[11] One mechanism for reducing the projected trade deficit is through a reduction in imports of products of importing sectors without a compensating increase in exports from exporting sectors. The relative importance of the above four sectors in base year imports suggests that the extent to which the projected California trade deficit is to be met through a relative decline in imports depends in an important way upon the possibility of a growing self-sufficiency of these important sectors within the state economy, and the potential for self-sufficiency in turn depends upon the interaction of locational factors noted above. More useful judgments regarding the extent to which such factors limit the degree of self-sufficiency could be formed on the basis of detailed industry studies. But there is basis for the presumption that accessibility to markets and agglomeration effects command considerable weight in assessing potential for three of these sectors—chemicals and fertilizers [16], machinery [18], and "other" manufacturing [21] (Perloff *et al.*, 30). The projected growth in California population implies a continuing and substantial growth in the regional market. An increasing degree of self-sufficiency within

[11] Numbers in brackets following sector names are sector numbers (see page 5).

these sectors would not seem an unrealistic expectation. Primary metals [20] would also be expected to respond to a growing market for its output. However, accessibility of resource supplies must remain a very important factor in the location of important industries in this sector.

On the export side of the base year accounts (table D-9), the secondary agricultural sector—fruit and vegetable processing [14]—was most important, followed by the manufacturing sectors, aircraft and parts [19], and petroleum [17]. Primary agricultural sectors figure more prominently in the export picture as contributors to total exports, with significant contributions from cotton [5], vegetables [6], and citrus fruits [8]. But, even in 1954, it appears that the aggregate contribution of primary agricultural sectors to exports was more than matched by that of the service sectors [24, 25, and 26]. California's advantage in the particular primary agricultural sectors noted is related to its climatic endowment, and the importance of fruit and vegetable processing is related to the accessibility of raw material supplies. The importance of petroleum is also related to domestic oil supplies and accessibility to foreign supplies.

The aircraft industry, on the other hand, depends far less on a resource materials base. Growth of the aircraft industry nationally has been heavily supported by federal government expenditures during World War II and in the postwar period. The California industry has benefited from a liberal share of this activity. An endowment of space for aircraft testing and the availability of a labor force, particularly in the postwar period, has contributed to California's establishing and retaining a strong position vis-à-vis other regions in this sector. The existence of productive plants and the growth of related industry, notably electronics, helps to ensure a strong place for aircraft (and missiles) in the projected California economy. Nevertheless, the quantitative importance to be assigned to this sector in California's projected economic activity is inevitably subject to fairly wide margins of error. In the long run, labor is ultimately a mobile resource, and other United States regions are endowed with space for testing. Furthermore, related supporting industries have grown in other regions also and, from the resource point of view, restrictions on further growth are no more stringent than in California. In the present work, projected activity for this sector is closely related to projected federal government expenditures in California (see Appendix C), and the procedure for projecting federal expenditures cannot be claimed to reeognize at all adequately the complex process by which allocation of federal expenditures over states is determined. The result has been a projected rate of growth for this sector somewhat slower than for the California economy generally.

Full projections have been generated for only three specific alternative trade-balancing constraints. Implementation of the constraint in each case involves adjustment of competitive import coefficients, adjustment of the exogenously projected vector of exports, or a combination of both. The quantitative deficits on which the adjustments are based are those generated by the initial projections of GDO component X^1 and summarized in table 2. In the discussion which follows and in the tables summarizing empirical results, the three alternative trade constraints are designated, respectively, A-I, A-II, and A-III.

Under A-I, closing the trade gap is accomplished by simultaneously increasing exports from exporting sectors and decreasing imports of products of importing sectors. Furthermore, the burden of closing the gap is distributed over sectors in proportion to imports

and exports generated for corresponding sectors in the initial GDO-X^1 projections. However, proportional allocation here refers to allocation before taking account of indirect supporting output requirements—that is, proportionality was preserved in the initial vectors of export increments (ΔY_e) and import decrements (ΔX_m) of Appendix A-3. Indirect output requirements, of course, vary over sectors. In addition, the condition has been imposed that the entire increment of supporting indirect output is to be met from domestic production; i.e., no part of supporting incremental output required from other sectors is to be imported. These conditions lead to distortion in trade patterns so that the relative distribution of imports and exports over sectors need not correspond closely to that resulting from the initial projections.

Clearly, this equal proportional basis for adjustment cannot be regarded as particularly realistic since it would be surprising indeed if the growing California economy were to distribute the burden of balancing trade over sectors in anything closely approximating this pattern. In this sense, the pattern imposed is extreme. However, it has been adopted not primarily on grounds of realism but more as a basis for comparison with other more specific allocations of the trade-balancing burden (allocations which are also extreme but in the direction of being too specific).

A-II reflects one such more specific assumption. In this case the trade gap is closed by direct constraints on imports of products of three major importing sectors—miscellaneous manufacturing [21], fabricated metals and machinery [18], and chemicals and fertilizers [16]. Imports of the remaining importing sector in the manufacturing group (primary metals) have not been constrained directly mainly because of the presumed importance of accessibility to resource materials for growth of this sector. Under the conditions imposed, significant growth of this sector is assured even in the absence of direct import constraints due to the dependence of other sectors in this group, particularly fabricated metals and machinery [18] on inputs from primary metals. As in the case of A-I, the primary burden of maintaining trade balance in A-II is distributed over sectors in proportion to imports generated in the initial projections. Import coefficients of other importing sectors are altered in the process because of the requirement that the entire increment of supporting (indirect) output must be met from domestic production. Exporting sectors also contribute supporting output, but net exports from these sectors are assumed to remain as initially (and independently) projected for each projection reference year. Clearly this alternative places too much of the trade-balancing burden on the three sectors selected. However, if growing self-sufficiency is to figure prominently in California economic development as a trade-balancing mechanism, these three manufacturing sectors (and particularly machinery and other manufacturing) must presumably undergo significant change in this direction. From this point of view, it seemed instructive to examine the implications for California's sectoral growth under this extreme.

The assumption underlying A-III differs from A-II only in that the burden of balancing trade is extended to include, in addition to the three importing sectors of A-II, a single exporting sector—fruit and vegetable processing [14]. This sector was the most important net exporting sector in the base year. The other two leading exporting sectors, aircraft [19] and petroleum [17], have not been included to share the export load in this constraint. It has been noted that growth of the aircraft

sector depends heavily on federal expenditures in the projections generated. For purposes of the comparisons here sought, further manipulation of federal expenditures in California was not regarded as an "acceptable" device for achieving trade balance. The reluctance to place additional export demands on the petroleum sector stems from the likelihood that the independently projected exports for this sector are perhaps quite generous in the initial projections—that is, the initial export projection based on an expenditure elasticity of 2.2 (see table C-4) probably projects too large a share of the market in other regions for California, particularly in view of the substantial growth projected for the within-state market for the products of this sector. Another reason for restricting the export adjustment to canning, preserving, and freezing [14] was to assign more weight to the state's agriculture in the trade-balancing adjustment. Singling out this sector remains, of course, a highly specific assumption. On the other hand, the effects on primary agricultural sectors, though not direct, are nevertheless significant because of the indirect output required to support fruit and vegetable processing.

The trade balance adjustments were implemented through appropriate adjustments in the import coefficients of net importing sectors and the export component of final demand of relevant net exporting sectors. Adjusted import coefficients are presented in tables D-4 and D-5 and the adjusted exports in table D-6 (Appendix D). Alternative A-I results in a significant reduction in import coefficients for each net importing sector in 1965 as compared with 1954 and a further decline in each subsequent projection reference year, 1970 and 1975. On the export side, A-I assigns to each net exporting sector a significant and increasing increment in exports over the projection span. This results from the particular adjustment mechanism adopted in A-I and the growing trade deficit to be removed (table 2).

The more selective adjustments under alternatives A-II and A-III are also apparent in these comparisons. Although import coefficients of all net importing sectors are reduced in each of these alternatives, the significant reductions appear in chemicals [16], machinery [18], and other manufacturing [21] on which the import constraints were directly imposed, and in primary metals [20], the sector most significantly affected by the imposed condition that indirect supporting output be met entirely from domestic production. There are no adjustments in exports under A-II and only canning, preserving, and freezing [14] exports are adjusted under A-III. Of course, the adjustments imposed on sector 14 in the latter case are rather substantial in relative and absolute terms, resulting in projected exports for this sector by 1975 more than twice the level initially projected independently of trade balance adjustment.

All other final demand components remain as initially projected—that is, remain unchanged from those underlying the initial projections of X^1 in the previous section. The remaining difference between the present and the initial projections is that additional sector outputs required to maintain (expansion) capital stocks are generated by the projection system in the present case (see pages 9–10, and Appendix A-1).

The effects of including growth in capital stock in projection under trade balance constraint are indicated by a comparison of results summarized in tables 4 and 5 with those in table 3. Again, results have been aggregated to four major sectors, with corresponding tables for the 28 detailed sectors rele-

TABLE 4

FINAL PROJECTIONS, GDO, BY MAJOR SECTORS

Major sector	1954	1965	1970	1975	1954	1965	1970	1975
	thousand 1954 dollars				*per cent of total*			
	Projection A-I							
Primary agriculture	2,915,178	5,035,373	6,215,289	7,467,630	5.11	4.56	4.28	4.18
Agricultural processing	4,949,000	8,521,432	10,467,742	12,530,440	8.67	7.71	7.21	7.02
Manufacturing	17,779,159	36,525,960	48,848,611	60,471,970	31.16	33.04	33.63	33.86
Other	31,419,245	60,454,378	79,733,569	98,107,288	55.06	54.69	54.89	54.94
Total*	57,062,582	110,537,143	145,265,211	178,577,328	100.00	100.00	100.00	100.00
	Projection A-II							
Primary agriculture	2,915,178	4,348,213	5,156,535	6,032,520	5.11	3.99	3.61	3.45
Agricultural processing	4,949,000	7,698,913	9,195,091	10,801,604	8.67	7.07	6.44	6.17
Manufacturing	17,779,159	37,573,400	50,436,948	62,427,611	31.16	34.51	35.33	35.66
Other	31,419,245	59,269,137	77,991,089	95,825,782	55.06	54.43	54.62	54.73
Total*	57,062,582	108,889,653	142,779,663	175,087,517	100.00	100.00	100.00	100.00
	Projection A-III							
Primary agriculture	2,915,178	4,672,168	5,658,421	6,715,521	5.11	4.25	3.92	3.79
Agricultural processing	4,949,000	8,608,734	10,605,827	12,722,375	8.67	7.84	7.35	7.18
Manufacturing	17,779,159	37,070,316	49,690,113	61,501,325	31.16	33.74	34.44	34.70
Other	31,419,245	59,504,472	78,336,699	96,278,333	55.06	54.17	54.29	54.33
Total*	57,062,582	109,855,690	144,291,060	177,217,454	100.00	100.00	100.00	100.00

* Entries may not add to totals due to rounding.
SOURCE: Table D-7.

gated to Appendix D. The measures appearing for the base year 1954 in tables 4 and 5 are derived directly from table B-1 and include private capital formation, which is excluded from corresponding measures in table 3. The magnitudes of GDO by major sectors in table 4 are, of course, larger than corresponding measures in table 3 because of the combined effect of trade balance adjustment and capital formation. Both of these forces also help determine the percentage distribution of GDO over major sectors in table 4, particularly for the projection reference years 1965, 1970, and 1975. The differences in percentage distribution of GDO which show up for 1954 are more directly the result of capital formation alone since there is no tampering with the trade balance mechanism reflected in these results. Thus, the inclusion of capital formation largely explains the higher percentage contribution of the residual other sector in 1954 and the offsetting decline in percentage contribution of primary agriculture and agricultural processing in table 4, as compared with table 3. The relatively higher level of activity in the construction sector [28], which is included in the other category, is largely responsible for the different pattern of relative importance. The manufacturing sector holds its own because it, too, is an important producer of capital goods.

The effects associated more specifically with different trade-balancing assumptions are brought into sharper focus by comparing the results of different alternatives in tables 4 and 5. Of primary interest is the implied relative importance

TABLE 5

FINAL PROJECTIONS, COMPETITIVE IMPORTS AND EXPORTS, BY MAJOR SECTORS

Major sector	1954	1965	1970	1975	1954	1965	1970	1975
	thousand 1954 dollars				*per cent of total*			
	Projection A-I							
Competitive Imports								
Primary agriculture	276,176	271,164	283,585	302,130	4.20	3.83	3.57	3.47
Agricultural processing	524,129	560,589	482,279	613,813	7.97	7.91	7.34	7.05
Manufacturing	5,712,312	6,174,984	6,972,794	7,682,056	86.82	87.13	87.88	88.17
Other	66,708	80,235	96,082	114,584	1.01	1.13	1.21	1.32
Total*	6,579,325	7,086,973	7,934,740	8,712,582	100.00	100.00	100.00	100.00
Exports								
Primary agriculture	573,446	1,043,562	1,292,892	1,567,562	16.61	15.16	14.74	14.28
Agricultural processing	821,868	1,452,403	1,785,876	2,147,685	23.81	21.09	20.36	19.56
Manufacturing	1,181,121	2,598,672	3,403,157	4,394,480	34.22	37.74	38.80	40.02
Other	875,341	1,790,971	2,288,548	2,869,972	25.36	26.01	26.09	26.14
Total*	3,451,776	6,885,608	8,770,473	10,979,699	100.00	100.00	100.00	100.00
	Projection A-II							
Competitive Imports								
Primary agriculture	276,176	432,560	527,989	629,404	4.20	8.98	11.66	14.49
Agricultural processing	524,129	841,774	1,016,012	1,201,295	7.97	17.47	22.44	27.66
Manufacturing	5,712,312	3,431,984	2,837,117	2,331,064	86.82	71.21	62.66	53.67
Other	66,708	112,981	146,349	181,839	1.01	2.34	3.23	4.19
Total*	6,579,325	4,819,302	4,527,466	4,343,603	100.00	100.00	100.00	100.00
Exports								
Primary agriculture	573,446	734,870	814,163	915,694	16.61	14.62	13.82	12.98
Agricultural processing	821,868	1,010,131	1,099,988	1,213,734	23.81	20.09	18.68	17.20
Manufacturing	1,181,121	1,963,037	2,417,395	3,052,202	34.22	39.04	41.05	43.25
Other	875,341	1,319,784	1,557,819	1,874,964	25.36	26.25	26.45	26.57
Total*	3,451,776	5,027,822	5,889,365	7,056,594	100.00	100.00	100.00	100.00
	Projection A-III							
Competitive Imports								
Primary agriculture	276,176	433,594	529,618	631,503	4.20	7.55	8.97	10.34
Agricultural processing	524,129	843,371	1,018,502	1,204,736	7.97	14.69	17.26	19.73
Manufacturing	5,712,312	4,348,798	4,206,180	4,086,574	86.82	75.76	71.26	66.92
Other	66,708	114,265	148,219	184,295	1.01	1.99	2.51	3.02
Total*	6,579,325	5,740,028	5,902,519	6,107,108	100.00	100.00	100.00	100.00
Exports								
Primary agriculture	573,446	734,870	814,163	915,694	16.61	12.65	11.47	10.52
Agricultural processing	821,868	1,791,173	2,311,250	2,863,069	23.81	30.84	32.55	32.89
Manufacturing	1,181,121	1,963,037	2,417,395	3,052,202	34.22	33.79	34.04	35.06
Other	875,341	1,319,784	1,557,819	1,874,964	25.36	22.72	21.94	21.54
Total*	3,451,776	5,808,864	7,100,627	8,705,929	100.00	100.00	100.00	100.00

* Entries may not add to totals due to rounding.
SOURCES: Tables D-8 and D-9.

TABLE 6

IMPLIED TRADE BALANCE, FINAL PROJECTIONS

Year	GDO	Federal receipts	Federal expenditures	Exports			Imports			Trade surplus or deficit
				Net excess federal expenditures	Goods and services	Total	Competitive	Noncompetitive	Total	
	1	2	3	4	5	6	7	8	9	10
	thousand 1954 dollars									
	Projection A-I									
1954	357,062,582	5,479,258	9,362,800	3,883,542	3,451,776	7,335,318	6,579,325	579,515	7,158,840	176,478
1965	410,537,143	10,480,155	11,234,886	754,731	6,885,608	7,640,339	7,086,073	1,098,872	8,185,845	−545,506
1970	545,265,211	13,706,982	13,693,832	− 13,150	8,770,473	8,757,323	7,934,740	1,432,684	9,367,424	−610,101
1975	678,577,328	17,075,278	16,368,511	−706,767	10,979,699	10,272,932	8,712,582	1,758,466	10,471,048	−198,116
	Projection A-II									
1954	357,062,582	5,479,258	9,362,800	3,883,542	3,451,776	7,335,318	6,579,325	579,515	7,158,840	176,478
1965	408,889,653	10,465,143	11,234,886	769,743	5,027,822	5,797,565	4,819,302	1,000,412	5,819,714	− 22,149
1970	542,779,663	13,585,607	13,693,832	8,225	5,889,365	5,897,590	4,527,466	1,283,176	5,810,642	86,948
1975	675,087,517	17,037,817	16,368,511	−669,306	7,056,594	6,387,288	4,343,603	1,561,158	5,904,761	482,527
	Projection A-III									
1954	357,062,582	5,479,258	9,362,800	3,883,542	3,451,776	7,335,318	6,579,325	579,515	7,158,840	176,478
1965	409,855,690	10,486,225	11,234,886	748,661	5,808,864	6,557,525	5,740,028	1,005,695	6,745,723	−881,440
1970	544,291,060	13,719,328	13,693,832	− 25,496	7,100,627	7,075,131	5,902,519	1,292,700	7,195,219	−120,088
1975	677,217,454	17,087,595	16,368,511	−719,084	8,705,929	7,986,845	6,107,108	1,573,630	7,680,738	306,107

SOURCES:

Col. 1: Table D-7.

Cols. 2 and 8: Projections based on fixed base year coefficients in table B-2 and GDO in table D-7.

Col. 3: Table C-6.

Col. 4: Column 3 minus column 2.

Col. 5: Table D-9.

Col. 6: Column 4 plus column 5.

Col. 7: Table D-8.

Col. 9: Column 7 plus column 8.

Col. 10: Column 6 minus column 9.

of major sectors under the different alternatives. Considering first competitive imports and exports of table 5, it will be recalled that the trade constraint imposed under A-I called for declining import coefficients for all importing sectors and upward adjustments in exports from all exporting sectors for successive reference points in the projection span. This leads to competitive imports smaller for each importing sector and exports larger for each exporting sector than would be the case if no trade balance adjustment were made. However, since the burden is spread over all importing and exporting sectors, the percentage distribution of imports over importing sectors and of exports over exporting sectors is not materially different under A-I from what it would be without trade balance adjustment.

On the other hand, the trade constraints imposed under A-II and A-III are less neutral in their effects on relative importance of sectors. A-II places the direct burden of balancing trade on import reduction of products of three importing manufacturing sectors. As a consequence, the major manufacturing sector in table 5 shows an absolute decline in competitive imports (in 1954 dollars) over the projection span, while other major sectors show significant increases. This shows up even more markedly in the changing percentage distribution of competitive imports. The relative importance of the manufacturing sector in accounting for imports falls off drastically through the projection span with, of course, compensating gains in relative importance of other sectors. Under A-III the burden of balancing trade is shared by the manufacturing sector, through a decline in imports, and the agricultural processing sector, through an expansion in exports. Accordingly competitive imports decline somewhat less for the manufacturing sector than under A-II, compensated by a substantial increase in exports from the agricultural processing sector. More detailed sector effects are revealed by the corresponding detailed sector tables in Appendix D.

The effect of alternative trade balance constraints on the composition of California's gross domestic output is suggested by the summary measures in table 4. A growing relative contribution of the manufacturing sector to state aggregate GDO is apparent under each alternative as opposed to a declining percentage for the primary and secondary agricultural sectors and a fairly stable percentage for the residual other category. The heavier demand placed on the manufacturing sector to replace imports with domestic output under A-II and A-III results in a larger relative growth of this sector under these alternatives than under A-I. Similarly, the stronger relative position enjoyed by the agricultural processing sector under A-III is a result of the heavier export demands imposed on canning, preserving, and freezing [14] under this alternative. Primary agriculture also holds up stronger under A-III than A-II because of the heavier indirect output requirements from this sector to support the higher level of agricultural processing output under A-III.

Table 6 summarizes the projected trade balance under A-I, A-II, and A-III analogous to that summarized for the initial projections in table 2. Aggregate GDO for corresponding years runs higher in each of the final alternatives than in the initial projections of X^1 because of the inclusion of capital formation in the former and also because of the additional output required to replace imports and augment exports. This in itself leads to a significant increase in federal receipts from the California economy since the fixed federal receipts coefficients employed are tied directly to sectoral GDO. Projected

TABLE 7

IMPLIED OVERALL BALANCE, FINAL PROJECTIONS

Year	Trade surplus or deficit	State and local government			Households			Total surplus	Implied net private capital formation	Overall surplus or deficit
		Receipts	Expenditures	Surplus	Income	Expenditures	Savings			
	1	2	3	4	5	6	7	8	9	10
	thousand 1954 dollars									
	Projection A-I									
1954	176,478	3,963,451	3,846,830	116,621	29,789,278	27,299,175	2,490,103	2,783,202	2,430,246*	352,956
1965	−545,506	7,279,527	7,131,469	148,058	53,982,472	51,208,582	2,773,890	2,376,442	6,531,754	−4,155,312
1970	−610,101	9,476,211	9,277,428	198,783	70,400,144	66,595,158	3,804,986	3,393,668	9,375,819	−5,982,151
1975	−198,116	11,815,475	11,615,785	199,690	86,532,680	83,400,667	3,132,013	3,133,587	9,733,003	−6,599,416
	Projection A-II									
1954	176,478	3,963,451	3,846,830	116,621	29,789,278	27,299,175	2,490,103	2,783,202	2,430,246*	352,956
1965	− 22,149	77,197,428	7,131,469	65,959	53,328,756	51,208,582	2,120,174	2,163,984	6,287,818	−4,123,834
1970	86,948	9,350,132	9,277,428	72,704	69,411,248	66,595,158	2,816,090	2,975,742	9,093,966	−6,118,224
1975	482,527	11,644,507	11,615,785	28,722	85,140,488	83,400,667	1,739,821	2,251,070	9,438,089	−7,187,019
	Projection A-III									
1954	176,478	3,963,451	3,846,830	116,621	29,789,278	27,299,175	2,490,103	2,783,202	2,430,246*	352,956
1965	−188,440	7,221,409	7,131,469	89,940	53,626,670	51,208,582	2,418,088	2,319,588	6,350,057	−4,030,409
1970	−120,088	9,387,765	9,277,428	110,337	69,876,839	66,595,158	3,281,681	3,271,930	9,168,784	−5,896,854
1975	306,107	11,696,869	11,615,785	80,084	85,799,262	83,400,667	2,398,595	2,784,785	9,519,313	−6,734,527

* Estimated net private capital formation for 1954 (from table B-1), including net inventory increase of 67,354.

SOURCES:

Col. 1: From column 10, table 6.

Cols. 2 and 5: Projection based on fixed base year coefficients in tables B-2 and B-3 and GDO in table D-7.

Col. 3: Table C-5.

Col. 4: Column 2 minus column 3.

Col. 6: Table C-3.

Col. 7: Column 5 minus column 6.

Col. 8: Sum of columns 1, 4, and 7.

Col. 9: Implied net increments in expansion capital goods (from table D-10).

Col. 10: Column 8 minus column 9.

federal expenditures were not modified in the trade balance constraints imposed, which results in an actual excess of federal receipts over expenditures by the year 1975 under each of the alternatives. Furthermore, although federal expenditures exceed federal receipts in the three earlier years listed, they do converge very rapidly between 1954 and 1970. This means that, under the federal expenditure projections adopted in the present study, the contribution of the federal government sector to the export side of the California accounts almost disappears by 1970 and actually appears as a growing import item from then on to 1975. Some degree of convergence in these items would seem realistic in projections for California. But the reader should be reminded that the rate of convergence in the present case is very much influenced by the slow rate of growth exogenously projected for federal government expenditures.

The effects of the trade balance constraints are clearly evident in the behavior of goods and services imports and exports over the projection span. By the nature of the trade constraints imposed, levels of imports and levels of exports are lowest under A-II and highest under A-I. The net results on balance of trade, taking into account the shift from a surplus to deficit position in the federal expenditure-receipts account, is shown in column 10. The estimated surplus in balance of trade of just over 176 million applies for the base year under each alternative. Proceeding into the projection period, a deficit of just over one-half billion appears for 1965 under A-I, increasing slightly by 1970, and falling off sharply by 1975. For A-III a somewhat smaller deficit appears in 1965, declining to a still smaller deficit by 1970 and emerging as a surplus of over 300 million by 1975. Under A-II, a small deficit appears in 1965, followed by sharply growing surpluses in 1970 and 1975 reaching the level of just under 500 million in the latter year. As has been stated, these particular quantitative measures of the trade balance grow out of the specific constraints imposed and, in any event, cannot be interpreted as predictions. That their behavior over time appears more acceptable than the large and continually growing deficit generated by the initial projections of X^1 is merely the result of a projection scheme constrained to generate this closer conformity to balanced accounts.[12]

While the trade balance constraints imposed achieve a somewhat closer approximation to trade balance over the projection span, an overall deficit in California's accounts vis-à-vis the rest of the world persists. This is shown by the summary measures in table 7, where the projected deficit appears in column 10. This deficit is the result of the failure of total state "savings" to match the capital growth required to maintain base year capital stock-GDO ratios. Total state savings in this case consist mainly of household savings, but the latter have been adjusted to include the small surpluses in each year on state and local government accounts and to include (exclude) trade surpluses (deficits). On this basis, the California economy shows a small surplus in its overall accounts in the base year 1954. But a sizable and growing deficit appears under each projection alternative, be-

[12] It is apparent from the results that the trade-balancing adjustments made are not precise. The trade deficit on current account is used as a basis for adjusting import *coefficients* and *levels* of export final demands. When the system is extended to include capital growth, the new lower import coefficients apply to the full GDO of importing sectors, but there is no mechanism generating the additional counterpart adjustment in export levels. This procedure would not be expected to result in trade balance when capital growth is included. Neither can it be asserted strictly that the adjustment involves current accounts only. The greater relatively is the dependence on reduced imports of products of importing sectors for balancing trade, the greater the prospect of generating a surplus when capital growth is incorporated.

ginning at around 4.0 billion for 1965 and reaching 6.5 to 7.0 billion by 1975.

A deficit in California's total accounts with the rest of the world is not necessarily unrealistic. A deficit of some magnitude could be plausibly interpreted as indicating a dependence of the growing California economy on borrowing from other regions to support capital growth; i.e., investment of savings from other regions in the California economy.[13] However, the magnitude of the deficit and its continuing increase over the projection span are suspect and call for some examination of the mechanism generating such results.

The implied average annual growth rates summarized in table 8 help to see what is happening in the projections. Of particular relevance to the growing overall deficit are the projected growth rates for household income and expenditure. Aggregate household saving (household income less household expenditure) is the dominant component of aggregate state savings. Accordingly, the growing overall deficit in the present projections is primarily a result of failure of household savings to grow at a rate sufficient to keep pace with growing capital requirements. This is apparent from inspection of projected savings levels in table 7. Clearly, the savings-income ratio for the aggregate of households falls off sharply in the projection period as compared with the base year. Another manifestation of this is the slower rate of growth projected for total household income than for total household expenditure (table 8), particularly in the period 1954–1965 and 1970–1975. Closer inspection reveals that the drag on rate of growth of total household income results from the relatively slow growth in household incomes from exogenous (final demand) sectors, particularly during the 1954–1965 period. Had total household income increased at the same rate as shown for its endogenous component, a savings-income ratio more nearly approximating that of the base year would have been preserved in the projection period.

The most important exogenous sectors in respect to direct payments to households are the government sectors. Expenditures of these sectors were projected independently and fixed base year household income coefficients (z_{sh} and z_{fh}, table B-2) were employed in deriving the exogenous component of aggregate household income in table 7. The slower rate of growth projected for federal government expenditures in California is an important factor explaining the slower rate of growth in the exogenous component of household income in table 8. Household coefficients in the government sectors reflect wage and salary payments to government employees. To assume these coefficients fixed is equivalent to assuming that wages and salaries per employee remain stable during the projection period in terms of 1954 dollars and that the rate of growth in number of employees corresponds to the rate of growth of total expenditures, or a fortuitous compensating variation in these two factors which would maintain a stable relationship in the aggregate between employee compensation and total government expenditures. Adjusted household coefficients for government sectors which might be regarded as representing other, perhaps more plausible, assumptions have not been developed in the present study. It is only noted that suitable adjustment could affect the implied domestic (i.e., within state) balance between savings and growth in capital stock. However, an overall deficit would be expected to remain, implying an inflow of savings from other regions to help support California's economic growth.

[13] Savings brought into the state by in-migrants show up in these accounts also as borrowing from other regions.

TABLE 8

IMPLIED AVERAGE ANNUAL GROWTH RATES

Year	GDO	Federal receipts	Federal expenditures	Exports	Imports		
				Goods and services	Competitive	Noncompetitive	Total
	per cent						
	Projection A-I						
1954–1965	6.20	6.07	1.74	6.48	0.68	6.81	1.18
1965–1970	5.82	5.52	4.04	4.96	2 29	5.46	2.66
1970–1975	4.22	4.49	3.63	4.60	1.89	4.08	2.18
	Projection A-II						
1954–1965	6.05	6.06	*	3.48	−2.79	5.67	−2.00
1965–1970	5.57	5.51	....	3.21	−1.24	5.02	−0.26
1970–1975	4.16	4.48	....	3.68	−0.83	3.84	0.01
	Projection A-III						
1954–1965	6.14	6.08	....	4.85	−1.23	5.73	−0.63
1965–1970	5.60	5.52	....	4.10	0.56	5.07	1.15
1970–1975	4 20	4.49	....	4.16	0.68	3.87	1.18

Year	State and local government		Household income			Household expenditures	Household savings
	Receipts	Expenditures	Endogenous	Exogenous	Total		
	per cent						
	Projection A-I						
1954–1965	5.69	5.77	6.06	3.10	5.56	5.89	1.09
1965–1970	5.42	5.40	5.59	4.65	5.45	5.39	6.50
1970–1975	4.51	4.60	4.23	4.08	4.21	4.60	−3.73
	Projection A-II						
1954–1965	5.58	....	5.92	....	5.44	....	−1.32
1965–1970	5.37	....	5.54	....	5.41	....	5.82
1970–1975	4.49	....	4.18	....	4.17	....	−8.96
	Projection A-III						
1954–1965	5.61	....	5.99	....	5.50	....	−0.15
1965–1970	5.39	....	5.57	....	5.44	....	6.27
1970–1975	4.49	....	4.21	....	4.19	....	−5.94

* Blanks indicate same as under A-I.
SOURCE: Calculated from corresponding entries in tables 6 and 7.

Implied Water Requirements

It is of some interest to see what our projections imply with respect to total water input required to support growth under the alternative trade constraints imposed. For this purpose, sectoral water input coefficients developed by Zusman and Hoch (72), measuring applied water requirements in acre-feet per $1,000 sector GDO in the base year, are used along with an alternative set of adjusted coefficients derived by the present author.

Evidence summarized in a subsequent section suggests that primary agricultural production is overprojected under each alternative, implying also overprojection of aggregate water requirements. However, the main interest of this section lies in the differences in implied water requirements arising solely from differences in assumed patterns of external trade. Given the importance of applied water as an input in agricultural production, differences in aggregate water requirements associated with different external trade patterns depend essentially on how demanding these trade patterns are on the agricultural sectors. Of the trade constraints adopted, A-I is most demanding on agriculture, A-III is next, and A-II is least. Implied water requirements follow the same order from highest to lowest. The differences are substantial. Comparing the extremes, represented by A-I and A-II, the former implies water requirements more than 3 million acre-feet larger than the latter in 1965, and this differential increases to more than 6 million acre-feet by 1975. The implications of these projections for water resource development are indeed sensitive to the specific external trade patterns assumed. Summaries of relevant results and a more detailed account of procedures underlying aggregate water requirement projections and related measures are the subject of the present section.

The unadjusted (base year) and adjusted (for each projection reference year) water coefficients are presented in table 9. Procedures used in deriving the unadjusted coefficients are described in Zusman and Hoch (72), and the adjustment procedure underlying the adjusted coefficients is outlined in Appendix C (table C-7).[14] Direct water input coefficients were not developed for certain of the endogenous sectors. Zeros appear for these sectors in table 9. Water requirements of these sectors are in the aggregate embodied in the exogenous (household) water coefficient, which is measured in acre-feet per $1,000 household income. This procedure, adopted initially by Zusman and Hoch, has been carried through to the adjusted coefficients. The projected aggregate water requirements and other measures considered below would not have been materially different had separate water coefficients been available for these sectors.

Water coefficients have been adjusted for only the primary agricultural sectors 4 through 9, and for each of these sectors the adjusted coefficient declines for successive projection reference years. This is simply a reflection of increasing yields per acre in each sector, increasing yields being the sole basis for adjustments in water coefficients. And since the adjustments reflect only

[14] Only the coefficients for sectors 4 through 9 are adjusted, and for each of these sectors the adjustment is straightforward based on projected yield indexes from (18). The adjustment assumes that water requirements per acre remain fixed and the full "expected" trend in yield is reflected in changed water requirements per unit product. To the extent that projected yield increases are due to shifts from nonirrigated to irrigated production, this procedure results in too large a downward adjustment in the water coefficient. Of the sectors here considered, sector 4 is most vulnerable to overadjustment on this account.

TABLE 9

WATER INPUT COEFFICIENTS: UNADJUSTED (BASE YEAR) AND ADJUSTED FOR PRODUCTIVITY (YIELD) TREND

Sector	Unadjusted	Adjusted		
	1954	1965	1970	1975
Endogenous*				
1.....	0	0	0	0
2.....	0	0	0	0
3.....	0	0	0	0
4.....	23.314184	20.956570	19.964192	19.016463
5.....	8.411101	7.306377	6.855013	6.430505
6.....	3.164220	2.726366	2.547681	2.380903
7.....	7.708929	7.219450	7.007480	6.801596
8.....	3.226062	2.993192	2.892810	2.795790
9.....	46.678495	42.512291	40.745893	39.051698
10.....	3.937195	3.937195	3.937195	3.937195
11.....	0.009977	0.009977	0.009977	0.009977
12.....	0.023125	0.023125	0.023125	0.023125
13.....	0.029276	0.029276	0.029276	0.029276
14.....	0.035742	0.035742	0.035742	0.035742
15.....	0.029916	0.029916	0.029916	0.029916
16.....	0.061052	0.061052	0.061052	0.061052
17.....	0.028370	0.028370	0.028370	0.028370
18.....	0.002319	0.002319	0.002319	0.002319
19.....	0.000956	0.000956	0.000956	0.000956
20.....	0.036614	0.036614	0.036614	0.036614
21.....	0.029293	0.029293	0.029293	0.029293
22.....	0	0	0	0
23.....	0	0	0	0
24.....	0	0	0	0
25.....	0	0	0	0
26.....	0	0	0	0
27.....	0	0	0	0
28.....	0	0	0	0
Exogenous†	0.066645	0.066645	0.066645	0.066645

* Water requirements in acre-feet per thousand dollars sector GDO.

† Water requirements in acre-feet per thousand dollars household income. As estimated for base year, this coefficient includes requirements for endogenous sectors 1–3 and 22–28.

SOURCE: Unadjusted (1954) coefficients from Zusman and Hoch (72). Adjusted coefficients from Appendix C (table C-7). Coefficients are adjusted only for sectors 4 through 9.

projected yield trends, they cannot be regarded as taking account of changing economic factors; for example, such as changes in coefficients that might result from increasing prices paid for water by the primary agricultural sectors. Thus, the adjustment imposed is only partial and relatively crude, but there is basis for believing the direction of adjustment to be plausible.

The case for adjusting coefficients in other than primary agricultural sectors may be equally strong (perhaps stronger) from the point of view of potential for technical efficiency in the use of water. But the basis for adjusting empirical coefficients for other sectors is even less adequate than for the primary agricultural sectors. From another point of view, it may be claimed that it is far more serious to disregard prospective changes in water coefficients in the primary agricultural sectors than in other sectors of the California economy. The reason for this is the dominance of the primary agricultural sectors as water users. In terms of their respective implications for total water requirements, small relative changes in the water coefficients of primary agricultural sectors are equivalent to much larger relative changes in coefficients for other sectors. For this reason, primarily, it seemed instructive to examine alternative results based on adjusted coefficients even though the adjustments could not be extended to include other than the important primary agricultural sectors.

The implied total water requirements based alternatively on unadjusted and adjusted water coefficients are summarized for projections A-I, A-II, and A-III by major sectors in tables 10 and 11 and by detailed sectors in tables D-11, D-12, D-13, and D-14. Total requirements, indicated by individual sectors for which water coefficients were developed, are simply the product of projected sector GDO and the water coefficient for the corresponding sector. Residual water requirements, the combined requirement for the remaining endogenous, as well as exogenous, sectors are also projected based on the exogenous water coefficient in table 9. Table 10 is derived from unadjusted coefficients, while adjusted coefficients are applied in table 11. The estimated base year water use by sectors is included in each table for comparison.

TABLE 10
IMPLIED WATER REQUIREMENTS BY MAJOR SECTORS
(Based on unadjusted water coefficients)

Sector	1954	1965	1970	1975	1954	1965	1970	1975
	acre-feet				*per cent of total*			
	Projection A-I							
Endogenous								
Primary agriculture	21,224,222	34,864,360	42,705,958	51,024,961	89.69	88.42	87.73	87.41
Agricultural processing	139,787	240,252	294,952	353,019	0.59	0.61	0.61	0.60
Manufacturing	315,452	726,236	981,520	1,229,477	1.33	1.84	2.02	2.11
Other	0	0	0	0	0	0	0	0
Exogenous	1,985,306	3,599,710	4,694,314	5,769,954	8.39	9.13	9.64	9.88
Total*	23,664,767	39,439,558	48,676,744	58,377,411	100.00	100.00	100.00	100.00
	Projection A-II							
Endogenous								
Primary agriculture	†	31,355,445	37,300,783	43,693,445	.....	87.41	86.36	85.79
Agricultural processing	.....	214,535	255,139	298,906	.....	0.60	0.59	0.59
Manufacturing	.....	743,893	1,007,007	1,261,688	.....	2.07	2.33	2.48
Other	.....	0	0	0	.....	0	0	0
Exogenous	.....	3,556,143	4,628,409	5,677,171	.....	9.91	10.72	11.15
Total*	.....	35,870,016	43,191,338	50,931,210	.....	100.00	100.00	100.00
	Projection A-III							
Endogenous								
Primary agriculture	.....	33,249,264	40,232,360	47,685,353	.....	87.95	87.11	86.68
Agricultural processing	.....	246,046	303,997	365,425	.....	0.65	0.66	0.66
Manufacturing	.....	733,741	992,462	1,243,687	.....	1.94	2.15	2.26
Other	.....	0	0	0	.....	0	0	0
Exogenous	.....	3,575,997	4,659,438	5,721,075	.....	9.46	10.09	10.40
Total*	.....	37,805,048	46,188,257	55,015,540	.....	100.00	100.00	100.00

* Entries may not add to totals due to rounding.
† Blanks indicate same as under A-I.
SOURCES: Tables D-11 and D-13.

In view of the likely margins of error in water use data, the degree of confidence to be placed in the absolute levels of water use even for the base year is somewhat questionable. And the validity of projected rates of growth in water requirements as measures of prospective requirements can be particularly sensitive to how realistic are the projection conditions imposed, including the important external trade constraints. Of particular importance to realistic projection of water requirements is the adequacy of conditions for capturing the forces governing growth of primary agricultural sectors (sectors 1–10). The dominance of these latter sectors as water users as contrasted with their much smaller relative contribution to state GDO means that projected state water requirements are much more sensitive to projected growth in these sectors than is state GDO. Comparisons of projected with observed growth rates for the period 1954–1962 presented in a subsequent section suggest strongly that primary agriculture is overprojected under each alternative, implying also significant overprojection of aggregate water requirements.

However, while the magnitude projected for each alternative is for this reason suspect, projected requirements under one trade constraint relative to

TABLE 11

IMPLIED WATER REQUIREMENTS BY MAJOR SECTORS

(Based on adjusted water coefficients)

Sector	1954	1965	1970	1975	1954	1965	1970	1975
	acre-feet				*per cent of total*			
	Projection A-I							
Endogenous								
Primary agriculture	21,224,222	31,679,773	37,169,987	42,550,649	89.69	87.40	86.16	85.27
Agricultural processing	139,787	240,252	294,952	353,018	.59	.66	.68	.71
Manufacturing	315,452	726,236	981,520	1,229,477	1.33	2.00	2.28	2.46
Other	0	0	0	0	0	0	0	0
Exogenous	1,985,306	3,599,710	4,694,314	5,769,954	8.39	9.93	10.88	11.56
Total*	23,664,767	36,245,971	43,140,773	49,903,098	100.00	100.00	100.00	100.00
	Projection A-II							
Endogenous								
Primary agriculture	†	28,502,782	32,488,914	36,475,108	.....	86.33	84.65	83.44
Agricultural processing	.....	214,535	255,139	298,906	.....	.65	.66	.68
Manufacturing	.....	743,893	1,007,007	1,261,688	.....	2.25	2.62	2.89
Other	.....	0	0	0	.....	0	0	0
Exogenous	.....	3,556,143	4,628,409	5,677,171	.....	10.77	12.06	12.99
Total*	.....	33,017,353	38,379,469	43,712,873	.....	100.00	100.00	100.00
	Projection A-III							
Endogenous								
Primary agriculture	.....	30,258,419	35,116,169	39,934,544	.....	86.91	85.50	84.49
Agricultural processing	.....	246,046	303,997	365,425	.....	.71	.74	.77
Manufacturing	.....	733,741	992,462	1,243,087	.....	2.11	2.42	2.63
Other	.....	0	0	0	.....	0	0	0
Exogenous	.....	3,575,997	4,659,438	5,721,075	.....	10.27	11.34	12.10
Total*	.....	34,814,203	41,072,066	47,265,731	.....	100.00	100.00	100.00

* Entries may not add to totals due to rounding.
† Blanks indicate same as under A-I.
SOURCES: Tables D-12 and D-14.

another do have suggestive value, and it is this type of comparison which is of primary interest here. It follows as no surprise from the alternative projections previously summarized that A-II implies the lowest total water requirements, with A-I the highest and A-III falling in between. The spread between A-I and A-II increases from about 3.5 million acre-feet in 1965 to around 6.5 million acre-feet by 1975. This results from the dependence of A-I on increased exports from the heavy water-using primary agricultural sectors to close the trade gap. Whether either A-I or A-II is particularly "realistic" is representing the intersectoral pattern of California economic growth is not of primary importance in this comparison. The main point is rather that the direction taken by California's trade patterns with the rest of the world is of more than minor importance in an economic assessment of the state's water resource development problem.

The use of adjusted water coefficients generates lower projected water requirements under each trade pattern. The decline in requirements is significant because of the importance of the primary agricultural sectors as water users. Restricting comparisons to the projected magnitudes for 1975, the use of adjusted coefficients results in a

TABLE 12

DIRECT AND INDIRECT WATER REQUIREMENTS FOR NET TRADE BALANCE INCREMENT OF 100,000*

Sector	Exporting sectors			Importing sectors		
	Leakage factor†	Gross export increment	Water requirements	Leakage factor†	Gross import decrement	Water requirements
		thousand 1954 dollars	*acre-feet*		*thousand 1954 dollars*	*acre-feet*
1	.....	.....	.....	.371394	159,082	2,322,503
2	.080577	108,764	815,117	.....	.....	.....
3	.....	.....	.....	.....	.....	.....
4	.....	.....	.....	.055426	105,868	2,628,250
5	.042698	104,460	948,564	.....	.....	.....
6	.031108	103,211	355,020	.....	.....	.....
7	.049164	105,171	844,781	.....	.....	.....
8	.037956	103,945	357,438	.....	.....	.....
9	.....	.....	.....	.049028	105,156	4,050,511
10	.048120	105,055	562,392	.....	.....	.....
11	.....	.....	.....	.088811	109,747	1,147,969
12	.....	.....	.....	.247605	132,909	1,229,030
13	.....	.....	.....	.090888	109,997	807,977
14	.109799	112,334	298,124	.....	.....	.....
15	.....	.....	.....	.187684	123,105	208,875
16	.....	.....	.....	.161633	119,280	129,043
17	.112441	112,669	11,908	.....	.....	.....
18	.....	.....	.....	.147983	117,369	27,977
19	.093443	110,307	15,402	.....	.....	.....
20	.....	.....	.....	.246595	132,731	108,839
21	.....	.....	.....	.116228	113,151	20,559
22	.086231	109,437	11,887	.....	.....	.....
23	.....	.....	.....	.118251	113,411	6,619
24	.112602	112,689	58,429	.....	.....	.....
25	.109094	112,245	7,574	.....	.....	.....
26	.070440	107,578	10,119	.....	.....	.....
27	.....	.....	.....	.137351	115,922	678,528
28	.....	.....	.....	.....	.....	.....

* In units of thousand 1954 dollars.
† Represents proportion of gross export increment (gross import decrement) required to offset leakage.
SOURCES: Calculated by procedures outlined in Appendix A; note A-3, procedure (b).

minimum decrease of 7.2 million acre-feet under A-II and a maximum decrease of 8.5 million acre-feet under A-I. Among the different trade constraint alternatives, differences in water requirements are similar to those generated by unadjusted water coefficients. The maximum difference is that between A-I and A-II for 1975 requirements in the latter case were just over 6 million acre-feet less than in the former.

In these comparisons the implications of changing trade patterns for water requirements are restricted to three specific alternatives, each the direct consequence of a specific trade-balancing constraint. The resulting magnitudes do not bring out the full range of alternatives, nor do they focus on water efficiency of individual sectors in their relation to the overall trade-balancing mechanism. The direct and indirect water requirements associated with closing a trade gap of a given magnitude may be thought of as the "water cost" of closing the gap. Differences in water requirements associated with A-I, A-II, and A-III then reflect differences in water costs of three specific weighted combinations of sector activity, the differences in weights determined in these instances essentially by the different trade constraints imposed. It is instructive to look at one sector at a time from this same point of view. Relevant em-

pirical measures of water requirements for individual sectors based on unadjusted water coefficients are summarized in table 12. Procedures for deriving these measures are outlined in Appendix A (note A-3).

Importing and exporting sectors are listed separately in table 12, but the figures on water requirements are directly comparable between each pair of sectors; i.e., between importing sectors, between exporting sectors, and between importing and exporting sectors. The measures represent direct and indirect water requirements of producing a sufficient export increment by exporting sector i (or of generating additional domestic output to replace a sufficient competitive import decrement for importing sector i) to generate a net trade balance increment of $100,000,000 (1954 dollars). Each export and each import sector is considered individually.[15] The total export increment (or competitive import decrement) called for a to generate a given trade-balancing increment is larger than the trade-balancing increment itself because of certain leakages in the system. The leakages taken into account in the present measures are those due to noncompetitive imports and federal receipts from California sectors. The additional direct and indirect output required to close a given trade gap calls for additional noncompetitive imports as inputs and generates additional federal receipts (in accordance with fixed federal government "input" coefficients), both of which constitute offsets which must be netted out in the trade-balancing mechanisms.[16] To exemplify, consider the gross export increment of $108,764,000 indicated for sector 2 in table 12. This means that, to generate a net trade balance effect of $100,000,000 through an increase in exports from sector 2, incremental exports and competitive imports of other sectors set at zero, a gross export increment of $108,764,000 is called for. Of this figure, $100,000,000 is the net trade balance increment, the remaining $8,674,000 going to offset an equivalent amount of noncompetitive imports required and federal receipts generated by the system. A similar interpretation applies to the remaining gross export increments and to the gross import decrements listed.

The additional output required to generate a given net trade balance increment consists of direct output by the sector involved plus supporting output from that sector and other sectors as required in view of the sectoral interdependence of the system. The measures of direct and indirect water requirements presented include in each case water required as input to support both direct and indirect output requirements. A glance at table 12 brings out the marked differences in water cost over individual sectors. Comparisons within the set of exporting sectors and within the set of importing sectors show the primary agricultural sectors to be the most "costly" in terms of water requirements for meeting trade deficits. Water costs associated with agricultural processing sectors are also relatively high due mainly to the heavy dependence of these sectors on the primary agricultural sectors for raw material inputs. Still, if water scarcity were sufficiently critical, exports of agricultural products in processed form

[15] In the notation of Appendix A-3, each element in ΔY_e or in ΔX_m is zero except the element for sector i in the calculation of direct and indirect requirements for the ith sector.

[16] Competitive imports do not appear in the leakage term for the measures here constructed because of the condition imposed that the entire direct and indirect output increment required to generate the given net trade-balancing increment be produced domestically. By this device, competitive imports are held at zero for the increment of economic activity here considered. Noncompetitive imports, on the other hand, are by definition imports of goods not produced in the California economy. Accordingly, the expansion of output required to support the export increment (competitive import decrement) calls for additional noncompetitive imports as inputs.

could turn out to be more effective trade balancers than exports in primary (fresh) form. For example, the 298,000 acre-feet requirement which appears for exports of processed fruit and vegetables [14] is somewhat less than the water requirements shown for the counterpart primary fruit and vegetable sectors 6, 7, and 8, and particularly smaller than that shown for noncitrus fruit [7].

Comparison of importing with exporting sectors suggests that, purely from the point of view of water requirements, a considerable efficiency could be achieved by importing more of certain agricultural products and offsetting these imports by exports from other agricultural sectors. Compare, for example, the 2.6 million acre-feet of water "released" by imports of $100,000,000 worth of grain [4] with the water required to generate an offsetting increment of exports of fruits [7 or 8] or vegetables [6], or even cotton [5]. Of course, these are only partial comparisons, with no particular connotation that they are determining from an economic point of view. Other factors, such as other resource endowments and changing size of export market due to the complex of factors which affect the characteristics of export demand, may well dominate water requirements in the economics which ultimately determines direction of development in the California economy. In a full assessment of the economic realities, high-water-requirement agricultural products could continue to figure prominently in California's trade with the rest of the world, providing exports to exchange for the imports required to support growth in general economic activity which lies ahead.

Implied Productivity Growth

Independent projections of income and population have been introduced in generating exogenous projections of final demand. Exogenous projections of California labor force are available in Gershenson (20). Available labor force has not been incorporated explicitly in the projection mechanism as a possible limiting input. Rather, projections have proceeded as if the growing labor force implied by the growing California population would be sufficient to meet increasing labor requirements of the continually growing levels of state economic activity.

For labor to impose no constraint on growth implies a flow of the labor resource into the state in response to growing labor demands of state economic development. On the other hand, compatibility between projected population, which underlies projected domestic final demand, and projected labor force is relevant to assess feasibility of projected levels of economic activity. Should the labor force implied by population projections either exceed or fall short of labor required to meet the needs of the state's economy, economic forces would presumably come into play to retard or increase the inflow of labor. Alternatively, the composition of aggregate state product might accommodate in certain ways to limited labor supply, or growing unemployment could be in prospect should the labor supply be excessive. Still, growth in population and in labor force are strongly related phenomena, and the absence of compatibility between labor force and GDO rates of growth might imply, for "realistic" projection, adjustment to bring them more closely into proper relation. It follows, of course, that, if adjustment is required, both labor force and population are likely to be subject to adjustment, and tampering with the state population (and income) base in turn calls for corresponding revision of the original final

TABLE 13

IMPLIED AVERAGE ANNUAL RATES OF GROWTH IN LABOR PRODUCTIVITY, CALIFORNIA*

Projection alternative	Projection period		
	1954–1965	1965–1970	1970–1975
	per cent		
A–I	3.2	2.2	1.0
A–II	3.0	2.2	1.0
A–III	3.1	2.2	1.0

* Rate of growth of projected GDO divided by rate of growth of projected net labor force. Net labor force is total labor force less projected government employment, the latter based on government labor coefficients from table C–8 and projected government expenditures from tables C–5 and C–6.

TABLE 14

AVERAGE ANNUAL LABOR PRODUCTIVITY GROWTH RATES TOTAL PRIVATE ECONOMY, UNITED STATES

	1954–1958	1958–1962	1954–1962
	per cent		
Output per employee*	2.0	3.1	2.6
Output per employed person†	1.8	3.1	2.4

* Based primarily on U. S. Bureau of Labor Statistics employment and hours (establishment) data.
† Based primarily on U. S. Bureau of the Census employment data from Current Population Surveys.
SOURCE: Derived from productivity indexes in (51), table VI–1.

demand projections. In the spirit of the present study, a mechanism for dealing with such a situation if it exists would be an iterative procedure to achieve an "acceptable" degree of agreement among implied patterns of growth in employment, population, and exogenous final demand.

Appraisal of compatibility of the present projections of GDO with independently projected California labor force inevitably must rest on indirect and relatively crude comparisons. An obvious but clearly inadequate approach is to generate aggregate labor requirements implied by alternative projections employing base year (1954) labor coefficients (table C-8) and to compare the resulting growth rates of labor requirements with projected rates of growth in the labor force. This approach is inadequate because of the bias resulting from disregarding growth in labor productivity, which on the basis of historical experience and continuing technological development can be expected to continue as a significant factor in future growth. Of course, projection of productivity trends into the future is subject to considerable uncertainty. Nevertheless, comparison with recent experience can be regarded as suggestive.

From projected GDO (table 4) and from independently projected labor force (table C-2), the rates of growth in labor productivity implied for maintenance of compatibility between projected aggregate output and available labor input can be derived. These derived rates are presented in table 13. Comparisons are possible only for the aggregate of economic activity since, of course, independent projections of employment by any sectoral breakdown of activity do not exist. The judgment regarding compatibility rests on assessment of plausibility of the implied labor productivity growth rates; this assessment, in turn, rests on comparison with recent historical experience.

The first projection period (1954-1965) is now history, and observations on productivity trends since 1954 are comparable in timing to implied trends during this projection span. However, available measures of labor productivity trends are in other respects not directly comparable with productivity trends implied by projections for the California economy. More or less suitable historical productivity measures are available for the United States but not for regions within the national economy (51). The rates of productivity growth appearing in table 14 are for the national economy based on the

period 1954-1962. To assume that this reflects sufficiently closely the productivity growth rate in California for the same period is admittedly open to question. Such an assumption is perhaps particularly suspect for the California economy since this state's overall economic growth rate has been significantly greater than the national during this period. In this context there is reason to suppose that a region in a technologically advancing economy, which is experiencing a rate of economic growth more rapid than the national average, will also exhibit a more rapid rate of growth in labor productivity than that suggested by the national aggregate. This suggests that the United States rate of productivity growth in table 14 is an underestimate of the California rate in the period.

Only brief comment seems called for on the measures summarized in table 13. Implied rates of productivity growth are included for each projection alternative and for each of the projection spans which have served as frames of reference for results summarized in earlier sections. Since the United States productivity measures refer to total private economic activity, state, local, and federal projected employment in California (based on government labor coefficients in table C-8) has been deducted from projected California labor force for deriving implied productivity growth rates for the state. Projected GDO for California is conceptually comparable to private output since government output is not included in the GDO aggregate. Use of the "net private" labor force rather than employment in deriving implied productivity growth rate assumes that base year unemployment rates prevail in the projection period.

The relevant comparison for assessing aggregate output-labor force compatibility is the implied productivity growth rate for the projection span 1954–1965 and the observed United States growth rates in the period 1954–1962. Not surprisingly, the implied California rate is relatively insensitive to the specific projection alternatives adopted here. A compound annual rate of around 3.0 per cent is indicated for the first projection period. This compares with a United States annual rate of growth in output per employee (per employed person) of 2.6 per cent (2.4 per cent). It cannot be said that this confirms employment-output compatibility in the aggregate California projection, but the divergence between California projected and actual for the period is probably somewhat less than that suggested by the rates indicated. Major considerations point in this direction. The first is the previously mentioned likelihood that California productivity growth rates in the 1954–1962 period actually exceed those shown for the United States economy. A second relevant observation relates to the apparent upward trend in productivity growth rates in the 1954–1962 period. Note that output per employee shows a growth rate of 2.0 per cent in 1954–1958 and just over 3.0 per cent in 1958–1962. This suggests an upward trend in the productivity growth rate which, if maintained through 1965, would result in an average rate for 1954–1965 in excess of the 2.6 per cent indicated for 1954–1962.

The comparison with indicators of recent trends in United States labor productivity is perhaps too tenuous a basis for concluding that California projections of GDO and labor force can be regarded as compatible for this period. On the other hand, divergence in the rates compared is in the direction expected. Although the magnitude of the divergence is not to be dismissed as insignificant, neither can it be regarded as evidence that the projection scheme generates levels of aggregate output out of line with independently projected labor force.

Implied productivity growth rates

are also included in table 13 for the two successive five-year projection spans beyond 1965, but little can be said by way of appraising plausibility of the productivity trends implied. The growth rates drop off markedly in successive periods, the 1.0 per cent rate for 1970–1975 being only one-third of the 3.0 per cent rate for 1954–1965. Although the rate of productivity growth could perhaps be expected to recede in California as the state economy matures, little basis exists for forming a judgment about the specific quantitative indicators which result in the present case.

It is perhaps suggestive to compare the present implied productivity growth rates for California with implied productivity growth rates growing out of recent projections for the United States economy (Landsberg *et al.*, 23). Their projection reference periods do not correspond to those adopted here for California projections, but implied compound rates are reported for the periods 1960–1970 and 1970–1980. "Low," "medium," and "high" projections were developed in the United States study . The implied average (compound) rate of growth of gross national product per worker ranged from a low of 1.9 per cent to a high of 2.7 per cent for the period 1960–1970 and from 1.7 per cent to 2.4 per cent for 1970–1980. Private product per privately employed worker ranged from 2.2 per cent to 2.7 per cent in the former period and from 2.2 per cent to 2.8 per cent for the latter period. The last measure is probably conceptually more comparable to GDO as here projected for the California economy. But in neither measure do the implied United States productivity growth rates fall off as fast as do the California rates in table 13. If the productivity rates implied by the United States projections were to be accepted as more realistic for the California economy, the projected level of California economic activity (particularly in 1970–1975) presumably provides employment opportunity for a smaller labor force than that presently projected for the state.

Projected Versus Observed Growth Rates

The projections summarized have been viewed above as an exercise exploring the sensitivity of the California economy to different patterns of trade, and claims of "realistic forecasts" of level and composition of aggregate state product have been avoided. Comparison of the results with observed experience, insofar as this is possible, will bring this into sharper focus and at the same time should have suggestive value for assessing the alternative conditions imposed.

The first projection reference period, 1954–1965, opens the possibility of comparing "projected" growth rates for this period with observed rates for a major part of the period (1954–1962). Unfortunately, measures of GDO by sectors (or even for major sector aggregates) are not directly available in published form for years other than 1954. This precludes direct comparison of projected and actual GDO. It is possible, however, to develop approximate measures that at least can suggest the degree of correspondence between projected and actual GDO for this period.

The main impression to be gained from such comparisons is that primary agricultural sectors appear to be substantially overprojected in each of our alternatives; manufacturing, and particularly agricultural processing, appears to be underprojected; and the rate projected for service sectors corresponds well with that observed. Moreover, overprojection and underprojection appear to balance out reasonably well over sectors, with the projection of overall growth corresponding closely to observed growth rates. The significance of this comparison needs to be tempered, of course, with the recognition that the basis for measures of observed

growth is itself not firm, particularly for most nonagricultural sectors. A more complete statement of procedures and qualifications will make this clear.

Three types of measures have been constructed to reflect observed growth rates, but it has not been possible to develop suitable measures for all minor sectors in the 28-sector detail carried in the projections. Minor sector detail has been attempted for primary agricultural and manufacturing sectors, but even for these subgroups the coverage is not complete. The nonagricultural-nonmanufacturing sectors [22–28] are dealt with as an aggregate, no attempt being made to examine growth rates by minor sectors within this aggregate. Such measures as it has been possible to develop of observed growth rates are presented along with projected rates of growth in table 15. Geometric means of annual rates are summarized in this table. The measures on which these mean rates are based appear in Appendix E.[17]

For the primary agricultural sectors, measures of production relatively accessible in regularly published sources correspond closely conceptually to GDO as measured in the input-output construct. Accordingly, the observed mean annual growth rates in production for these sectors would be expected to correspond closely to actual mean annual growth rate in GDO. The production data assembled by sectors (tables E-1 and E-3) do not, except for sector 5 (cotton), include all minor products included in the base year measure of GDO but, except for three sectors, the 1954 production measure represented more than 90 per cent of 1954 GDO (see table E-2).[18] Calculated production growth rates for the period 1954–1962 are presented for individual sectors 1 through 9 in table 15 and for the aggregate of primary agricultural sectors [1–10].

Data on production are not available directly for other than primary agricultural sectors. For these other sectors it was necessary to turn to other, more approximate, measures. Two such measures are included here—one based on employment adjusted for labor productivity and the other based on deflated value added. From data available, it has been possible to construct both rates as alternative measures of observed growth for major manufacturing sectors (that is, sector aggregates 11–15, 16–21, and 11–21) and for selected minor sectors. For other than primary agricultural and manufacturing sectors (that is, sectors 22–28), the only meas-

[17] All references to mean annual rates in this section are to the geometric means summarized in table 15. For those sectors for which annual data are available for the full 1954–1962 period, arithmetic means of annual rates were also obtained and are presented along with the geometric means in table E-1.

[18] Sectors 1 (meat animals and products), 9 (forage), and 10 (miscellaneous agriculture) are the exceptions. The proportion in sector 9 is low primarily because pasture is omitted from production but included in the base measure of GDO. For sector 1, the base year measure of GDO (27 and 72) is greater than domestic (California) production, corresponding more nearly to production plus imports of stockers and feeders. Imports of stockers and feeders in turn are regarded as noncompetitive imports. Thus, the observed production growth rate would be expected to correspond to the projected GDO growth rate for this sector only if the noncompetitive import coefficient remained stable at its base year value during the period examined. Inspection of stocker and feeder inshipment data indicates that inshipments grew at a somewhat faster rate than production during 1954–1962. The comparison of production growth rate with projected GDO growth rates for sector 1 remains an appropriate comparison in the present context. However, it does appear that the growth rate in stocker and feeder inshipments accounts for a substantial part of the discrepancy between the observed rate in column 8 and the projected rates in columns 3 and 4 of table 15.

The production data assembled for sector 10 represent only 52 per cent of GDO in 1954. Mainly for this reason, an observed growth rate is not included for this sector. However, the observed part of 10 is included in the aggregate [1–10].

TABLE 15

PROJECTED AND OBSERVED AVERAGE ANNUAL GROWTH RATES

Sector	Projected average annual growth rates, 1954–1965				Observed average annual growth rates			
	Initial X^1	A-I	A-II	A-III	Adjusted employment		Deflated value added 1954–1961*	Production 1954–1962
					1954–1962	1954–1961		
	1	2	3	4	5	6	7	8
	per cent							
1	4.9	7.1	4.8	5.0	...	...	...	3.2
2	4.9	4.9	4.8	4.9	...	...	...	5.4
3	4.3	4.4	4.3	4.4	...	...	...	2.3
4	4.4	3.8	3.2	3.3	...	...	...	2.0
5	2.5	4.8	1.9	2.0	...	...	...	3.1
6	3.1	4.9	3.2	4.5	...	...	...	2.5
7	3.0	4.9	2.9	5.4	...	...	...	1.9
8	3.0	5.7	3.0	3.4	...	...	...	−2.8
9	4.6	4.8	4.6	4.7	...	...	...	1.4
10	3.8	5.1	3.5	4.7	...	...	...	...
11	4.3	4.8	4.3	4.4	...	...	...	...
12	4.9	5.6	5.0	5.1	...	...	9.6	...
13	4.3	4.9	4.3	4.3	...	...	...	...
14	2.8	4.9	2.6	6.4	4.5	4.0	6.9	...
15	4.4	4.9	4.4	4.7	...	...	...	...
16	5.0	8.0	8.9	8.8	5.5	5.1	7.6	...
17	6.5	7.4	6.6	6.6	0.8	0.5	3.9	...
18	4.9	8.4	9.3	9.2	11.1	10.3	10.9†	...
19	1.3	2.0	1.3	1.3	0.2	−0.2	...	...
20	4.1	10.1	7.9	7.8	6.2	6.1	6.5	...
21	5.3	7.6	8.7	8.5	6.1	5.6	7.8	...
22	4.3	6.3	4.8	4.8	...	...	...	...
23	5.9	6.3	6.0	6.1	...	...	...	...
24	5.9	6.1	5.9	5.9	...	...	...	...
25	5.4	5.9	5.7	5.8	...	...	...	...
26	6.0	6.1	6.0	6.0	...	...	...	...
27	4.6	5.5	5.2	5.3	...	...	...	...
28	5.5	6.4	6.2	6.3	...	...	...	...
1–10	3.8	5.1	3.7	4.4	...	...	...	2.4
11–15	4.1	5.1	4.1	5.2	5.8	5.7	7.2	...
16–21	4.4	6.8	7.0	6.9	7.1	6.5	6.6	...
22–28	5.7	6.1	5.9	6.0	5.9	...	...	...
11–21	4.4	6.4	6.5	6.6	7.0	6.4	6.5	...
1–28	5.1	6.2	6.1	6.1	6.2‡	...	...	...

* Deflators employed and deflated value added appear in table E-5.
† Based on aggregate not strictly comparable to sector 18. See first footnote, table E-1.
‡ Average of production rate for major sector 1–10 and adjusted employment rates for 11–21 and 22–28, weighted by 1954 GDO.

SOURCES:
Cols. 1–4: Geometric means of annual rates calculated from projections in tables D-1 and D-7.
Cols. 5–8: Table E-1.

ure obtained is that based on employment, and this only for the aggregate of sectors 22–28.

There is basis for questioning both of these latter measures as indicators of observed GDO growth rates for the California economy. The adjusted employment measure is based on employment data from (50), adjusted for changes in labor productivity based on indexes of output per employee developed from data and auxiliary measures appearing in (51).[19] Growth rates in number of persons employed adjusted for output per employee can be regarded as giving conceptually appropriate measures of growth rates in output. A difficulty is that the productivity measures used in this instance are at best a rough measure of what is sought. There are two major reasons for this. First, while measures of California labor productivity are called for, index numbers from (51) are the United States economy and may not represent at all well the California experience. One would expect that the United States productivity growth rate underestimates the California rate in this period (1954–1962) because the more rapidly growing California economy is likely to have experienced technological change at rates above national average. If so, measured California GDO growth rates based on the present adjusted employment measures would on this account be biased downward. A second difficulty is that the United States productivity measures used refer to broad aggregates, namely, total manufacturing (corresponding approximately to our major sector aggregate 11–21) and total nonmanufacturing (corresponding approximately to our major sector aggregate 22–28). Labor productivity trends can and probably have varied widely over the minor sectors comprising these major aggregates.

The United States total manufacturing growth rate was applied uniformly to individual California manufacturing sectors and also to the major manufacturing sector aggregates. For the nonmanufacturing sectors, only the aggregate is involved. The limitations of the adjusted employment measure stemming from the breadth of product coverage of the productivity indicators used are presumably more serious for individual manufacturing sectors. Accordingly, there is more reason to doubt the reliability of adjusted employment rates as measures of GDO growth rates in the individual sectors for which they are presented than in the major sector aggregates, particularly sector aggregates 11–21 and 22–28.

The deflated value-added growth rates should also be regarded with caution as indicators of GDO rates. To arrive at these measures, value added in current dollars from (38) and (40) were deflated to 1954 values by United States implicit price deflators from (57) and (59) (see table E-5). Clearly, the validity of the resulting measures as indicators of GDO growth rates depends upon the stability of the relationship between value added and GDO over the observed period (1954–1961)[20] and the suitability of the United States implicit price deflators for converting the California current dollar values to a 1954 dollar base. With regard to the price deflator, the question again arises how well United States price deflators for relatively broad product aggregates reflect California price behavior for typically smaller and different aggregates in terms of product composition. Also open is the question of suitability of weighting in the implicit deflators for deflating value-added aggregates. The relevance of stability in the relation of GDO to value added is clear, but it has not been established whether or

[19] Employment data and productivity indexes used appear in tables E-1, E-3, and E-4.

[20] The latest year for which value-added data were available was 1961. Hence, the observation period for these measures was restricted to 1954–1961.

not treating it as if it were stable represents a serious departure from realism. In these circumstances it is hardly meaningful to speculate about possible biases in deflated value-added measures as indicators of GDO growth rates.

Major Sector Comparisons.—Turning to the comparisons of projected observed rates in table 15, reasons have been cited for regarding the major sector comparisons (particularly in respect to the adjusted employment measure) as more reliable than minor sector comparisons. Furthermore, it has been argued that these particular adjusted employment measures are perhaps more vulnerable to downward than to upward bias because there may have been a faster rate of technical change in Califorina during the observed period than is reflected in the measures of United States productivity used. This latter observation is probably more valid for manufacturing [11–21] than for nonmanufacturing sectors [22–28].

If we accept the observed growth rates as suggestive indicators, the rates summarized for major sectors do indicate that the projections generated imply too high a growth rate for primary agricultural sectors [1–10], too low a rate for agricultural processing [11–15], and rates more nearly corresponding to observed rates in other manufacturing [16–21] and nonmanufacturing [22–28].

In these comparisons it is in a sense more informative to focus on projections A-II and A-III, particularly since these (as opposed to X^1) include allowance for growth in capital stocks and (as opposed to A-I) result from trade constraints which imply a relatively slower rate of growth for primary agricultural sectors than for others. It will be recalled that in A-II three sectors in the major category 16–21 (namely, chemicals, machinery, and other manufacturing) were assigned the major incremental burden in maintaining trade balance. The higher relative growth rate for major sector [16–21] in A-II grows out of this constraint. Under A-III, on the other hand, the same three manufacturing sectors share the major incremental trade-balancing burden with the single agricultural processing sector 14 (canning, preserving, and freezing) This is reflected in a substantial increase in the relative rate of projected growth for sector 14 under A-III and is responsible for the significant increase in the projected rate for the major sector [11–15]. Still the projected rate for [11–15] under A-II appears to fall short of the observed, judged either by the adjusted employment or value-added measure. The projected rate for [16–21], on the other hand, does not appear out of line with the observed even under A-II, which imposes a relatively heavy burden on this major sector.

Focusing further on the primary agricultural aggregate [1–10], the suggestive evidence is strong that the projection scheme overprojects the growth rate for this sector, even under A-II, the projection alternative least demanding on agriculture. That primary agricultural sectors should project at a slower rate than nonagricultural sectors is implied by the typically lower final demand elasticities for the former sectors (table C-3). And the trade constraints under A-II serve as an additional restraining influence on this major sector. Still the observed growth rate appears to have fallen significantly short of the projected rate in the observed period 1954–1962.

From inspection of observed relative growth rates for primary [1–10] and secondary [11–15] agricultural sectors, it is noteworthy that agricultural processing is apparently continuing its gain of position relative to primary production, and gaining at a more rapid rate than implied under A-III, the projection alternative most favorable to this eventuality. This divergence in growth

rates implies a heavier proportion of domestically (California) produced primary agricultural products undergoing transformation through processing on its way to the final consumer, heavier reliance on imports of primary products for further processing within the state, or a combination of these two phenomena. In vegetable and fruit sectors, it does not seem likely that imports of raw produce for further processing in the state would be a dominant force in the observed divergence; but in other sectors, such as meat processing, this may well be happening. Sufficiently discriminating analysis is not possible from the measures summarized, but the observed rates do suggest that, in regard to primary and secondary agricultural relationships, conditions even more severe for primary agriculture than underlies A-II and more generous for agricultural processing than those in A-III cannot be termed unrealistic.

Not much can be said about projected versus observed growth rates for the aggregate of nonmanufacturing sectors [22–28]. This major sector is important in terms of California GDO (accounting for more than 50 per cent), final demand elasticities adopted range from 1.0 to 1.9 (table C-3), and the minor sectors comprising this category figure much less directly in trade patterns. It has been suggested above that the adjusted employment measure on which observed growth rate is based may constitute a more reliable indicator of GDO growth for this major sector than for manufacturing since United States productivity growth rates may be more appropriate here. As apparent from table 15, observed growth rate was obtained only for the aggregate of sectors 22–28 and this rate from adjusted employment only. The observed rate resulting corresponds closely to that projected under both A-II and A-III.

Minor Sector Comparisons. — The measures in table 15 suggest minor sector comparisons but must be viewed with caution in regard to reliability as measures of the observed growth rates. Individual sector rates for primary agricultural sectors are based on annual production data which, although not fully inclusive, are regarded as closely comparable conceptually to the sectoral GDO projected. Hence, these measured rates do indicate at this level of detail that conditions imposed have failed to capture experience, at least in the period observed. Inspection of observed and projected rates reveals that, typically, growth in minor primary agricultural sectors has been overprojected. In only two sectors—2 (poultry and eggs) and 5 (cotton)—have observed rates exceeded projected rates. This suggests that, for most primary agricultural sectors, domestic (i.e., within state) demands or foreign (i.e., other United States regions and foreign countries) demands or both are overprojected as a result of the demand conditions adopted. Domestic demand elasticities which are too high or a decline in California's position vis-à-vis other producing regions in supplying the interregional market are factors that could contribute to explaining the typical divergence which appears.

The discrepancies in poultry and eggs [2] and cotton [5] are in the reverse direction. Of these, the divergence in cotton is relatively greater. Final demand confronting this sector was entirely export demand. There was no explicit recognition of possible effects of the United States cotton program. Conditions favorable to California relative to other producting regions or conditions favorable to California cotton in foreign markets could be introduced in a projection model like the one we used in the form of a more elastic demand confronting the California cotton sector. A higher elasticity than that used (0.3) in projections A-II and A-III would have made for closer correspond-

ence between projected and observed rates in the period observed. In the projection scheme employed, of course, inclusion of the cotton sector among those sharing the trade-balancing burden in A-II and A-III would have been equivalent to increasing the elasticity of demand confronting this sector. The comparisons suggest that this might have been "more realistic."

A final comment on minor primary agricultural sectors concerns citrus fruits [8]. The observed negative rate reflects the decline in production in this sector caused to a great extent by the encroachment of urban development in southern California. Substantial new planting has occurred during this period but, because of the lag from planting to bearing, effects of longer run production trends are not well reflected by production in the observed period. Bearing acreage declines during 1954–1962 at a rate faster (3.3 per cent) than that shown for production. Total acreage, on the other hand, more nearly held its own, declining at a rate of 1.2 per cent. The constraints implied for the citrus sector by urban encroachment have not been recognized explicitly in the projection conditions. However, had some explicit constraint been imposed to reflect more realistically the long-run potential, it probably would not have removed the discrepancy between projected and observed in the observed period. The reason for this is that the projections of long-run growth trend do not capture departures from the longer run path. And it is no doubt a departure from the longer run path which is partly responsible for the marked negative observed rate appearing for this sector in table 15. Although the projected rate is clearly too high, the average observed rate over a somewhat longer period might be somewhat higher than that shown here (i.e., a negative rate closer to zero or perhaps a positive rate). One would not expect allowance for displacement by urban development to fully close the gap between projected and observed rates in citrus fruits [8] during the period of observation, but it could bring the comparison for this sector more nearly in line with other primary agricultural sectors.

Growth rates approximated by adjusted employment and deflated value added are included in table 15 for those minor manufacturing sectors for which employment and value-added measures could be constructed from published sources. These rates are more questionable as measures of GDO than are the production growth rates for primary agricultural sectors, for reasons noted in the discussion of major sector comparisons. The minor sector observed rates based on adjusted employment are particularly vulnerable because labor productivity indices for product aggregates do not closely correspond to those in California sectors. The observed rates presented were derived by adjusting employment growth rates for each minor sector by the same productivity growth rate—that referring to United States output per employee in total manufacturing.[21] With respect to deflated value added, there is perhaps less reason for regarding corresponding measures for major and minor sectors to differ materially in terms of reliability, though reservations previously noted apply to the value-added measure itself. Although a minor sector value-added aggregate typically is deflated in an implicit deflator derived for a somewhat broader aggregate, price behavior over time for the minor sector category might be expected to be strongly correlated with price behavior of the major aggregate to which it belongs.

Special limitations attaching to the interpretation of observed growth rates

[21] As noted later, more specific United States productivity indices from (49) based on the shorter period 1954–1960 permit alternative measures for two minor sectors [14 and 17].

for petroleum [17] and aircraft [19] are noted subsequently. In the remaining five sectors for which two alternative observed rates are presented, those based on employment are in each case lower than those based on value added.[22] This is consistent with the earlier observation that use of United States productivity growth rates may well bias downward the observed California growth rates based on adjusted employment. A second noteworthy point about these five minor sectors is that projections A-II and A-III appear clearly to overproject in three [16, 20, and 21] and clearly to underproject in one [18]; the remaining one [14] is underprojected under A-II but appears to come closer to the mark under A-III.[23] The underprojection of machinery [18] is of some interest, particularly since this sector was assigned an important share of the trade-balancing burden in both A-II and A-III. Chemicals [16] and other manufacturing [21] also assumed heavy trade-balancing roles in each case (the comparison suggests too heavy) as did canning, preserving, and freezing [14] under A-III (but not under A-II). GDO for primary metals [20] is determined primarily by intermediate demands, sector 18 being the dominant user. Though [20] is overprojected, the divergence from observed is relatively smaller than for other important sectors due to the braking influence of underprojection of 18.

The special difficulties associated with petroleum [17] and aircraft [19] comparisons are related to lack of correspondence in composition of the aggregate projected and that observed. In each case the projected aggregate on which the observed measures are based omits an important component of its projected counterpart.

For sector 17, empirical basis exists for improving the productivity adjustment over that used in table 15. In that table the observed rates for this sector reflect petroleum refining only, while 17, as defined in the input-output construct, includes petroleum refining and crude petroleum. Crude is important in this sector, accounting for around 40 per cent of sector GDO in 1954 (27). A revised measure of observed growth rate was developed for 17 in an attempt to remedy the major deficiencies of those appearing in table 15. Two significant features mark the revision. First, petroleum refining is one industry for which specific indices of United States labor productivity are available (49). Hence, to represent the refining component of the revised sector 17 rate, the California petroleum refining employment growth rate was adjusted by a productivity growth rate derived from this specific United States index. The revised adjusted employment growth rate for refining was 3.2 per cent, which compares much more closely to the 3.9 per cent appearing in table 15 based on value added. The second feature incorporates the crude petroleum component in the observed rate. The growth rate for crude petroleum production was approximated from data in (46) for 1954–1962. Actually, California crude production declined during this period, the average annual growth rate being –2.2 per cent. A revised sector 17 growth rate of 1.1 per cent is given by an average, weighted by 1954 GDO from (27), of the revised adjusted employment rate

[22] This comparison refers to alternative measures for the directly comparable time period 1954–1961 and is the primary reason for including adjusted employment measures based on this period. Rates based on employment run consistently higher when 1962 is included.

[23] Productivity adjustments based on a more specific United States productivity index for "canned and preserved foods (except meat)" for the period 1954–1962 from (49) affected the observed adjusted employment growth rates only slightly. The resulting measures for the 1954–1962 and 1954–1961 periods were, respectively, 4.3 and 4.1 per cent as compared with 4.5 and 4.0 per cent in table 15.

for refining and the negative crude rate. Although this rate is higher than the 0.8 per cent based on adjusted employment in petroleum refining only in table 15, it remains substantially below the projected rates for sector 17. This partly reflects the adoption in the projection conditions of a final demand elasticity confronting this sector which is probably too high. (2.2). Beyond this, sector 17 is one sector for which a suitable constraint reflecting California's resource base may be important for realistic projection. If the observed growth rates are accepted as reliable indicators, the apparent growth in refining occurring along with a decline in crude production implies that the projection scheme has preserved for sector 17 too strong a position on the export side of California's account with the rest of the world.

A different measurement problem exists for sector 19 (aircraft). The major demand for products of this sector is federal government demand. In the exogenous projections of federal government demand, an estimated California share of federal missile expenditures was allocated to this sector and in this sense incorporated in projected demand confronting this sector. The justification for such a procedure cannot be fully documented, but it does have some plausibility. Missile expenditures were minor in the base year 1954 but have grown markedly in the period since 1954. Under these circumstances, it could not be expected that missile production would be accommodated well by input-output flow coefficients based on 1954 industry composition. Confronted with this situation, it was reasoned that assignment of the new missile activity to sector 19 represented a closer approximation to reality than would its assignment to some other sector. The validity of this procedure remains open to question. But having adopted the procedure, it is clear that projections for sector 19 represent a mixture of missile and conventional aircraft production.

With respect to observed rates of growth, it is not possible to extract from published sources value-added measures for the aircraft sector in the period of observation. And the growth rate approximation based on adjusted employment in table 15 reflects employment in only "aircraft and parts" SIC industries (SIC 372). Presumably, most of the missile employment gets classified with "ordinance and accessories" (SIC 19) in the employment statistics in (50). Ordinance and accessories employment, although starting from a low base in 1954, has grown at a very high rate during the 1954–1962 period. For the SIC aircraft and ordinance industries combined, the growth rate derived from adjusted employment is 5.1 per cent. But this combined employment measure is too inclusive and open to even greater question regarding suitability as a measure of observed growth rate for sector 19.[24] Accordingly, neither the combined rate nor the rate appearing in table 15 can be regarded as referring to an aggregate that is closely comparable to that implied for sector 19 as projected.

Overprojection and Implied Water Requirements.—Though based on fragmentary and imprecise measures of observed growth, these comparisons lend support to the conclusion that the conditional projections generated imply, in the first projection span, too high a growth rate for primary agriculture and too low a rate for manufacturing. The projected rate for the nonmanufacturing aggregate [22–28] and for all

[24] In assessing this measure the inadequacies stemming from the use of United States total manufacturing productivity indices in adjustment should be borne in mind. This is particularly pertinent in something like missiles where output per employee may be very different from that characterizing total manufacturing and from that characterizing conventional aircraft production, the activity with which missile production has been merged in this instance.

sectors combined [1–28] in the period 1954–1965 appears to conform reasonably well to derived observed rates for 1954–1962.

Although the trade-balancing constraints imposed in A-II and A-III (particularly the former) assign a declining relative role to primary agriculture in preserving balance in California's accounts with the rest of the world, the comparisons suggest that a still lesser role for primary agriculture is compatible with recent history. And the comparisons have appraisal value in this instance since there is reason to accept the measures of observed rates for primary agricultural sectors as closely related to sectoral GDO. Several individual manufacturing sectors appear also to have been overprojected. At the same time, agricultural processing sectors in aggregate and machinery [18] in particular, from among other manufacturing sectors, appear to have grown at a faster rate than that required to meet the conditions imposed. For these latter sectors, the empirical basis for the observed rates is regarded as more tenuous. Implications of comparisons of observed and projected rates for the period 1954–1962 cannot be extended for all sectors directly to the balance of the period spanned by these projections. On the other hand, the comparisons do emphasize the necessity for caution against any temptation to interpret the results as forecasts of sectoral growth. By the same token, the implied water requirements cannot be accepted as realistic projections.

Total state water requirements are much more sensitive to the particular pattern of over- and underprojection which results in this instance than is total state GDO. It has been noted that the observed growth rate in aggregate state GDO appears to conform reasonably well to projected, which implies that sectoral over- and underprojections balance out in terms of GDO. A similar balancing out does not occur in the implied water requirements. The major reason for this is to be found in the projected growth for primary agricultural sectors [1–10], which in the aggregate and for most individual sectors is seriously overprojected under each projection alternative. Primary agricultural sectors in the aggregate account for less than 5 per cent of state GDO but more than 85 per cent of total applied water requirements as projected for 1965. The dominance of primary agriculture as a water user means that projected water requirements become particularly senitive to projected growth for this major sector.

The extent of overprojection is suggested by certain calculations summarized below based on observed growth rates in output for primary agricultural sectors in the period 1954–1962. On this basis, the aggregate water requirement for agricultural sectors [4–9] is around 22 million acre-feet in 1965. This compares with just under 27 million acre-feet projected for 1965 under A-II, the projection alternative exhibiting the lowest total water requirements. This is a substantial discrepancy associated with only an 11-year projection span. The 22 million acre-feet estimate should not be endowed with undue precision. On the other hand, observed growth rates are more compatible with this lower figure, and this serves to emphasize the necessity for regarding the higher levels projected with considerable caution. Description of procedures used in generating this rival estimate for 1965 follows.

The rival estimate accepts observed growth rates for primary agricultural sectors in table 15 as valid indicators of actual growth rates for the full projection span, 1954–1965. Observed growth rates for individual sectors 4 through 9 are used. These six sectors together accounted for over 80 per cent of projected water requirements for 1965. The compound annual growth rate for each sector is applied to its corresponding

TABLE 16

IMPLIED WATER REQUIREMENTS IN 1965 BASED ON PROJECTED AND OBSERVED GROWTH RATES, SECTORS 4–9

Sector	1954 requirements	Implied 1965 requirements*			
		A-I	A-II	A-III	Observed growth rates
	1	2	3	4	5
	acre-feet				
4	4,609,890	6,222,145	5,830,714	5,922,207	5,150,343
5	2,391,520	3,477,103	2,566,046	2,572,691	2,906,301
6	1,543,630	2,258,166	1,889,826	2,168,584	1,752,977
7	2,618,276	4,130,616	3,371,598	4,362,809	3,013,543
8	442,025	757,932	568,008	594,182	299,358
9	8,458,283	12,828,315	12,574,881	12,707,197	8,966,692
Sum (4–9)	20,063,624	29,674,277	26,801,673	28,327,670	22,089,541

* Based on adjusted water coefficients.

SOURCES:

Cols. 1–4: From table D-12.

Col. 5: Computed; observed production growth rates from table 15 applied to base year GDO from table D-7 and adjusted water coefficients from table 9 applied to resulting sectoral GDO.

base year GDO and the resulting modified sectoral GDO projections for 1965 are multiplied by corresponding adjusted water coefficients from table 9. The results are summarized in table 16.

The resulting implied water requirements for the sector aggregate [4–9] are substantially less for 1965 than requirements derived from the original projections—5 to 6 million acre-feet less for projections A-II and A-III.[25] The observed growth rates for other sectors are too tenuous and fragmentary to extend these calculations to the remaining sectors. However, water requirements are much smaller in the remaining sectors, and beyond this there would be a stronger tendency for over- and underprojection to balance out. Accordingly, the result for the sector aggregate [4–9] may be taken as a first approximation to the overprojection for 1965 for the entire California economy. This suggests that total applied water requirements of around 28–29 million acre-feet is a more realistic measure for 1965 than the 33–35 million acre-feet projected under A-II and A-III, respectively.

A similar straightforward adjustment in implied water requirements for 1970 and 1975 would be reasonable only if it could be assumed that the observed

[25] The lower water requirements for the sector aggregate [4–9] obtained on the basis of observed growth rates in table 16 also appear to be consistent with what evidence is available on growth of irrigated land in California. Data on total "irrigated land in farms" and "irrigated cropland harvested" are available for 1954 (36) and 1959 (37). The derived compound annual rate of growth from 1954 to 1959 was for irrigated land in farms 1.0 per cent and for irrigated cropland harvested 0.9 per cent. The implied compound annual rate of growth in water requirements for the aggregate [4–9] as given by the adjusted figure in table 16 is 0.9 per cent. This latter rate is based on observed growth in the longer period 1954–1962 and in this sense is not strictly comparable with the irrigated acreage growth rates based on 1954–1959. Also, the irrigated acreage growth rates do not reflect growth associated with changing relative importance of multiple cropping on irrigated land, but the effects of this on growth rate are probably minor.

Recognizing the limitations on comparability of the derived rates for present purposes, the comparison remains suggestive. The derived rates for adjusted water requirements and irrigated land show close agreement. And this agreement would appear to lend additional support to the water requirements adjustment shown in table 16.

growth rates for primary agricultural sectors in 1954–1962 represented the long-run growth rates for these sectors. There is hardly basis for either accepting or rejecting this assumption. What these comparisons with observed experience indicate is that our projected conditions do result in overprojection of primary agriculture in the first projection span, 1954–1965, even under A-II, the alternative assigning the smallest role to primary agriculture in California's growing economy. In the face of this strongly suggestive evidence, one concludes that more realistic projections would probably result under projection conditions which include more severe constraints on growth of most primary agricultural sectors. Among other things, this means that imports of primary agricultural products would grow somewhat faster relative to exports than what is exhibited in table 5 for the present projections. Finally, it implies that, due to the importance of primary agricultural sectors as water users, realistic total water requirements for 1970 and 1975 are probably significantly below those implied by our projections.

APPENDIX A

THE FORMAL PROJECTION FRAMEWORK

A-1. The Input-Output Model

This note represents a formal statement of the input-output model used in the present work. The magnitudes and coefficients defined may be regarded as referring to the California economy although the statement here could be regarded as referring to any regional economy. Counterpart, empirical measures for the California economy based on 1954 are summarized in Appendix B.

In what follows, subscripts i and j refer to endogenous sectors ($i, j, = 1, 2, \ldots, n$). (In the input-output table format, i denotes endogenous row, and j denotes endogenous column.) Exogenous sectors are denoted by h (households),s (state and local government), f (federal government), e (exports), k (capital formation), and m (noncompetitive imports).

Define:

(A.1.0)

X_i = gross domestic output of sector i.

M_i = competitive imports of sector i product.

ΔU_i = net withdrawal from inventories of sector i product. (This element is zero for those sectors showing no change or an increase in inventories in the base year, 1954.)

$X^g{}_i = X_i + M_i + \Delta U_i$ = gross supply of sector i product.

X_{ij} =domestic output of sector i used as input in sector j.

M_{ij} = competitive imports of sector i product used as inputs in sector j.

ΔU_{ij} = withdrawal from inventory of sector i product used as inputs in sector j.

$X^g{}_{ij} = X_{ij} + M_{ij} + \Delta U_{ij}$ = total supply of sector i product used as inputs in sector j.

Y_{ih} = purchases by households of sector i product.

Y_{is} = purchases by state and loval government of sector i product.

Y_{if} = purchases by federal government of sector i product.

Y_{ie} = net exports of sector i product. (This element is zero for net importing sectors.)

$Y_i = Y_{ih} + Y_{is} + Y_{if} + Y_{ie}$ = total "final demand" for product of sector i, excluding capital formation.

ΔK_i = sector i product flowing to capital formation (expansion capital plus net additions to inventory).

Z_{mj} = noncompetitive imports used as inputs by sector j.

$Z_{mh}, Z_{ms}, Z_{mf}, Z_{mk}$ = noncompetitive imports used as inputs by exogenous sector denoted by second subscript.

Z_{sj} = state and local government "inputs" to (tax receipts from) sector j.

$Z_{sh}, Z_{ss}, Z_{sf}, Z_{sk}$ = state and local government inputs to (tax receipts from) exogenous sector denoted by second subscript.

Z_{fj} = federal government inputs to (tax receipts from) sector j.

$Z_{fh}, Z_{fs}, Z_{ff}, Z_{fk}$ = federal government inputs to (tax receipts from) exogenous sector denoted by second subscript.

Z_{hj} = household input to (household income from) sector j.

$Z_{hh}, Z_{hs}, Z_{hf}, Z_{hk}$ = household input to (household income from) exogenous sector denoted by second subscript.

It will help to clarify the terms defined to refer to table 1 (page 4). In the upper left $(n \times n)$ partition are the intersectoral flows X^g_{ij}. The $(n \times 5)$ array next on the right represents flows from corresponding endogenous row sectors to final demand, including capital formation. The lower left $(4 \times n)$ partition contains inputs from exogenous sectors to endogenous sectors. And the lower (4×5) rectangular array for exogenous sectors represents purchases by exogenous column sectors from exogenous row sectors. A number of the magnitudes are zero. No Z designations appear in the net export column since this sector is defined in a way such that no payments are made to exogenous row sectors.

Entries appear in the total supply column for endogenous rows only, each entry being simply the sum of all elements to its left. To the right of total supply are (competitive) import (M_i) and inventory withdrawal (ΔU_i) columns, each appearing with negative signs. These items are subtracted from total supply for each endogenous sector to give that sector's gross domestic output (X_i). It is noted that column sums for endogenous sectors are equal to row sums for corresponding sectors. Balance in the overall system implies that this condition will be met if all exogenous "producing" sectors are represented in the four rows of Z elements. Equality is not implied for corresponding column and row sums of exogenous sectors.

In any given year, a part of the total supply of sector i product will be used as input in endogenous sectors j (represented by the elements X^g_{ij}), while the balance of the supply will flow to one or more of the components of final demand (Y_{ih}, Y_{is}, Y_{if}, Y_{ie}) and/or to capital formation (ΔK_i). For any sector i, there is a balance implied which may be written:

$$X^g_i = X^g_{i1} + X^g_{i2} + \cdots + X^g_{in} + Y_{ih} + Y_{is} + Y_{if} + Y_{ie} + \Delta K_i \tag{A.1.1}$$

or, alternatively, as:

$$X^g_i - X^g_{i1} - X^g_{i2} - \cdots - X^g_{in} = Y_{ih} + Y_{is} + Y_{if} + Y_{ie} + \Delta K_i. \tag{A.1.2}$$

The n relations (A.1.2) are the Leontief balance relations.

To transform the balance equations into the conventional form expressed in terms of input-output coefficients, define:

$$a_{ij} = \frac{X^g_{ij}}{X_j}$$

$$m_i = \frac{M_i}{X^g_i} \tag{A.1.3}$$

$$u_i = \frac{\Delta U_i}{X^g_i}.$$

The coefficients a_{ij} are the "technical production coefficients," expressing in dollar terms (in base year prices) the sector i product required as input per unit of gross

domestic output of sector j. But it is total supply that is distributed over sectors in (A.1.1.) and (A.1.2), and total supply of sector i product may include, in addition to domestic production in a given year, imports represented by M_i and withdrawals from inventory represented by ΔU_i. The coefficients m_i represent the proportion of total supply of sector i product imported, and the u_i represents the proportion of total supply withdrawn from inventory. In the present case, m_i is zero for a net exporting sector in the bast year, and u_i is zero for a sector showing no net withdrawals from inventory in the base year.

Now, it is clear that the proportion of total supply of sector i domestically produced in a given year is represented by $(1 - m_i - u_i)$ and we may write:

$$(A.1.4) \qquad X_i = (1 - m_i - u_i)X_i^g$$

from which we obtain:

$$(A.1.5) \qquad X_i^g = \frac{X_i}{(1 - m_i - u_i)} .$$

The equation (A.1.2) may now be written:

$$(A.1.6) \qquad \left[\frac{1}{(1 - m_i - u_i)}\right] X_i - a_{i1}X_1 - a_{i2}X_2 - \cdots - a_{in}X_n = Y_i + \Delta K_i$$

where the sum of the Y components of the final demand is written as Y_i.

For our purposes, the system (A.1.6) is more conveniently dealt with in condensed matrix form. Accordingly, define:

(A.1.7)

$X^g = n$ element column vector of total supplies.
$X = n$ element column vector of gross domestic outputs.
$Y = n$ element column vector of total final demands, excluding capital formation.
$Y_h, Y_s, Y_f, Y_e = n$ element column vectors of purchases by exogenous sectors denoted in the subscripts.
$\Delta K = n$ element column vector of flows to capital formation.
$A = \{a_{ij}\} = (n \times n)$ matrix of technical coefficients (a_{ij} is the element in the ith and jth column).
$D_m = (n \times n)$ diagonal matrix of import coefficients m_i.
$D_u = (n \times n)$ diagonal matrix of inventory withdrawal coefficients u_i.
$I = (n \times n)$ identity matrix.

Introducing these definitions, the matrix expression representing the system (A.1.6) may be written:

$$(A.1.8) \qquad [(I - D_m - D_u)^{-1} - A]X = Y + \Delta K$$

where the superscript –1 denotes inverse. And, denoting the $(n \times n)$ matrix in square brackets on the left of (A.1.8) by C, we have:

$$CX = Y + \Delta K \tag{A.1.9}$$

Now, for given levels of the final demand vectors Y and ΔK and assuming that the coefficients in C are known, the sectoral gross domestic outputs which the economy is required to produce to support the given final demand may be obtained from solving (A.1.9) for the vector X. The solution is given by:

$$X = C^{-1}(Y + \Delta K) \tag{A.1.10}$$

where the superscript –1 again denotes inverse. Elements X_i in the solution for X include domestically produced sector i product flowing to final demand plus domestically produced sector i product required as inputs in other endogenous sectors to meet the levels of final demand represented by given Y and ΔK. Thus, the solution X reflects direct *and* indirect requirements of outputs X_i. In input-output parlance, C^{-1} is commonly referred to as the matrix of interdependence coefficients.

The projection scheme is considered explicitly in the next note, but it derives essentially from (A.1.10). What is desired is a projection of the vector X for a future projection reference year T. (In our case, projection reference years are 1965, 1970, and 1975.) If both the vectors Y_T and ΔK_T could be projected exogenously and if the base year empirical measure of the matrix C could be used without modification, it would be a straightforward matter to substitute projected Y_T and ΔK_T for Y and ΔK in (A.1.10) and perform the indicated multiplication to obtain X_T.

However, two major reasons make a straightforward procedure of this sort not appropriate. First, the required additions to capital in year T (ΔK_T) cannot very reasonably be considered independently of X_T. To recognize this dependence requires that the projection scheme be modified to allow ΔK_T to be generated by the endogenous mechanism simultaneously with X_T for given (exogenously projected) final demand vector Y_T. Second, to assume that coefficients in the C matrix remain stable at base year values is a particularly hazardous assumption. It is not uncommon in projections based on input-output constructs to assume that base year technical coefficients (a_{ij}) apply without change for the projection span, and this assumption is adopted in the present work. Of course, adopting the assumption does not make it valid. One would prefer to adjust technical coefficients for projection purposes if the empirical bases for such adjustment could be developed from data at hand. However, assumed constancy of technical coefficients would be expected to be somewhat closer to reality than would assumed constancy of the matrix C. This is so since the C matrix involves import coefficients as well as the technical coefficients, and considerable variability in the elements of C for a given region can result from variation in patterns of trade. This is particularly true of an open state economy like California's which is growing rapidly and which in the base year depended heavily upon trade with the rest of the world for a range of products consumed. It turns out that use of base year import coefficients does not generate very plausible projections in the present case.

In terminating this note, it is convenient to set down some additional expressions which are used in examining balance in the projections summarized in the text. Define "input" coefficients for exogenous producing (row) sectors:

$$z_{mj} = \frac{Z_{mj}}{X_j};\ z_{mh} = \frac{Z_{mh}}{\bar{H}};\ z_{ms} = \frac{Z_{ms}}{\bar{S}};\ z_{mf} = \frac{Z_{mf}}{\bar{F}};\ z_{mk} = \frac{Z_{mk}}{\Delta K}$$

$$z_{sj} = \frac{Z_{sj}}{X_j};\ z_{sh} = \frac{Z_{sh}}{\bar{H}};\ z_{ss} = \frac{Z_{ss}}{\bar{S}};\ z_{sf} = \frac{Z_{sf}}{\bar{F}};\ z_{sk} = \frac{Z_{sk}}{\Delta K}$$

(A.1.11)

$$z_{fj} = \frac{Z_{fj}}{X_j};\ z_{fh} = \frac{Z_{fh}}{\bar{H}};\ z_{fs} = \frac{Z_{fs}}{\bar{S}};\ z_{ff} = \frac{Z_{ff}}{\bar{F}};\ z_{fk} = \frac{Z_{fk}}{\Delta K}$$

$$z_{hj} = \frac{Z_{hj}}{X_j};\ z_{hh} = \frac{Z_{hh}}{\bar{H}};\ z_{hs} = \frac{Z_{hs}}{\bar{S}};\ z_{hf} = \frac{Z_{hf}}{\bar{F}};\ z_{hk} = \frac{Z_{hk}}{\Delta K}.$$

Representing the coefficients for endogenous sectors in vector form by:

$z_m = n$ element column vector of coefficients z_{mj}
$z_s = n$ element column vector of coefficients z_{sj}
$z_f = n$ element column vector of coefficients z_{fj}
$z_h = n$ element column vector of coefficients z_{hj}

we may write the expressions:

$$z_m'X + z_{mh}\bar{H} + z_{ms}\bar{S} + z_{mf}\bar{F} + z_{mk}\overline{\Delta K} = \bar{Z}_m \quad \text{(total noncompetitive imports)}$$

$$z_s'X + z_{sh}\bar{H} + z_{ss}\bar{S} + z_{sf}\bar{F} + z_{sk}\overline{\Delta K} = \bar{Z}_s \quad \text{(total state and local government tax receipts)}$$

(A.1.12)

$$z_f'X + z_{fh}\bar{H} + z_{fs}\bar{S} + z_{ff}\bar{F} + z_{fk}\overline{\Delta K} = \bar{Z}_f \quad \text{(total federal government tax receipts)}$$

$$z_h'X + z_{hh}\bar{H} + z_{hs}\bar{S} + z_{hf}\bar{F} + z_{hk}\overline{\Delta K} = \bar{Z}_h \quad \text{(total household income)}$$

where primes on z vectors in the first term in each case denote transpose. Base year values of Z coefficients are used for each projection reference year. The assumed constancy of these coefficients also may not be plausible in all respects. On the other hand, firm basis for specific patterns of change in future years is difficult to develop. It should be noted that, since capital formation is dealt with in projection in a manner different from that implied by the straightforward procedures here described, the exogenous inputs in this sector also enter in a different way.

A-2. The Projection System

This note is a statement of results of certain algebraic manipulation to put the projection system in appropriate form for generating the empirical results desired. Throughout, the projections reference year will be denoted by T, which in this study refers to 1965, 1970, or 1975. Fixed base year technical coefficients (a_{ij}) are employed in all projections. And fixed base year import coefficients are adopted initially; i.e., the matrix C does not vary for different T. Although it does not appear explicitly here, withdrawals from inventory have not been permitted as a source of supply of products in projection. This is accomplished by regarding all coefficients u_i in (A.1.3) as zero. Accordingly, D_u is zero in (A.1.8).

The empirical technical coefficients employed in projection have embodied in them an allowance for capital replacement but not for expansion of capital to

maintain capital stocks at levels "required" to sustain growth. If only capital replacement is to be provided for in projection and the net additions to capital stock required to sustain growth simply disregarded, the projection system under a fixed C matrix is represented by (A.1.10) with ΔK set equal to zero. Accordingly, we may write:

$$X_T = C^{-1} Y_T \,. \tag{A.2.1}$$

Final demands Y_T are projected exogenously, and (A.2.1) is solved to obtain X_T. Preliminary projections were obtained by (A.2.1) in the present study as a basis for preliminary appraisal of performance of the system under fixed base year import coefficients.

The inclusion of capital required to sustain growth in the projections implies additional output of capital goods—or borrowing from the rest of the world—to maintain productive capacity and inventory-output ratios compatible with levels of output required to meet current demands in year T. The empirical constructs employed in this study (Zusman and Hoch, 72) distinguish two forms of capital to be recognized in the growth process—expansion capital and inventories. Capital coefficients have been developed in relation to "capacity" for the former and in relation to output for the latter. Where capital requirements have been incorporated in the empirical projections in this report, only expansion capital has been introduced. Although the following development employs terminology which may seem to refer specifically to expansion capital, from the point of view of implementing empirical projections, the capital dealt with might as well be regarded as including both expansion capital and inventories.

To incorporate capital requirements, define the capital coefficient:

$$k_{ij} = \frac{K_{ij}}{X_j} \tag{A.2.2}$$

and the matrix of capital coefficients:

$$K = (r \times n) \text{ matrix of capital coefficients } k_{ij}. \tag{A.2.3}$$

In (A.2.2), k_{ij} represents the amount (in base year dollar terms) of product of sector i required as capital goods by sector j per unit GDO of the latter. If each sector j is producing up to capacity, the coefficients k_{ij} are capital goods requirements per unit capacity. In the matrix K, $r \leqq n$. A sector not producing capital goods is not represented in a row of K. *Hence,* $r = n$ only in the case where sectors are defined in such a way that capital goods are produced in each sector.

Now, the addition to capital goods (ΔK) required to maintain capacity compatible with an increase in projected output is given by:

$$\begin{aligned} \Delta K_T &= KX_T - KX_0 \\ &= \bar{K}_T - \bar{K}_0 \end{aligned} \tag{A.2.4}$$

where subscript 0 denotes the year serving as base for the projection. Expression (A.2.4) is an r element column vector. The ith element of $\bar{K}_T$ represents the total requirements of sector product for use as capital goods in producing the *GDO*

represented by X_T, and the ith element of K_0 is similarly defined with reference to the base year. Base year outputs X_0 are known prior to projection, and, given K, $\bar{K}_0$ corresponding to X_0 can be derived. Then the constraint to be imposed on the projection system to incorporate ΔK_T in the endogenous mechanism is obtained directly from (A.2.4) and may be written:

$$KX_T - I(\Delta K_T) = \bar{K}_0 \tag{A.2.5}$$

where I is the $(r \times r)$ identity matrix. This expression says that the vector of additions to capital goods subtracted from the vector of total capital goods which must be on hand, in accordance with requirements, at point T is equal, element by element, to the vector of capital goods on hand in the base year.

What remains is to augment the system (A.1.9) to incorporate the constraints (A.2.5). The resulting system is the following, written in partitioned matrix form:

$$\begin{bmatrix} C & \vdots & -E_k \\ \cdots & \vdots & \cdots \\ K & \vdots & -I \end{bmatrix} \begin{bmatrix} X_T \\ \cdots \\ \Delta K_T \end{bmatrix} = \begin{bmatrix} Y_T \\ \cdots \\ \bar{K}_0 \end{bmatrix}. \tag{A.2.6}$$

The submatrix I appearing with negative sign on the left is the $(r \times r)$ identity matrix. All other submatrices have been previously defined except E_k. This matrix is $(n \times r)$ and is an operator which, with negative sign, serves to subtract from total projected output X_T that part of output required in the augmentation of capital stocks, thus leaving a net flow to final demand just sufficient to meet exogenously projected X_T. The entries in E_k depend upon the span covered by a given projection. The elements in each row and column of E_k are all zero except one, and this element is an appropriately positioned number p, representing the proportion of ΔK_T produced in reference year T. Positioning of p would be in the first column of row 1, the second column of row 2, and so on. If the span covered by the projection is greater than one year, only part of the capital stock increment ΔK_T would be produced in reference year T. In the present projections, the simple procedure was adopted of assigning $(1/s)$ of ΔK_T to each year spanned, where s represents the number of years spanned. Hence, if the span is five years, the nonzero element appearing in E_k becomes 0.2.

The full matrix on the left of (A.2.6) is $(n+r) \times (n+r)$. For independently projected Y_T and given initial $\bar{K}_0$, projected X_T and ΔK_T are given by:

$$\begin{bmatrix} X_T \\ \cdots \\ \Delta K_T \end{bmatrix} = \begin{bmatrix} C & \vdots & -E_k \\ \cdots & \vdots & \cdots \\ K & \vdots & -I \end{bmatrix}^{-1} \begin{bmatrix} Y_T \\ \cdots \\ \bar{K}_0 \end{bmatrix}. \tag{A.2.7}$$

The ΔK_T generated in this form relates to the full projection span. Adopting the simple procedure noted above, the part assignable to reference year T is $(1/s)\Delta K_T$.

The augmented matrix to be inverted for (A.2.7) would normally be somewhat larger than C. In our case, 15 rows and columns were added by the inclusion of K, resulting in an enlarged matrix (43×43). But, due to the structure of the submatrices E_k and I, a stepwise procedure for inversion of the enlarged matrix be-

comes convenient. To see this, write the inverse of the partitioned matrix on the right of (A.2.7) in the form of a corresponding partitioning directly of elements of the inverse. That is, write:

$$\text{A.2.8)} \qquad \left[\begin{array}{c:c} C & -E_k \\ \hdashline K & -I \end{array}\right]^{-1} = \left[\begin{array}{c:c} C^{11} & C^{12} \\ \hdashline K^{21} & K^{22} \end{array}\right].$$

Then, from the multiplication of the inverse by the original matrix:

$$\text{(A.2.9)} \qquad \left[\begin{array}{c:c} C & -E_k \\ \hdashline K & -I \end{array}\right]\left[\begin{array}{c:c} C^{11} & C^{12} \\ \hdashline K^{21} & K^{22} \end{array}\right] = \left[\begin{array}{c:c} I & 0 \\ \hdashline 0 & I \end{array}\right]$$

we obtain:

$$\text{(A.2.10)} \qquad \begin{aligned} &\text{(a)}\ CC^{11} - E_kK^{21} = I \\ &\text{(b)}\ CC^{12} - E_kK^{22} = 0 \\ &\text{(c)}\ KC^{11} - K^{21} = 0 \\ &\text{(d)}\ KC^{12} - X^{22} = I \end{aligned}$$

where the identity matrices on the right of (a) and (d) are $(n \times n)$ and $(r \times r)$, respectively; and the 0 matrices on the right of (b) and (c) are $(n \times r)$ and $(r \times n)$, respectively. After some manipulation, this set of relations gives:

$$\text{A.2.11)} \qquad \begin{aligned} &\text{(i)}\ C^{11} = [C - E_kK]^{-1} \\ &\text{(ii)}\ C^{12} = C^{11}(-E_k) \\ &\text{(iii)}\ K^{21} = KC^{11} \\ &\text{(iv)}\ K^{22} = KC^{12} - I\,. \end{aligned}$$

The matrix to be inverted directly in this operation is the $(n \times n)$ matrix in (i), while the remaining elements are obtained through the auxiliary expressions (ii) to (iv).

A-3. Trade Balance Adjustment

The projection scheme adopted does not incorporate the relation of the California economy to the "rest of the world" (mainly, other regions in the United States) as a part of the endogenous mechanism. Thus, trade balance with the rest of the world, if not otherwise controlled, is essentially determined by the particular set of independently projected export demands and import coefficients applying to a particular projection reference year. In this connection, it seems plausible to include net federal government expenditures in California as one component of the trade balancing relation. An excess of federal expenditures over receipts in a par-

ticular region represents net expenditures within the region from external sources. From the point of view of the regional (California) economy, this is equivalent to net exports. Thus, in considering California's trade balance with the rest of the world, net federal expenditures in California should be taken explicitly into account.

In view of the manner in which independent projections of net exports and federal expenditures have been derived in the projection scheme, the use of fixed base year import coefficients in projection would be expected to generate a growing deficit position for the California economy; that is, a widening gap in the excess of imports over exports is to be expected. There is point, therefore, to examining the apparent trade balance which emerges from straightforward application of procedures previously outlined and introducing adjustments if such are indicated for preserving a "more realistic" degree of balance in California's projected trade with the aggregate of other regions. The mechanism which must operate to correct imbalance will involve one or a combination of three forces: (a) an increment in net exports, (b) a decrement in net imports, and/or (c) an increment in net federal expenditures in California. This note develops explicit expressions for trade balance effects in each case. Expressions analogous to those here derived were employed in the specific alternative trade balance adjustments introduced in the empirical projection system:

$$(A.3.1) \qquad CX_T = Y_T + \Delta K_T$$

for projected Y_T and ΔK_T and given C matrix. Now, projected output given by:

$$(A.3.2) \qquad X_T = C^{-1}Y_T + C^{-1}(\Delta K_T)$$

may be thought of as decomposable into two components, $X^1{}_T$ and $X^2{}_T$, where $X^1{}_T$ is identified with the first component on the right and $X^2{}_T$ is identified with the second component. In the projection procedure, Y_T is projected exogenously and ΔK_T is determined endogenously by the procedure outlined in the preceding appendix. In the present note, it is convenient to deal in terms of component $X^1{}_T$ only. This is in accord with projection procedures followed. That is, in the projection procedure, preliminary projections were obtained for $X^1{}_T$ only. This component was then examined for trade balance, and adjustments in projected exports and import coefficients were introduced to force balance in the part of California economic activity represented by this component. This is what has been referred to as forcing "balance on current account," although identifying the component X^1 with California economic activity on current account is an arbitrary distinction in an important sense. The adjusted import coefficients, and correspondingly adjusted C matrix, are then regarded as applicable for the projection of both components of output.

(a) Net export increment: It will be recalled that, due to the way in which exports and imports are dealt with in the California model, a given sector is a net exporter or a net importer (or exactly balanced). In projection, net exports are permitted only from base year net exporting sectors, and import coefficients greater than zero are permissible only for base year net importing sectors. The trade balance effect of an export increment is here considered under the assumption that base year import coefficients continue to apply for importing sectors. Then, recall-

ing that exports appear as a component of the final demand vector Y (Appendix A-1), we may write the increment in output required to support an increase in exports as:[26]

$$\text{A.3.3)} \qquad \Delta X = C^{-1}(\Delta Y_e) \, .$$

Let the net trade balance effect of an increment in exports be represented by $\overline{\Delta V}$. Due to "leakage," the increment in net exports required to generate a given increment $\overline{\Delta V}_0$ in the net trade balance will generally be larger than the export increment itself; that is $(1'_n)\ (\Delta Y_e) > \overline{\Delta V}^0$, where $(1'_n)$ is an n element row vector with each element unit. The leakage arises from the fact that the incremental output required to support an export increment itself calls for additional imports and generates additional federal receipts. Accordingly, alternative equivalent explicit expressions for the net trade balance effect are:

$$\text{(A.3.4)} \qquad \begin{aligned} &(a)\ \overline{\Delta V} = 1_n'(\Delta Y_e) - (q + z_m + z_f)'(\Delta X) \\ &(b)\ \overline{\Delta V} = 1_n'(\Delta Y_e) - (q + z_m + z_f)'C^{-1}(\Delta Y_e) \\ &(c)\ \overline{\Delta V} = [1_n' - (q + z_m + z_f)'C^{-1}](\Delta Y_e) \, . \end{aligned}$$

All terms in (A.3.4) have been previously defined (note A-1) except q, and q is an n element column vector of competitive import coefficients denoting competitive imports per unit gross domestic output (that is, $q_i = M_i/X_i$).[27] The second term on the right of (A.3.4a) represents leakage. That is, the increment in competitive imports, noncompetitive imports, and federal receipts required to generate the output increment ΔX is subtracted from the net export increment ΔY_e. Federal expenditures are assumed to remain stable and, hence, do not appear in the expression. It will be clear that the incremental export vector may include positive increments for each exporting sector or for only some of them. Thus, (A.3.4) includes the case where only one element in ΔY_e is greater than zero.

To facilitate comparison of different import-export patterns for balancing trade, the net effect on trade balance $\overline{\Delta V}$ may be set at some convenient level $\overline{\Delta V}^0$. In this way, it is possible to compare directly equivalent alternatives, equivalent in the sense that each generates the same net trade balance effect. In the present case, let the incremental export vector which will generate the net trade balance effect $\overline{\Delta V}^0$ be designated by ΔY^0_e. Choose first any convenient vector ΔY_e in (A.3.4c) and obtain $\overline{\Delta V}$. ΔY^0_e may then be determined by multiplying ΔY_e by the scalar $\overline{\Delta V}^0/\overline{\Delta V}$; that is:

$$\text{(A.3.5)} \qquad \Delta Y^0_e = \Delta Y_e \left(\frac{\overline{\Delta V}^0}{\overline{\Delta V}} \right) .$$

(b) Net import decrement: An import decrement for importing sectors is the counterpart of an export increment for exporting sectors from the point of view of achieving trade balance. In the derivation of the export increment as in (a), it

[26] To simplify notation, subscript T is omitted from this and following algebraic expressions though the expressions apply to a projection reference point T.

[27] Competitive import coefficients m_i have been defined denoting sector i imports per unit total supply of product of sector i. q_i may be expressed in terms of m_i by $q_i = m_i/(i - m_i)$.

was assumed that import coefficients for importing sectors remained fixed at base year levels and that federal government expenditures remained fixed at some exogenously projected level. In the present case of an import decrement, additional domestic output is required to replace product previously imported. And there are additional indirect output requirements spread over all sectors. For convenience, the condition is imposed that the additional output required from each sector in offsetting an import decrement for a given sector is to be met wholly from domestic output. Thus, for the incremental effect being examined, competitive import coefficients are zero for all sectors. This can be achieved, working from the form (A.3.4c), replacing C^{-1} by $[I-A]^{-1}$ and replacing q by zero in the leakage term. Accordingly, denoting the vector of import decrements by ΔM, we may write directly for the net trade balance effect:

$$\overline{\Delta V} = \{1_n' - (z_m + z_f)'[1 - A]^{-1}\}\Delta M. \tag{A.3.6}$$

It is understood that for this case the final demand vector, including export and federal expenditure components, is regarded as fixed. The incremental output required to offset the competitive import decrement ΔM is:

$$\Delta X = [I - A]^{-1}\Delta M. \tag{A.3.7}$$

Again denoting the import decrement required to achieve a trade balance effect ΔV^0 by ΔM^0, a conveniently chosen initial vector ΔM in (A.3.6) can be scaled to ΔM^0 by:

$$\Delta M^0 = \Delta M \left(\frac{\overline{\Delta V^0}}{\overline{\Delta V}}\right). \tag{A.3.8}$$

As with exports, forms (A.3.6) and (A.3.7) may be used if desired to examine the effect of import decrements in the full set or any subset of importing sectors.

The essential difference between the procedure here described and that outlined in (a) is that incremental indirect competitive import requirements are met here through domestic production. Net export increments in (a) can be treated under precisely the same restriction, in which case the expressions appearing here are directly applicable. The empirical results in table 12 were obtained for exporting as well as importing sectors by these formulae rather than those in (a). The resulting measures generated for export increments and import decrements are, therefore, directly comparable.

(c) Federal expenditure increment: Examining the trade balance effect of an increment in federal government expenditures in isolation (that is, assuming import coefficients fixed at base year levels and assuming other components of final demand, including exports, fixed) involves only a slight modification of (A.3.4c). The modification is necessary since the leakage term in (A.3.4) does not reflect the full amount of leakage associated with an increment in federal expenditures. The additional item to be netted out is federal government receipts appearing as "input" in the exogenous federal expenditure column (see table A-1). Define the sum of federal purchases from endogenous sectors in table A-1 as $\overline{Y}_f$ (that is, $\overline{Y}_f = \sum_i Y_{if}$). The federal receipts coefficient in the federal government final demand sector is defined in (A.1.6) as $z_{ff} = Z_{ff}/\overline{F}$, where $\overline{F}$ represents total federal expenditures as contrasted with $\overline{Y}_f$ representing federal purchases from endogenous sectors. In the projection procedure, it is assumed that the ratio $(\overline{Y}_f/\overline{F})$ remains

stable at the base year value. Thus, the additional federal receipts to be netted out in this case are easily allowed for by the inclusion of an additional term in (A.3.4c). With appropriate modification, we write directly for the net trade balance effect:

$$\overline{\Delta V} = \left\{ 1_n' - (q + z_m + z_f)' C^{-1} - \left(\frac{z_{ff} \bar{F}}{\bar{Y}_f} \right) 1_n' \right\} \Delta Y_f \tag{A.3.9}$$

where ΔY_f denotes incremental federal expenditures allocated over sectors in some predetermined way. The output requirements for this case are given by an expression analogous to (A.3.8) with ΔY_f replacing ΔY_e. Also, ΔY^0_f can be determined by scaling as for exports in (A.3.10).

Concluding Note

The above development focuses on export increments, import decrements, and federal expenditure increments each in isolation. In certain empirical results presented in this report, export increments and import decrements are imposed simultaneously. In these cases, as with individual sectors examined in isolation, only expressions developed in (b) have been employed; that is, the full supporting output increment is assumed to be domestically produced. No cases are considered in which federal expenditure increments are combined with import decrements or export increments to achieve trade balance. Independently projected federal expenditures have an effect on the trade balance which emerges in the empirical projections, but beyond this, adjustment of federal expenditures is not regarded as an "acceptable" device for maintaining balance in California's economy vis-à-vis the rest of the world.

APPENDIX B

EMPIRICAL INPUT-OUTPUT MEASURES: PRODUCT FLOWS AND COEFFICIENTS

TABLE B-1

GROSS INDUSTRY FLOWS, CALIFORNIA ECONOMY, 1954*

Sector†	Endogenous						
	1	2	3	4	5	6	7
	Meat animals	Poultry and eggs	Farm dairy products	Grains	Cotton	Vege-tables	Fruit and nuts
	thousand dollars						
Endogenous							
1. Meat animals and products	0	0	0	0	0	0	0
2. Poultry and eggs	0	57,363	0	0	0	0	0
3. Farm dairy products	0	0	9,325	0	0	0	0
4. Food and feed grains	15,789	26,264	8,288	9,308	0	0	0
5. Cotton	0	0	0	0	1,084	0	0
6. Vegetables	0	0	0	0	0	5,562	0
7. Fruit (excluding citrus) and nuts	0	0	0	0	0	0	0
8. Citrus	0	0	0	0	0	0	0
9. Forage	91,016	0	81,371	0	0	0	0
10. Miscellaneous agriculture	107	0	1,976	8,109	28,939	16,206	13,260
11. Grain mill products	17,366	118,766	34,343	0	0	0	0
12. Meat and poultry processing	0	0	0	0	0	0	0
13. Dairy products	0	0	0	0	0	0	0
14. Canning, preserving, and freezing	0	0	0	0	0	0	0
15. Miscellaneous agricultural processing	0	0	0	0	0	0	0
16. Chemicals and fertilizers	1,355	1,516	1,676	13,337	15,219	13,635	20,554
17. Petroleum	855	1,195	1,259	4,056	2,064	4,014	9,732
18. Fabricated metals and machinery	2,015	5,207	7,860	23,158	23,955	17,747	27,384
19. Aircraft and parts	0	0	0	0	0	0	0
20. Primary metals	0	0	0	0	0	0	0
21. Other manufacturing	846	12,035	1,584	905	868	24,692	10,424
22. Mining	0	0	0	21	61	76	164
23. Utilities	1,523	1,742	1,485	583	838	1,353	3,153
24. Selected services	820	1,661	1,316	3,937	1,877	3,870	8,9.1
25. Trade and transportation	16,141	31,143	15,345	17,404	17,280	24,116	20,542
26. Unallocated	2,553	5,268	7,268	1,685	2,259	2,770	5,915
27. Scrap and by-products	9,293	945	6,304	0	0	0	0
28. Construction	5,218	8,813	9,676	2,856	4,262	4,424	2,762
Exogenous							
m. Noncompetitive imports	113,270	0	10,475	0	0	0	0
s. State and local governments	5,667	4,065	10,663	7,763	6,546	9,797	11,577
f. Federal government	283	886	613	1,117	1,614	2,239	2,075
h. Households	52,764	34,748	132,716	103,490	177,463	357,338	203,149
Column sum	336,881	312,217	343,543	197,729	284,329	487,839	339,642

TABLE B-1—*continued*

Sector†	Endogenous						
	8	9	10	11	12	13	14
	Citrus	Forage	Miscellaneous agriculture	Grain mill products	Meat and poultry processing	Dairy products	Canning, preserving, and freezing
	thousand dollars						
Endogenous							
1	0	0	0	0	562,638	0	0
2	0	0	0	0	62,851	32	6
3	0	0	0	0	0	276,821	0
4	0	0	385	133,191	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	154,636
7	0	0	0	0	0	0	207,818
8	2	0	0	0	0	0	13,440
9	0	0	7,062	6,732	0	0	0
10	3,507	10,391	8,081	0	0	0	68,074
11	0	0	138	27,741	277	198	9,418
12	0	0	500	2,406	51,016	1,941	17,200
13	0	0	0	1,118	992	55,717	1,080
14	0	0	0	1,067	2,217	1,014	19,614
15	0	0	1,104	13,932	5,633	24,342	105,591
16	4,792	7,086	7,857	6,823	8,221	3,169	29,928
17	1,952	3,053	8,568	621	984	1,317	1,385
18	7,879	22,170	26,162	5,410	12,667	13,796	119,847
19	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0
21	6,459	783	8,326	21,648	6,759	15,738	83,508
22	38	57	27	56	0	0	0
23	744	312	3,244	2,266	3,636	4,754	7,556
24	1,993	3,552	5,931	1,136	2,267	3,721	9,050
25	7,316	13,395	16,766	28,240	27,284	20,652	35,544
26	2,436	2,302	3,986	7,590	5,356	6,091	40,103
27	0	0	301	39,622	45,357	0	0
28	1,065	2.161	3,473	1,127	3,658	3,523	9,624
Exogenous							
m	0	0	195	0	1,632	0	0
s	4,700	10,123	8,735	1,249	1,935	4,088	9,121
f	768	1,261	2,395	8,197	9,683	12,643	46,195
h	93,566	104,557	181,642	93,526	211,126	121,072	232,603
Column sum	137,017	181,203	294,778	403.698	1,026,189	570,629	1,221,341

TABLE B-1—*continued*

Sector†	Endogenous						
	15	16	17	18	19	20	21
	Miscellaneous agricultural processing	Chemicals and fertilizers	Petroleum	Fabricated metals and machinery	Aircraft	Primary metals	Other manufacturing
	thousand dollars						
Endogenous							
1	0	0	0	0	0	0	26
2	2,655	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	3,419	100	0	0	0	0	0
5	0	0	0	0	0	0	1,117
6	7,735	0	0	0	0	0	0
7	45,384	180	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	48,620	4,735	0	0	0	0	2,961
11	92,816	2,343	0	5	0	158	0
12	26,682	19,034	7	0	0	0	2,306
13	15,824	641	0	0	0	0	429
14	11,254	932	0	0	0	0	0
15	343,626	16,654	2	15	0	5	1,854
16	118,610	300,200	49,160	54,128	30,632	4,921	137,815
17	4,699	20,289	1,064,867	9,619	17,416	18,114	27,924
18	44,991	26,440	80,506	1,141,316	637,433	29,891	200,100
19	0	0	0	2,669	416,166	0	0
20	0	13,691	1,666	626,644	376,912	339,951	64,379
21	79,655	40,618	39,521	252,761	252,680	14,596	1,389,739
22	222	11,496	1,954	1,066	0	22,512	28,109
23	17,387	13,222	23,149	34,106	53,908	15,827	65,507
24	15,666	2,751	9,617	12,421	16,437	2,250	23,562
25	79,033	34,496	131,324	150,807	98,622	41,440	215,428
26	57,410	34,041	39,217	55,281	70,919	8,153	85,215
27	0	42,412	9	4,049	0	67,111	16,367
28	12,973	4,182	55,218	27,405	38,295	22,284	40,662
Exogenous							
m	109,062	10,764	511	8,891	25,737	72,097	17,243
s	14,209	5,841	64,703	23,738	15,239	5,410	31,999
f	74,587	42,374	150,422	190,883	109,473	35,597	236,724
h	500,654	216,938	1,148,834	1,401,730	2,389,738	195,511	2,020,783
Column sum	1,727,143	865,274	2,860,687	3,997,514	4,549,607	895,828	4,610,249

TABLE B-1—*continued*

Sector†	Endogenous						
	22	23	24	25	26	27	28
	Mining	Utilities	Selected services	Trade and transportation	Unallocated	Scrap and byproducts	Construction
	thousand dollars						
Endogenous							
1	0	0	0	0	0	147	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	45,357	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	35,561	0
6	0	0	0	0	0	1,724	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	40	0
11	0	5	11,513	602	1,066	1,057	0
12	0	688	92,207	2,049	17,493	33,163	0
13	0	417	70,824	4,623	6,263	0	0
14	0	263	46,308	704	4,213	314	0
15	0	712	207,112	23,793	12,083	4,587	322
16	12,099	1,273	39,573	21,964	51,103	51,455	116,047
17	6,604	80,180	24,822	129,396	135,634	1,231	113,461
18	20,465	76,313	351,815	364,273	46,318	17,905	1,007,473
19	0	0	788	15,712	0	10,772	0
20	7,101	2,261	331	26,853	4,559	16,629	313,029
21	9,421	16,669	168,140	254,788	698,273	8,718	957,784
22	4,306	0	0	423	0	0	72,242
23	12,160	208,045	114,735	183,900	579,982	0	15,468
24	7,900	8,663	183,135	201,317	93,237	0	139,989
25	10,536	49,098	280,579	392,481	359,886	0	895,550
26	6,330	28,641	305,299	735,718	691,387	0	209,224
27	0	851	0	0	0	0	6,061
28	3,078	134,698	142,317	294,660	2,114,352	0	5,270
Exogenous							
m	452	7,370	41	52,763	639	0	171
s	19,815	159,515	135,309	341,573	995,272	0	32,329
f	12,796	111,795	244,741	558,651	238,030	0	86,952
h	173,046	701,764	2,014,523	4,576,387	4,163,235	0	2,524,116
Column sum	306,109	1,589,221	4,434,112	8,152,630	10,213,025	228,660	6,495,488

TABLE B-1—*continued*

Sector†	Exogenous				
	h	s	f	e	Δk
	Households	State and local governments	Federal government	Exports	Net private capital formation
	thousand dollars				
Endogenous					
1	3,372	0	0	0	18,532
2	187,210	450	35	1,602	13
3	9,996	0	0	0	2,044
4	0	0	0	0	26,369
5	0	0	0	227,897	18,670
6	183,918	529	177	141,130	0
7	35,308	528	44	49,722	658
8	14,947	25	0	108,603	0
9	0	0	0	0	0
10	31,098	0	122	44,492	4,060
11	128,890	216	525	0	433
12	947,391	4,392	8,140	0	0
13	506,845	2,263	1,557	0	0
14	286,674	1,048	4,868	821,868	18,983
15	1,136,522	2,097	5,429	0	5,692
16	243,650	6,871	6,530	0	959
17	554,630	9,857	50,677	550,779	1
18	1,130,950	40,374	331,196	0	56,801
19	1,430	17	3,472,736	630,342	1,217
20	2,320	83	0	0	638
21	2,488,470	38,559	86,965	0	4,787
22	7,620	50	67	155,542	0
23	228,590	40,750	5,610	0	0
24	3,088,970	15,239	332,812	230,064	0
25	4,552,520	16,037	362,308	205,233	16,084
26	6,280,650	892,825	230,220	284,502	102,429
27	0	0	0	0	372
28	21,285	1,073,456	437,000	0	2,005,711
Exogenous					
m	110,470	924	0	0	36,808
s	1,526,803	134,013	360,374	0	680
f	3,266,036	0	16,426	0	13,952
h	322,610	1,566,227	3,649,000	0	124,422
Column sum	27,299,175	3,840,830	9,362,800	3,451,776	2,460,315

TABLE B-1—*continued*

Sector†	Total supply	Competitive imports	Inventory depletion	Row sum (gross domestic output)
	thousand dollars			
Endogenous				
1	584,715	— 247,834	0	336,881
2	312,217	0	0	312,217
3	343,543	0	0	343,543
4	223,113	— 25,384	0	197,729
5	284,329	0	0	284,329
6	495,411	0	— 7,572	487,839
7	339,642	0	0	339,642
8	137,017	0	0	137,017
9	186,181	— 2,958	— 2,020	181,203
10	294,778	0	0	294,778
11	447,876	— 44,178	0	403,698
12	1,227,515	— 199,080	— 2,246	1,026,189
13	668,593	— 96,907	— 1,057	570,629
14	1,221,341	0	0	1,221,341
15	1,911,107	— 183,964	0	1,727,143
16	1,382,158	— 516,884	0	865,274
17	2,861,255	0	— 568	2,860,687
18	5,919,617	—1,910,758	—11,345	3,997,514
19	4,551,849	0	— 2,242	4,549,607
20	1,797,047	— 901,219	0	895,828
21	6,096,719	—2,383,451	— 3,019	4,610,249
22	306,109	0	0	306,109
23	1,645,535	— 56,314	0	1,589,221
24	4,343,112	0	0	4,434,112
25	8,152,630	0	0	8,152,630
26	10,213,025	0	0	10,213,025
27	239,054	— 10,394	0	228,660
28	6,495,488	0	0	6,495,448
Exogenous				
m	.....	.....	.....	579,515
s	.....	.....	.....	3,063,451
f	.....	.....	.....	5,479,258
h	.....	.....	.....	29,789,278
Column sum	.....	—6,579,325	—30,069	96,874,084

* Each entry shows value of goods and services produced by sector designated on the left purchased by sector designated at the top.

† Sectors correspond to those defined by Martin and Carter (26) and Zusman and Hoch (72) except that sector 28 here represents total construction, corresponding to the combined sector 29–30 in (26) and (72).

SOURCE: From P. Zusman and I. Hoch (72), except column *f* which is taken from table C-6. Exports and competitive import columns differ from corresponding columns in (72). For all sectors except 28, adjustments have been made in exports or competitive imports to compensate for estimated federal expenditures, thus leaving GDO unchanged. The adjustment in federal government construction input is accommodated by a similar adjustment in GDO for sector 28 (+ 27,170 thousand dollars). A corresponding adjustment appears in the household row and column sum of column 28.

TABLE B-2

GROSS TECHNICAL COEFFICIENTS, CALIFORNIA ECONOMY, 1954*

Sector	Sector								
	1	2	3	4	5	6	7	8	9
Endogenous									
1	0	0	0	0	0	0	0	0	0
2	0	.183728	0	0	0	0	0	0	0
3	0	0	.027144	0	0	0	0	0	0
4	.046868	.084120	.024125	.047075	0	0	0	0	0
5	0	0	0	0	.003812	0	0	0	0
6	0	0	0	0	0	.011401	0	0	0
7	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	.000015	0
9	.270173	0	.236858	0	0	0	0	0	0
10	.000318	0	.005752	.041011	.101780	.033220	.039041	.025595	.057344
11	.051549	.380396	.099967	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0
16	.004022	.004856	.004879	.067451	.053526	.027950	.060517	.034974	.039105
17	.002538	.003827	.003665	.020513	.007259	.008228	.028654	.014246	.016849
18	.005981	.016678	.022879	.117120	.084251	.036379	.080626	.056044	.122349
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
21	.002511	.038547	.004611	.004577	.003053	.050615	.030691	.047140	.004321
22	0	0	0	.000106	.000215	.000156	.000483	.000277	.000315
23	.004521	.005579	.004323	.002948	.002947	.002773	.009283	.005430	.001722
24	.002434	.005320	.003831	.019911	.006602	.007933	.026354	.014546	.019602
25	.047913	.099748	.044667	.088019	.060775	.049434	.060481	.053394	.073923
26	.007578	.016873	.021156	.008522	.007945	.005678	.017415	.017779	.012704
27	.027585	.003027	.018350	0	0	0	0	0	0
28	.015489	.028227	.028165	.014444	.014990	.009069	.008132	.007773	.011926
Exogenous									
m	.336231	0	.030491	0	0	0	0	0	0
s	.016822	.014942	.031038	.039261	.023023	.020082	.034086	.034302	.055886
f	.000840	.002838	.001784	.005649	.005677	.004590	.006109	.005605	.006959
h	.156625	.111294	.386316	.523393	.624147	.732492	.598127	.682879	.577016

TABLE B-2—*continued*

Sector	Sector								
	10	11	12	13	14	15	16	17	18
Endogenous									
1	0	0	.548279	0	0	0	0	0	0
2	0	0	.061247	.000056	.000005	.001537	0	0	0
3	0	0	0	.485116	0	0	0	0	0
4	.001806	.329927	0	0	0	.001980	.000116	0	0
5	0	0	0	0	0	0	0	0	0
6	0	0	0	0	.126612	.004478	0	0	0
7	0	0	0	0	.170156	.026277	.000208	0	0
8	0	0	0	0	.011004	0	0	0	0
9	.023957	.016676	0	0	0	0	0	0	0
10	.027414	0	0	0	.055737	.028151	.005472	0	0
11	.000468	.068717	.000270	.000347	.007711	.053740	.002708	0	.000001
12	.001696	.005960	.049714	.003402	.014083	.015449	.023038	.000002	0
13	0	.002769	.000967	.097641	.000884	.009162	.000741	0	0
14	0	.002643	.002160	.001777	.016059	.006516	.001077	0	0
15	.003745	.034511	.005489	.042658	.086455	.198956	.019247	.000001	.000004
16	.026654	.016901	.008011	.005554	.024504	.068674	.346942	.017185	.013540
17	.029066	.001538	.000959	.002308	.001134	.002721	.023448	.372242	.002406
18	.088752	.013401	.012344	.024177	.098127	.026049	.030557	.028142	.285508
19	0	0	0	0	0	0	0	0	.000668
20	0	0	0	0	0	0	.015823	.000582	.156758
21	.028245	.053624	.006587	.027580	.068374	.046120	.046942	.013815	.063230
22	.000092	.000139	0	0	0	.000129	.013286	.000683	.000267
23	.011005	.005613	.003543	.008331	.006187	.010067	.015281	.008092	.008532
24	.020120	.002814	.032209	.006521	.007410	.009070	.003179	.003362	.003107
25	.056876	.069953	.026588	.036192	.029102	.045759	.039867	.045906	.037725
26	.013522	.018801	.005219	.010674	.032835	.033240	.039341	.013709	.013829
27	.001021	.098148	.044199	0	0	0	.049016	.000003	.001013
28	.011782	.002792	.003565	.006174	.007880	.007511	.004833	.019302	.006856
Exogenous									
m	.000662	0	.001590	0	0	.063146	.012440	.000179	.002224
s	.029632	.003094	.001886	.007164	.007468	.008227	.006750	.022618	.005938
f	.007786	.020305	.009436	.022156	.037823	.043168	.048970	.052582	.047745
h	.616199	.231673	.205738	.212173	.190449	.289874	.250716	.401594	.350650

TABLE B-2—*continued*

Sector	Sector									
	19	20	21	22	23	24	25	26	27	28
Endogenous										
1	0	0	.000005	0	0	0	0	0	.000642	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	.198360	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	.000242	0	0	0	0	0	.155510	0
6	0	0	0	0	0	0	0	0	.007540	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	.000642	0	0	0	0	0	.000175	0
11	0	.000176	0	0	.000003	.002596	.000074	.000104	.004623	0
12	0	0	.000500	0	.000433	.020795	.000251	.001713	.145032	0
13	0	0	.000093	0	.000262	.015973	.000567	.000613	0	0
14	0	0	0	0	.000165	.010444	.000086	.000413	.001373	0
15	0	.000005	.000402	0	.000448	.046709	.002918	.001183	.020060	.000050
16	.006733	.005493	.026893	.030525	.000601	.008925	.002694	.005004	.225028	.017866
17	.003828	.020220	.006057	.021574	.050452	.005598	.015872	.013280	.005384	.017468
18	.140107	.033367	.043403	.066855	.048019	.079343	.044682	.004535	.078304	.155103
19	.091473	0	0	0	0	.000178	.001927	0	.047109	0
20	.082845	.379482	.013964	.023198	.001423	.000075	.003294	.000446	.072724	.048192
21	.055539	.016293	.301446	.030777	.010489	.037920	.031252	.068371	.038126	.147454
22	0	.025130	.006097	.014067	0	0	.000052	0	0	.011122
23	.011849	.017667	.014209	.039724	.130910	.025876	.022557	.056788	0	.002381
24	.003613	.002512	.005111	.025898	.005451	.041301	.024694	.009120	0	.021552
25	.021677	.046259	.046728	.034419	.030804	.003277	.044462	.035238	0	.137873
26	.015588	.009101	.018484	.020679	.018022	.068852	.090243	.067897	0	.032211
27	0	.074915	.003550	0	.000535	0	0	0	0	.000933
28	.008417	.024875	.008820	.010055	.084757	.032096	.036143	.207025	0	.000811
Exogenous										
m	.095657	.080481	.003740	.001477	.004637	.000009	.006472	.000063	0	.000026
s	.003350	.005039	.006941	.064732	.100373	.030515	.041897	.097451	0	.004977
f	.024062	.039736	.051347	.041802	.070346	.055195	.068524	.023307	0	.013387
h	.525263	.218246	.438324	.565308	.441577	.454324	.561339	.407640	0	.388595

* Each entry shows dollars of direct purchases from sector designated on the left by sector designated at the top per dollar of gross domestic output of the latter.

SOURCE: Calculated from table B-1. Column 28 differs from corresponding Zusman and Hoch (72) column due to adjustment in sector 28 GDO in table B-1 (see "source," table B-1).

TABLE B-3

"INPUT" COEFFICIENTS, EXOGENOUS SECTORS CALIFORNIA ECONOMY, 1954*

Sector	*h*	*s*	*f*	Δk
m	.004047	.000240	0	.014961
s	.055029	.034837	.038490	.000276
f	.119639	0	.001754	.005671
h	.011818	.407147	.389734	.050572

* Each entry shows dollars of "purchases" from exogenous sector designated on the left by exogenous sector designated at the top per dollar total purchases (column sum, table B-1) of the latter.

SOURCE: Calculated from table B-1.

TABLE B-4

GROSS INTERDEPENDENCE COEFFICIENTS, CALIFORNIA ECONOMY, 1954*

Sector	Sector								
	1	2	3	4	5	6	7	8	9
1	1.004594	.009279	.004699	.003266	.002505	.001486	.002918	.001863	.002316
2	.000637	1.226399	.000656	.000457	.000350	.000208	000409	.000261	.000324
3	.008412	.014540	1.035948	.002894	.002163	.001307	.002485	.001659	.002239
4	.069660	.284172	.065593	1.050319	.000802	.000438	.000824	.000528	.000707
5	.006198	.010167	.005825	.001916	1.005311	.000877	.001593	.001084	.001456
6	.000397	.000897	.000416	.000192	.000136	1.011618	.000177	.000114	.000150
7	.000267	.001141	.000370	.000282	.000198	.000129	1.000273	.000171	.000216
8	.000005	.000023	.000007	.000006	.000003	.000002	.000006	1.000018	.000005
9	.274864	.014755	.249118	.002688	.003754	.001567	.002393	.001561	1.002611
10	.020752	.015715	.024892	.045652	.106230	.035245	.041398	.027139	.059956
11	.057573	.505432	.112695	.001601	.001230	.000731	.001443	.000920	.001175
12	.008335	.016846	.008527	.005943	.004557	.002703	.005309	.003389	.004214
13	.000664	.002639	.000921	.000823	.000480	.000385	.000868	.000551	.000709
14	.000519	.002125	.000718	.000560	.000342	.000251	.000582	.000360	.000461
15	.006385	.028917	.009013	.006105	.004535	.002851	.005767	.003649	.004628
16	.054480	.097142	.057291	.127444	.099563	.055613	.110510	.067562	.077167
17	.025257	.040873	.028659	.052093	.028624	.023287	.061532	.034343	.042075
18	.102246	.157260	.129681	.216353	.160783	.079601	.153771	.109765	.210462
19	.002355	.003987	.002263	.001077	.000812	.000499	.000846	.000607	.000871
20	.036721	.061733	.045298	.064677	.048655	.026640	.048023	.035120	.060804
21	.045061	.174755	.061606	.060484	.047967	.098331	.087762	.099417	.053374
22	.002513	.005009	.003088	.004374	.003538	.002481	.004171	.003040	.003693
23	.016076	.033138	.018670	.018630	.015412	.011778	.024417	.016987	.015179
24	.015320	.026310	.017551	.029595	.014317	.013031	.034025	.020354	.027477
25	.104561	.237728	.110667	.132707	.095286	.072998	.096321	.080639	.109528
26	.032913	.076635	.051426	.038692	.030684	.022028	.043207	.037610	.037624
27	.039635	.064856	.037217	.012181	.009437	.005470	.010068	.006789	.009246
28	.035973	.075197	.054274	.036665	.031949	.021187	.029296	.024611	.031465

TABLE B-4—*continued*

Sector	Sector								
	10	11	12	13	14	15	16	17	18
1	.003028	.016633	.585206	.006132	.012422	.016048	.029566	.001413	.003961
2	.000430	.002371	.080109	.001037	.001923	.004568	.004119	.000197	.000545
3	.002139	.026899	.016874	.558187	.004369	.011232	.019592	.001337	.007208
4	.002341	.376806	.060183	.037300	.007330	.030992	.007156	.000370	.001096
5	.001377	.018886	.012185	.003749	.002282	.003387	.014175	.000898	.005398
6	.000166	.001677	.001053	.000864	.130963	.007041	.001209	.000085	.000318
7	.000321	.002165	.000948	.002257	.176223	.034702	.001898	.000119	.000161
8	.000005	.000043	.000033	.000032	.011198	.000100	.000027	.000002	.000003
9	.026048	.029466	.163609	.135336	.006485	.009292	.013165	.000724	.002842
10	1.030664	.022628	.014933	.015833	.075166	.041941	.013266	.000595	.001406
11	.001913	1.082921	.068856	.065305	.017568	.077463	.013114	.000685	.001890
12	.005513	.030193	1.067258	.011156	.022638	.029243	.053818	.002570	.007184
13	.000733	.004571	.001966	1.109637	.002902	.013742	.002264	.000370	.000422
14	.000472	.003934	.003020	.002994	1.017620	.009132	.002519	.000235	.000312
15	.008719	.055865	.015941	.066100	.116014	1.260209	.043334	.002598	.003660
16	.059324	.134084	.074089	.055002	.100479	.164880	1.589063	.052303	057896
17	.060179	.036742	.024670	.026761	.033255	.028862	.078049	1.604010	.030025
18	.164635	.153619	.107881	.128941	.227192	.109352	.131518	.092284	1.457245
19	.000771	.006715	.004371	.001589	.001132	.001434	.005032	.000571	.003064
20	.049202	.064689	.044017	.043858	.070001	.041754	.093854	.032823	.381918
21	.080748	.146941	.064548	.100095	.183097	.141790	.159865	.064786	.166786
22	.003101	.005082	.003064	.003149	.004965	.004872	.025406	.003626	.012404
23	.024635	.026842	.020300	.027907	.029480	.032909	.046645	.024462	.032864
24	.027488	.020971	.015434	.020896	.024031	.021916	.014437	.010868	.011557
25	.091511	.159193	.116617	.119232	.102444	.111106	.111975	.098374	.099502
26	.036261	.060392	.038811	.054199	.072523	.076084	.092807	.041525	.044863
27	.008697	.120749	.077953	.023861	.014334	.021479	.090554	.005654	.034318
28	.031091	.037727	.036951	.048151	.041339	.039833	.044213	.048024	.038538

TABLE B-4—*continued*

Sector	Sector									
	19	20	21	22	23	24	25	26	27	28
1	.002347	.012574	.003052	.002446	.001229	.014892	.001406	.002461	.095380	.002940
2	.000323	.001722	.000423	.000342	.000172	.002163	.000204	.000344	.013038	.000410
3	.004135	.027282	.003391	.002559	.001469	.011689	.001682	.002014	.215934	.004092
4	.000648	.003570	.000758	.000654	.000319	.004838	.000497	.000492	.026304	.000815
5	.003076	.020705	.002721	.001679	.000878	.001509	.000761	.001087	.164808	.002855
6	.000188	.001114	.000177	.000168	.000104	.001889	.000140	.000173	.008607	.000228
7	.000108	.000298	.000188	.000224	.000136	.003762	.000279	.000260	.001665	.000237
8	.000002	.000006	.000003	.000005	.000004	.000130	.000006	.000008	.000031	.000005
9	.001653	.010052	.001698	.001310	.000699	.007054	.000808	.001177	.078314	.001816
10	.000854	.003895	.002021	.000961	.000395	.003973	.000567	.000709	.028632	.001179
11	.001125	.006007	.001338	.001210	.000575	.010025	.001013	.001086	.042802	.001476
12	.004257	.022777	.005533	.004448	.002235	.027150	.002558	.004480	.172726	.005338
13	.000322	.000542	.000608	.000785	.000588	.019563	.001435	.001305	.001469	.000903
14	.000224	.000562	.000329	.000519	.000404	.011844	.000572	.000796	.002891	.000643
15	.002395	.007100	.004423	.004561	.002426	.066166	.006802	.004519	.041379	.005053
16	.034936	.079084	.080094	.076777	.016580	.040979	.018256	.031255	.414973	.059649
17	.023856	.072070	.028051	.050476	.102721	.026763	.038827	.044700	.050696	.049945
18	.255371	.144367	.119050	.130792	.121639	.165803	.101850	.092908	.241553	.277305
19	1.102018	.007232	.001077	.000795	.000533	.001057	.002614	.000630	.055133	.001549
20	.221054	1.676305	.070836	.079384	.045547	.053243	.040699	.049924	.210626	.162405
21	.134811	.095532	1.466379	.082654	.065612	.116015	.090422	.180105	.152304	.273341
22	.007388	.045226	.012411	1.018280	.003192	.003494	.002757	.005626	.012574	.018497
23	.030040	.048393	.035153	.058321	1.160535	.048418	.040993	.082110	.029440	.028676
24	.009726	.013192	.013182	.032272	.012895	1.051904	.032005	.020974	.014761	.033018
25	.063974	.119825	.095170	.066774	.072966	.111932	1.078622	.099512	.106297	.194469
26	.037954	.043384	.048137	.042417	.040458	.103423	.115572	1.101738	.054099	.072863
27	.019496	.132482	.015145	.010630	.005526	.009487	.004739	.006688	1.055458	.017862
28	.031761	.065421	.033752	.032638	.114662	.069351	.071057	.244280	.043078	1.036414

* Each entry shows dollars of direct and indirect requirements for products of sector designated on the left per dollar of final demand for products of sector designated at the top.

SOURCE: Calculated from table B-3. (Inverse of 28 × 28 matrix [I-A], where A is the 28 × 28 matrix of gross technical coefficients for endogenous sectors and I is the identity matrix.)

TABLE B-5

EXPANSION CAPITAL COEFFICIENTS, CALIFORNIA ECONOMY, 1954*

Sector	Sector								
	1	2	3	4	5	6	7	8	9
6	0	0	0	0	0	.000417	0	0	0
8	0	0	0	0	0	0	0	.000035	0
10	.005457	0	0	0	0	.001216	.043077	.059929	.027783
16	0	0	0	0	0	.001023	.066772	.081887	.018947
17	0	0	0	0	0	.000301	.031615	.033357	.008164
18	.011729	.115068	.094902	.449802	.536253	.158883	.380595	.546586	.586750
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
21	.008528	.018594	.006715	0	0	.028430	.230512	.110372	.002093
22	0	0	0	0	0	.000005	.000533	.000649	.000152
23	0	0	0	0	0	.000162	.010243	.012713	.000834
24	0	0	0	0	0	.000291	.029078	.034056	.009497
25	.005624	.029237	.022228	.098388	.117299	.042032	.170710	.214590	.150163
26	0	0	0	0	0	.000207	.019216	.041626	.006155
28	.089625	.356386	.490451	.028457	.073155	.043218	.024509	.018199	.089873

TABLE B-5—*continued*

Sector	Sector								
	10	11	12	13	14	15	16	17	18
6	.017116	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
10	.000257	0	0	0	0	0	0	0	0
16	0	0	0	0	0	.000418	.000075	.000489	0
17	0	0	0	0	0	0	0	.000432	0
18	.407090	.055850	.039011	.104803	.117803	.181419	.228398	.221239	.213723
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	.001091	.094613	.000061
21	.012770	.000319	.001475	.002875	.000501	.003479	.012781	.055658	.002051
22	0	0	0	0	0	0	0	.000051	0
23	0	0	0	0	0	0	0	0	.000024
24	0	0	0	0	0	0	0	0	.003159
25	.091895	.012281	.008851	.023538	.025862	.040513	.002387	.081506	.047897
26	0	0	0	0	0	0	0	0	.000050
28	.028464	.044541	.044897	.079184	.121590	.134872	.084063	.485710	.159138

Sector	Sector									
	19	20	21	22	23	24	25	26	27	28
6	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
16	0	.000009	0	0	.005206	0	0	0	0	0
17	0	0	0	0	000526	0	0	0	0	0
18	.283914	.306853	.191943	.484205	.565961	.108008	.744727	.050506	0	.100868
19	0	0	0	0	0	0	.009806	0	0	0
20	0	.001270	.000821	002568	.258087	0	.010132	0	0	0
21	.004370	.011593	.002708	.002160	.094121	.065977	.052867	.073013	0	.001561
22	0	0	0	0	.001393	0	0	0	0	0
23	0	0	0	.012755	0	0	0	0	0	0
24	0	0	0	0	.047645	0	0	0	0	0
25	.003078	.003305	.042737	.109519	.431045	.038032	.178801	.034133	0	.022397
26	0	0	0	0	0	0	0	.032615	0	0
28	.112116	.429286	.180144	.214687	1.387507	.399209	.536150	4.163194	0	.013902

* Each entry shows dollars of direct requirements of products of sector designated on the left by sector designated at the top per dollar of capacity of the latter.

SOURCE: From Zusman and Hoch (72). Household coefficients in Zusman and Hoch columns 6–9 are in each case distributed over endogenous sectors in proportion to input flows from these sectors.

APPENDIX C

FINAL DEMAND PROJECTIONS AND RELATED DATA

TABLE C-1

HISTORICAL AND PROJECTED GROSS NATIONAL PRODUCT (GNP) PERSONAL INCOME (PI), AND POPULATION, UNITED STATES

Year	Aggregate		Per capita		Population
	GNP	PI	GNP	PI	
	1	2	3	4	5
	billion 1954 dollars		*1954 dollars*		*thousands*
Historical					
1947	282.3	226.5	1,959	1,571	144,126
1948	293.1	235.1	1,999	1,603	146,631
1949	292.7	234.9	1,962	1,574	149,188
1950	318.1	254.1	2,097	1,675	151,789
1951	241.8	267.4	2,215	1,733	154,283
1952	353.5	278.6	2,252	1,776	156,947
1953	369.0	291.2	2,313	1,825	159,559
1954	363.1	289.8	2,236	1,785	162,388
1955	392.7	309.0	2,376	1,870	165,276
1956	400.9	326.1	2,383	1,938	168,225
1957	408.6	334.4	2,386	1,952	171,278
1958	401.3	335.7	2,304	1,928	174,154
1959	428.6	353.9	2,420	1,998	177,080
1960	439.9	364.5	2,435	2,017	180,676
1961	447.7	376.0	2,437	2,045	183,742
1962	474.8	395.1	2,545	2,117	186,591
Projected					
1965	536.4	432.5	2,756	2,222	194,639
1970	653.8	527.1	3,118	2,514	209,682
1975	781.5	630.1	3,426	2,762	228,122

SOURCES:

Historical data

Cols. 1 and 2: From (55), (57), and (59). Current dollar measures of personal income deflated to 1954 dollars by United States consumption expenditures implicit price deflator from same sources.

Col. 3: Column 1 divided by column 5.

Col. 4: Column 2 divided by column 5.

Col. 5: From (61).

Projections

Col. 1: Column 3 multiplied by column 5.

Col. 2: Column 4 multiplied by column 5.

Col. 3: Projected from 1960 at medium growth rate projected by Landsberg *et al.* (23). Relevant compound rates are 2.5 per cent for 1961–1970 and 1.9 per cent for 1971–1975.

Col. 4: Column 3 multiplied by .8062. The factor .8062 is the ratio of average personal income to average gross national product in the period 1955–1957.

Col. 5: Projected from 1960 at medium growth rate projected by Landsberg *et al.* (23). Relevant compound rates are 1.96 per cent for 1961–1970 and 1.98 per cent for 1971–1975.

TABLE C-2

HISTORICAL AND PROJECTED PERSONAL INCOME (PI), POPULATION, AND CIVILIAN LABOR FORCE, CALIFORNIA

Year	Aggregate PI	Per capita PI	Population	Civilian labor force
	1	2	3	4
	million 1954 dollars	*1954 dollars*	*thousands*	
Historical				
1947	19,665	2,000	9,832	.....
1948	19,576	1,955	10,064	.....
1949	20,107	1,945	10,337	.....
1950	21,832	2,051	10,643	4,499
1951	23,673	2,127	11,130	4,668
1952	25,601	2,200	11,638	4,900
1953	26,911	2,224	12,101	5,061
1954	27,432	2,192	12,517	5,108
1955	30,104	2,315	13,004	5,299
1956	32,589	2,400	13,581	5,562
1957	33,855	2,388	14,177	5,793
1958	34,707	2,354	14,741	5,897
1959	37,751	2,469	15,288	6,099
1960	39,222	2,473	15,863	6,294
1961	41,240	2,507	16,453	6,479
1962	43,951	2,579	17,044	6,641
Projected				
1965	50,855	2,700	18,835	7,559
1970	66,158	3,044	21,734	9,002
1975	82,833	3,336	24,830	10,609

SOURCES:

Historical data

Col. 2: From (58) and (60). Current dollar aggregate deflated to 1954 dollars by United States consumption expenditures implicit price deflator from (55), (57), and (59).

Col. 2: Column 1 divided by column 3.

Cols. 3 and 4: From (13).

Projected

Col. 1: Column 2 multiplied by column 3.

Col. 2: Let $\bar{Y}_c$ = California per capita personal income (1954 dollars) and $\bar{Y}_{us}$ = United States per capita personal income (1954 dollars). Least squares fitting to annual data for the period 1947–1960 yielded $\bar{Y}_c = 83.6290 + 1.17740\ \bar{Y}_{us}$. This relation was used with projected $\bar{Y}_{us}$ from table C-1 (column 4) to obtain projected $\bar{Y}_c$ for 1965, 1970, and 1975.

Col. 3: From (11).

TABLE C-3

BASE YEAR AND PROJECTED HOUSEHOLD PURCHASES

Sector	Per capita expenditure elasticities*	Base year, 1954	Projected		
			1965	1970	1975
	1	2	3	4	5
		thousand 1954 dollars			
1	0	3,372	5,074	5,855	6,689
2	0 5	187,210	314,766	385,512	460,578
3	0	9,996	15,041	17,357	19,829
4	—†	0	0	0	0
5	—	0	0	0	0
6	0.2	183,918	289,460	342,215	398,118
7	0.2	35,308	55,570	65,697	76,429
8	0.6	14,947	25,682	31,818	38,347
9	—	0	0	0	0
10	1.0	31,098	58,185	75,385	94,004
11	—0.2	128,890	185,302	208,572	233,922
12	0.5	947,391	1,592,899	1,950,914	2,330,790
13	0.1	506,845	780,059	911,174	1,050,496
14	0.2	286,674	451,183	533,412	620,548
15	0.2	1,136,522	1,788,718	2,114,717	2,460,169
16	0.8	243,650	437,001	553,795	678,995
17	2.2	554,630	1,321,343	1,936,580	2,557,813
18	1.3	1,130,950	2,252,074	3,013,503	3,852,294
19	1.0	1,430	2,676	3,467	4,323
20	1.3	2,320	4,620	6,182	7,903
21	0.8	2,488,470	4,463,226	5,656,073	6,934,781
22	1.0	7,620	14,257	18,472	23,034
23	1 9	228,590	513,617	730,933	980,229
24	1.2	3,088,970	6,025,578	7,977,465	10,114,552
25	1.0	4,552,520	8,517,923	11,035,794	13,761,456
26	1.2	6,280,650	12,251,510	16,220,184	20,565,419
27	—	0	0	0	0
28	1.0	21,285	39,825	51,597	64,341
Total		22,073,256	41,405,589	53,846,673	67,435,059

* New purchases were projected for sectors showing zero purchases in the base year.
† Dashes denote that numerical elasticity coefficients are omitted for these sectors.

TABLE C-3—*continued*

SOURCES:

Col. 1: Expenditure elasticity for sector i product may be written

$$\frac{\bar{E}_{ip} - \bar{E}_{ib}}{\bar{E}_{ib}} + \frac{\bar{E}_p - \bar{E}_b}{\bar{E}_b}$$

where i refers to sector, b refers to base year, and p refers to year for which projection is made. E denotes per capita expenditure.

The empirical basis for sector elasticity coefficients cannot be regarded as strong. However, the coefficients adopted are considered to represent a somewhat closer approximation to realism than would be represented by assigning a coefficient of unity to each sector. The zero elasticities for sectors 1 and 3 are assigned, for lack of better measures, simply to preserve base year per capita final demands in the projections. Base year final demands for these sectors reflect only "home consumption" of products on farms where produced [see Martin and Carter (27)], and projections are to be interpreted similarly. Although zero elasticity may seem low for the products identified with sectors 1 and 3, it is probably too high for the "home consumed" components of these products. Sectors for which dashes appear have no product flowing directly to domestic (i.e., within state) household final demand.

The elasticities for sectors 2, 6, 7, and 8 are taken directly or derived from approximations for the United States appearing in Daly (16) and (17). California's base year household expenditures are used as weights in aggregating elasticities where necessary to conform to our sector definition.

Elasticities for the agricultural processing sectors [11–15] have been derived from those for primary agricultural sectors [1–10] as weighted averages, weighted for each processing sector by values of intermediate inputs flowing from the primary sectors. This means that, aside from weighting, it is assumed that elasticity coefficients for products flowing from processing sectors are equal to elasticity coefficients of corresponding products flowing from primary sectors. This is equivalent to assuming expenditure elasticities for services performed by processing sectors equal to elasticities for the primary product.

The approximations adopted for sectors 16, 17, 18, 20, 21, 23, 24, and 26 are based on simple least squares fitting to annual United States data (1947–1961) of the relation, $\log \bar{E}_{it} = A + B \log \bar{E}_t$. $\bar{E}_{it}$ represents United States per capita expenditure (1954 dollars) for an aggregate of products corresponding to the aggregate embraced by California sector i, and $\bar{E}_t$ represents United States per capita total consumption expenditures (1954 dollars). Expenditure data are U. S. Department of Commerce (USDC) personal consumption expenditures from (55), (56), (57), and (59).

The U. S. Department of Commerce expenditure categories selected for approximating elasticities for California sectors were as follows [see table 16 in (59) for USDC major expenditure types]:

California sector	*USDC expenditure aggregate*
16	"Other" nondurable goods
17	Gasoline and oil
18	Durable goods, total
20	Durable goods, total
21	"Other" nondurable goods
23	Household operation
24	"Other" services
26	Services, total

The remaining sectors have been assigned expenditure elasticities of unity. No specific empirical basis can be claimed for this procedure. Since the weighted average elasticity over sectors was, as a final step, forced equal to unity, these sectors can be regarded as having been assigned the average elasticity.

Col. 2: Table B-1.

Cols. 3–5: These columns were projected as follows. Let Y_{iht} denote purchases by household from endogenous sector i in year t, $Y_{ht} = \sum_{i=1}^{28} Y_{iht}$ denote total household purchases from endogenous sectors, and $\bar{Y}_{iht}$ and $\bar{Y}_{ht}$ denote the corresponding per capita magnitudes. Designate total population in year t by N_t and sector elasticities by μ_i. Further, denote independently projected California per capita incomes by $\bar{Y}_t$. Then the projections for year T based on year 0 are given by:

$$Y_{iht} = \left\{ \mu_i \left(\frac{\bar{Y}_t}{\bar{Y}_o} - 1 \right) + 1 \right\} \frac{Y_{iho} N_T}{N_o}.$$

The projections were generated in sequence with 1965 based on 1954, 1970 based on 1965, and 1975 based on 1970. At each stage, sector elasticities were adjusted proportionally to force their weighted sum to unity. This adjustment is implied by the constraint that the sum of projected sector expenditures must equal the independently projected aggregate household expenditure. In the procedure here adopted, per capita total household expenditures were in effect projected in direct proportion to independently projected per capita personal income (from table C-2). This is equivalent to assuming an elasticity of per capita total expenditure with respect to per capita personal income equal to unity.

TABLE C-4

BASE YEAR AND PROJECTED EXPORTS

Sector	Per capita expenditure elasticities	Base year, 1954	Projected		
			1965	1970	1975
	1	2	3	4	5
		thousand 1954 dollars			
1	—*	0†	0	0	0
2	0.5	1,602	2,108	2,359	2,680
3	—	0	0	0	0
4	—	0	0	0	0
5	0.3	227,897	285,624	314,969	350,967
6	0.2	141,130	173,458	188,888	208,421
7	0.2	49,722	61,112	66,548	73,429
8	0.6	108,603	146,181	164,997	189,242
9	—	0	0	0	0
10	1.0	44,492	65,887	76,402	90,955
11	—	0	0	0	0
12	—	0	0	0	0
13	—	0	0	0	0
14	0.2	821,868	1,010,131	1,099,988	1,213,734
15	—	0	0	0	0
16	—	0	0	0	0
17	2.2	550,779	1,036,669	1,334,962	1,763,591
18	—	0	0	0	0
19	1.0	630,342	926,368	1,082,433	1,288,611
20	—	0	0	0	0
21	—	0	0	0	0
22	1.0	155,542	228,589	267,099	317,975
23	—	0	0	0	0
24	1.2	230,064	352,915	419,386	508,398
25	1.0	205,233	301,616	352,430	419,559
26	1.2	284,502	436,422	518,621	628,695
27	—	0	0	0	0
28	—	0	0	0	0
Total	—	3,451,776	5,027,580	5,889,082	7,056,257

* Dashes denote that the corresponding numerical coefficients are omitted.

† Zero exports in the base year denotes that the corresponding sector was a net importing or balanced sector in the base year. Zero projected export for these sectors reflects the constraint that net importing or balanced sectors in the base year are not permitted to become net exporters in the projection period. Expenditure elasticities do not enter the projection procedure for these sectors.

SOURCES:

Col. 1: The same sector expenditure elasticities have been used for projecting exports as those used for projecting California household purchases in table C-3. The sector 5 elasticity, omitted from table C-3, was derived from (16).

Col. 2: Table B-1.

Cols. 3–5: Projections generated by a formula similar to that used for household purchases in table C-3, except that per capita personal income and population for the aggregate of United States regions other than California (derived from tables C-1 and C-2) replace the corresponding California magnitudes in the household purchases projection relation. Adjustment of sector elasticities in accordance with an "adding up" criterion does not apply here in the case of exports.

TABLE C–5

BASE YEAR AND PROJECTED STATE AND LOCAL GOVERNMENT PURCHASES

Sector	Base year, 1954	Projected		
		1965	1970	1975
	1	2	3	4
	thousand 1954 dollars			
1	0	0	0	0
2	450	834	1,085	1,358
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	529	980	1,275	1,596
7	528	979	1,274	1,595
8	25	47	61	76
9	0	0	0	0
10	0	0	0	0
11	216	400	520	651
12	4,392	8,143	10,593	13,263
13	2,263	4,195	5,457	6,832
14	1,048	1,942	2,526	3,163
15	2,097	3,888	5,058	6,333
16	6,871	12,738	16,571	20,748
17	9,857	18,273	23,772	29,764
18	40,374	74,848	97,371	121,913
19	17	32	42	53
20	83	153	199	249
21	38,559	71,483	92,993	116,432
22	50	92	120	150
23	40,750	75,545	98,278	123,049
24	15,239	28,250	36,751	46,014
25	16,037	29,731	38,677	48,425
26	892,825	1,655,171	2,153,235	2,695,954
27	0	0	0	0
28	2,073,456	1,990,035	2,588,864	3,241,382
Total	2,145,666	3,977,759	5,174,722	6,479,000

SOURCES:
Col. 1: Table B–1.
Cols. 2–4: Purchases from each sector projected in direct proportion to total California personal income in table C–2.

TABLE C-6

BASE YEAR AND PROJECTED FEDERAL GOVERNMENT PURCHASES

Sector	Base year, 1954	1958	Projected		
			1965	1970	1975
	1	2	3	4	5
1	0	0	0	0	0
2	35	126	157	191	228
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	177	353	439	535	639
7	44	158	197	240	287
8	0	0	0	0	0
9	0	0	0	0	0
10	122	179	223	272	325
11	525	806	1,003	1,223	1,462
12	8,140	12,674	15,706	19,217	22,970
13	1,557	2,670	3,321	4,048	4,839
14	4,868	7,304	9,086	11,075	13,238
15	5,429	8,313	10,341	12,604	15,066
16	6,530	10,751	13,374	16,301	19,485
17	50,677	75,819	93,318	114,961	137,415
18	331,196	310,314	286,025	470,513	562,414
19	3,472,736	3,025,617	3,763,816	4,587,591	5,483,639
20	0	0	0	0	0
21	86,965	133,914	166,587	203,047	242,706
22	67	83	103	126	151
23	5,610	12,675	15,767	19,218	22,972
24	332,812	403,053	501,391	611,129	730,495
25	362,308	317,844	395,393	481,931	576,062
26	230,202	406,949	506,238	617,037	737,557
27	0	0	0	0	0
28	437,000	418,483	520,586	634,525	758,400
Total	5,337,000	5,148,085	6,404,131	7,805,784	9,330,410

SOURCES: See below, "Table C-6: Explanatory Notes and Supplementary Tables."

Col. 1: From supplementary table C-6-d.

Col. 2: Current dollar measures in supplementary table C-6-d deflated to 1954 dollars by United States implicit deflators of government purchases from (59). Sectors 18, 19, and 22 were deflated by the durable goods deflator; sectors 23–26 by the services deflator; sector 28 by the construction deflator; and sectors 2, 6, 7, 10–17, and 21 by the nondurable goods deflator.

Col. 3: Projection coefficients for projections to 1955 are based on different indicators in the two subperiods 1958–1962 and 1962–1965. From 1958 to 1962, each sector was projected in proportion to total United States federal purchases of goods and services in constant 1954 dollars from (59). The projection coefficient for this span was 1.101124. For 1962–1965, each sector was projected in proportion to projected United States GNP from table C-1. The projection coefficient for this span was 1.129739. The product of these two coefficients gives a projection coefficient for the entire span 1958–1965 of 1.243983.

Cols. 4 and 5: Each sector projected from preceding columns in proportion to projected United States GNP (table C-1). The projection coefficients were 1.21887 for the span 1965–1970 and 1.195320 for 1970–1975.

Table C-6: Explanatory Notes and Supplementary Tables

Estimates of federal purchases by California sectors were not developed in the Martin-Carter (27) or Zusman and Hoch (72) works. In view of the importance of federal expenditures in the state, empirical measures of a full federal government final demand vector were considered important for the conditional projections developed in the present study. Accordingly, even though the empirical measures developed are recognized as subject to wide margins of error, it was reasoned that approximate measures of federal purchases by sectors would be preferable to leaving federal expenditures submerged in the external trade accounts as they are in the earlier work.

Federal purchases and construction estimates have been developed for two years, 1954 and 1958. The latter year serves effectively as the base for projecting federal government final demands to the projection reference years 1965, 1970, and 1975. In the procedure it has been convenient to deal with certain major categories of federal expenditures separately and then aggregate results. Accordingly, separate distributions of federal purchases in California have been developed for (a) military expenditures (excluding compensation of employees) and (b) other than military expenditures (excluding compensation of employees). A further convenient breakdown of each of these major components is available in the data on total United States federal expenditures. Component (a) is further broken down into (i) military equipment expenditures, (ii) military expenditures for other goods and services (excluding compensation of employees), and (iii) construction. Component (b) is available at the United States level by subcategories (i) purchases of goods and services (excluding compensation of employees) and (ii) construction. In effect, the procedure here employed has involved assigning a share of United States federal expenditures for each of these categories to California and then further allocating the resulting California subaggregates over appropriate California detailed sectors on the basis of various related measures.

Federal government expenditure data for 1954 from (55) and for 1958 from (56), derived for the subcategories noted above, are the basic control measures at the United States level. United States expenditures by the subcategories noted along with corresponding allocations to California for each year, 1954 and 1958, are summarized in table C-6-b. Procedures followed in arriving at the California measures were there noted, and the further allocation of these expenditures over California sectors follows.

Military equipment expenditures is, of course, the major expense category for the United States as a whole, and it turns out to be relatively even more important in the present allocation to California. Table C-6-a is included for reference in outlining the major steps in the procedure for arriving at federal expenditures in California for this category. Column 1 in that table is based on federal military expenditures for "major procurement and production" from (43). Data in (43) are assembled on a fiscal year basis and in other respects are not strictly comparable conceptually with federal expenditure aggregates in table C-6-b. However, the procurement data are further broken down into the important subclasses—aircraft, missiles, ships, and other—a breakdown which facilitates the further allocation of this major category over California sectors. Calendar year United States expenditures have been approximated in

SUPPLEMENTARY TABLE C-6-a

ESTIMATED FEDERAL DEFENSE EXPENDITURES FOR MILITARY EQUIPMENT CALIFORNIA, 1954 AND 1958

Military equipment	United States major procurement	California				Adjustment factor	California adjusted federal expenditures
		Employment as proportion of United States	Share of procurement	Research and development (R & D)	Procurement plus R & D		
	1	2	3	4	5	6	7
	million current dollars						
Aircraft and missiles							
1954	8,797	.3926	3454	363	3817	.9852	3760
1958	11,091	.2940	3261	653	3914	.9913	3880
Ships							
1954	1,050	.0358	37	0	37	.9852	36
1958	1,325	.0560	74	34	108	.9913	107
Electronics							
1954	1,084	.0577	63	73	136	.9852	134
1958	933	.0704	68	110	178	.9913	176
Other hard goods							
1954	3,547	.0426	151	37	188	.9852	185
1958	1,196	.0515	62	41	103	.9913	102

SOURCES:
Col. 1: Fiscal year data from (43) and adjusted to calendar year basis.
Col. 2: Based on employment data from (38) and (39).
Col. 3: Column 1 multiplied by column 2.
Col. 4: Based on United States R&D data from (43) and military prime contract data from (29).
Col. 5: Column 3 plus column 4.
Col. 6: Ratio of United States military equipment purchases from (55) and (56) to the sum of United States equipment procurement plus R&D from (44).
Col. 7: Column 5 multiplied by column 6.

SUPPLEMENTARY TABLE C-6-b

SELECTED CLASSES OF FEDERAL GOVERNMENT EXPENDITURES UNITED STATES AND CALIFORNIA, 1954 AND 1958

Expenditures	United States total		California total	
	1954	1958	1954	1958
	1	2	3	4
	million current dollars			
*Military**				
Purchases				
Military equipment	15,634	16,700	4,115	4,265
Other goods and services	7,202	8,703	735	1,084
New construction	1,030	1,402	105	175
Nonmilitary				
Purchases	1,532	3,399	167	382
New construction	2,415	1,986	215	177
Total purchases (less government sales)	24,368	28,802	5,017	5,731
Total new construction	3,445	3,388	320	352

* United States military purchases include foreign military assistance.
SOURCES:
Col. 1: From (2).
Col. 2: From (53).
Cols. 3 and 4: Computed.

table C-6-a by a simple average of expenditures in corresponding overlapping fiscal years. Also, other procurement and production from (43) has been allocated to "electronics" and "other hard goods" in table C-6-a on the basis of U. S. Department of Defense data on deliveries and prime military contracts from (29). From this latter source, a basis for proportional allocation to electronics and other hard goods was obtainable for 1953 and 1961 based on military deliveries in the former year and on prime contract awards in the latter year. The allocations for 1954 and 1958, shown in table C-6-a, were based on proportions derived by linear interpolation between the 1953 and 1961 figures. Accordingly, of the other procurement from (43), 23.4 per cent in 1954 and 43.9 per cent in 1958 were assigned to electronics and the balance in each year assigned to other hard goods.

In table C-6-a, California's share of federal procurement and production expenditures is assumed to be the same as its share of employment shown for each expenditure class in column 2. Employment shares are based on Census of Manufactures data for 1954 (38) and 1958 (39).[28] Procurement expenditures allocated to California in column 3 are, in each case, products of corresponding entries in columns 1 and 2.

Research and development (R&D) expenditures in column 4 represent federal expenditures for R&D not included in regular procurement outlays in column 1. The aggregate of unallocated federal R&D for each year is available also in (43). Forty per cent of this federal total has been allocated to California in each year.[29] The resulting California R&D has been allocated over California industries (including the military equipment categories in table C-6-a) on the basis of data giving industry distributions of United States R&D expenditures for fiscal years 1953–54 in (41) and 1957–58 in (44).[30] The part of federal R&D expenditure thus identified with military equipment appears in column 4. The unadjusted total federal defense expenditures for military equipment are then given by the sum of procurement and R&D. The resulting measures appear in column 5.

[28] The employment proportions shown in table C-6-a are based on SIC manufacturing industries as follows:

Aircraft and missiles—SIC 3721 (for 1954) and SIC 372 (for 1958).

Ships—SIC 373.

Electronics—SIC 36.

Other hard goods—SIC 33, 34, 35, 37 (other than 372 and 373), and 38.

The use of SIC 3721 for 1954 and the broader SIC 372 for 1958 makes an important difference in the proportion of aircraft and missiles expenditure allocated to California in the two years. Missile expenditures were minor in 1954 but much more important in 1958 SIC 3721 (establishments primarily engaged in assembling complete aircraft) was assumed to give a reasonable basis for deriving California's share of expenditures in 1954. A broader classification seemed preferable for deriving the 1958 allocation, and for this, SIC 372 (aircraft and parts) was used. The use of employment generally for determining California's share of expenditures must be recognized as growing more out of lack of other more suitable bases for estimation than from positive evidence that the results generated by this device are "good." In this case, the use of SIC 372 for aircraft and missiles in 1958 remains particularly open to question. It is likely that this procedure underestimates California's share of federal aircraft and missiles expenditure in 1958.

[29] The 40 per cent factor corresponds approximately to the percentage of military prime contracts for experimental, developmental, test, and research work awarded to California in fiscal year 1961 (29). The regional distribution of prime contract awards is thus assumed closely related to regional distribution of work performed (i.e., interregional subcontracting is assumed to be offsetting). Furthermore, California's share in R&D is assumed to have been the same in 1954 and 1958 as that reflected by 1961 contracts. Data available provide little basis for assessing validity of these assumptions.

[30] California's share of R&D for each industry is again assumed equal to its share in employment.

As noted above, it was total federal purchases of military equipment in table C-6-b which were finally used to set the level of federal expenditures from which the allocation to California was to be determined. Federal defense procurement and R&D data have been drawn upon only as a basis for distributing expenditures over industries. Total federal procurement plus R&D exceeded purchases of military equipment in both 1954 and 1958. The adjustment factors in column 6 represent, for 1954 and 1958, ratios of U. S. Department of Commerce military equipment purchases to total equipment procurement plus R&D for the United States. Multiplication of entries in column 5 by corresponding entries in column 6 give, in column 7, adjusted federal expenditures in California for military equipment. The totals of entries in column 7 of table C-6-a appear as entries for corresponding years in columns 3 and 4 of table C-6-b.

In the final allocation of military equipment expenditures to the federal government final demand column of the California input-output table, aircraft and missiles expenditures were assigned to sector 19 (aircraft and parts) while the combined expenditures for the other three categories were assigned to sector 18 (fabricated metals and machinery).

The remaining two categories of military expenditures in table C-6-b are purchases of other goods and services (excluding compensation of employees) and construction. The aggregate allocated to California for each of these categories is in each year in direct proportion to military personnel stationed in California. The relevant proportions of total United States military personnel stationed in California were .1021 in 1954 and .1246 in 1958. The resulting California expenditures appear in columns 3 and 4.

There remains the allocation of these two categories of military expenditures over California sectors. Construction expenditures were assigned directly to sector 28. But military construction in table C-6-b includes only new construction, while sector 28 is defined to include new and maintenance construction. Accordingly, an additional allowance has been made for maintenance construction. The latter was estimated as 36.6 per cent of new construction in 1954 and 36.4 per cent of new construction in 1958.[31] Maintenance construction expenditures thus derived were deducted from military purchases of other goods and services shown in table C-6-b. The results are shown in the measures as rearranged in table C-6-c.

The total of new and maintenance construction in table C-6-c is assigned to the military component of sector 28 in table C-6-d. The remaining aggregates of military purchases of other goods and services were allocated to the remaining California sectors (i.e., California sectors excluding 18, 19, 20, and 28) in proportion to prime military contracts identified with corresponding sectors in the fiscal year 1960. The relevant proportional distribution was developed from data in (22). The use of 1960 prime contracts for 1954 and 1958 allocations implies relative stability in the distribution over sectors of other military purchases during the period 1954–1960. Evidence supporting the validity of such an assumption cannot be documented from information available to the author. However, the fact that this category does not include the more volatile military hard goods expenditures presumably makes the assumed stable distribution over sectors more acceptable than it would be were military equipment included.

Other than military purchases and construction by the federal government are shown also in tables C-6-b and C-6-c. United States total other than military

[31] Based on United States total maintenance and repair expenditures as percentage of total United States new construction from (52), (53), and (54).

purchases are simply total net United States purchases (i.e., total federal government purchases less federal government sales) minus total federal military purchases. Similarly, United States other than military new construction is total federal new construction less military new construction.

SUPPLEMENTARY TABLE C-6-c
ESTIMATED FEDERAL GOVERNMENT PURCHASES BY MAJOR EXPENDITURE CATEGORIES CALIFORNIA, 1954 AND 1958

	1954	1958
	million current dollars	
Military		
Purchases		
Military equipment	4,115	4,265
Other goods and services	697	1,020
Total military purchases	4,812	5,285
Construction		
New	105	175
Maintenance	38	64
Total military construction	143	239
Nonmilitary		
Purchases		
Goods and services	88	318
Construction		
New	215	177
Maintenance	79	64
Total nonmilitary construction	294	241
Total purchases	4,900	5,603
Total construction	437	480
Grand total	5,337	6,083

SOURCE: Computed.

For approximating the aggregate of other purchases in California, it has been assumed that expenditures in California were proportional to federal civilian employment in California. Federal civilian employment data from (48) and (50) were adopted as the basis for this allocation. The relevant California proportions of employment were .1088 in 1954 and .1123 in 1958. Other than military new construction in California, on the other hand, was estimated for 1954 by the difference between Brubaker's (2) estimate of total federal new construction in California and military new construction as estimated above. The 1958 figure for new construction was then derived by projecting the California 1954 estimate in direct proportion to the change in total United States other than military construction between 1954 and 1958; that is, California nonmilitary new construction is assumed to be the same proportion of total United States nonmilitary new construction in 1958 as in 1954. Adjustments for nonmilitary maintenance construction were made in the same way as for the military component, the resulting estimated maintenance construction being deducted from nonmilitary other purchases. The resulting subaggregates are shown in table C-6-c.

As for military, the sum of new nonmilitary and maintenance construction for each year is assigned to sector 28 in table C-6-d. The remaining nonmilitary purchases constitute relatively small proportions of estimated total federal government purchases in California in both years. Independent information for classifying expenditures in this category is too limited to provide a basis for allocating these expenditures over California sectors. In the absence of such independent basis, nonmilitary other purchases in each year were allocated over state sectors (other than sector 28) in the same pattern as state and local government expenditures in 1954 (table C-5). This procedure is admittedly questionably. On the other hand, the relatively minor importance of this category of expenditures suggests that refinement in its allocation over sectors would have little effect on results generated in the present study.

The finally resulting allocations of federal government expenditures over California sectors are shown in table C-6-d. Military and nonmilitary ex-

SUPPLEMENTARY TABLE C-6-d

FEDERAL GOVERNMENT PURCHASES, 28-SECTOR DETAIL CALIFORNIA, 1954 AND 1958

Sector	1954			1958		
	Military	Other than military	Total	Military	Other than military	Total
	thousand current dollars					
1	0	0	0	0	0	0
2	0	35	35	0	127	127
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	133	44	177	195	159	354
7	0	44	44	0	159	159
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	122	0	122	180	0	180
11	507	18	525	745	64	809
12	7,779	361	8,140	11,420	1,304	12,724
13	1,372	185	1,557	2,013	668	2,681
14	4,780	88	4,868	7,015	318	7,333
15	5,253	176	5,429	7,711	636	8,347
16	5,967	563	6,530	8,759	2,035	10,794
17	49,867	810	50,677	73,197	2,926	76,123
18	327,878	3,318	331,196	356,664	11,989	368,653
19	3,472,736	0	3,472,736	3,594,432	0	3,594,432
20	0	0	0	0	0	0
21	83,797	3,168	86,965	123,002	11,448	134,450
22	67	0	67	99	0	99
23	2,266	3,344	5,610	3,316	12,084	15,400
24	331,571	1,241	332,812	485,226	4,484	489,710
25	360,981	1,327	362,308	381,381	4,800	386,181
26	156,924	73,278	230,202	229,645	264,799	494,444
27	0	0	0	0	0	0
28	143,000	294,000	437,000	239,000	241,000	480,000
Total	4,955,000	382,000	5,337,000	5,524,000	559,000	6,083,000

SOURCE: Computed.

penditures are there shown separately as derived. A final adjustment was necessary in this latter table to bring federal government purchases by sectors into conceptual conformity with the California input-output table adopted in the present work. The procedure described above for deriving purchases by sectors makes no allowance in the military component for trade and transportation margins to be assigned to sector 25.[32] Data are not available for direct determination of margin allowances. Accordingly, adjustments have been made in military purchases from sectors 1 through 22 such that a margin allowance from each of these sectors gets reassigned to sector 25. The adjustment is based on the United States Bureau of Labor Statistics 1947 interindustry relations study (47). In effect, the aggregates of federal government purchases from California sectors 1 through 22 in 1954 and 1958 were assumed to bear the same relation to the trade and transportation sector (26) as that shown between aggregate federal purchases from corresponding United States sectors and trade and transportation in the 1947 United States table. A uniform proportional adjustment was applied to each sector.

[32] The basis for separating out a trade and transportation sector in the original California input-output construct is discussed in Martin and Carter (26).

TABLE C-7

WATER COEFFICIENT ADJUSTMENT FACTORS, SECTORS 4–9

Sector	1975 yield index (1954–57 = 100)	Implied average annual rate of increase*	Adjustment factors			Water coefficients			
			1965	1970	1975	Base year 1954	Adjusted		
							1965	1970	1975
	1	2	3	4	5	6	7	8	9
4.....	122	.009	1.1125	1.1678	1.2260	23.314184	20.956570	19.964192	19.016463
5.....	130	.013	1.1512	1.2270	1.3080	8.411101	7.306377	6.855013	6.430505
6.....	132	.013	1.1606	1.2420	1.3290	3.164220	2.726366	2.547681	2.380903
7.....	113	.006	1.0678	1.1001	1.1334	7.708929	7.219450	7.007480	6.801596
8.....	115	.007	1.0778	1.1152	1.1539	3.226062	2.993192	2.892810	2.795790
9.....	119	.008	1.0980	1.1456	1.1953	46.678495	42.512291	40.745893	39.051698

* Compound rate.

SOURCES:

Col. 1: Weighted averages of projected yield indexes from Dean and McCorkle (18, table 2) weighted by 1954 GDO from Martin and Carter (27). Product and subgroup yield indexes combined as follows to form sector indexes:

Sector 4—feed grains and food grains (rice and wheat).
Sector 5—cotton.
Sector 6—vegetables (tomatoes, leafy green and yellow, and other), potatoes, and dry edible beans.
Sector 7—fruits (apples, grapes, and other), and tree nuts (walnuts and almonds).
Sector 8—citrus.
Sector 9—based on projected hay yield increase from 3.36 to 4.00 tons per acre from (18, page 31).

Col. 2: Computed. Base value of 100 centered on base period 1954–1957.

Cols. 3–5: Computed. Let rate for sector j in column 2 be denoted by r_j. Then, column 3 = $(1 + r_j)^{11}$; column 4 = $(1 + r_j)^{16}$; and column 5 = $(1 + r_j)^{21}$.

Col. 6: From Zusman and Hoch (72).

Cols. 7–9: Computed. Base year coefficient divided by adjustment factor for corresponding year.

The column of total federal purchases for 1954 appears as the first column of table C-6. The 1958 column appears also as column 2 of the latter table, but deflated to 1954 dollars, using implicit United States price deflators for government purchases there cited.

Finally, federal government purchases by sectors for 1954 are those included in table B-1 as the exogenous federal government final demand column. As noted above, the source cited for the latter table (Zusman and Hoch, 72) does not include a full federal government final demand vector. Instead, federal purchases are in large part submerged in the external trade accounts (exports and competitive imports). In view of this, measures here developed of federal purchases by sectors draw these purchases from the external trade accounts, requiring compensating adjustments in these accounts. This was done in table B-1. For net importing sectors, federal government purchases are provided for by a corresponding increase in imports. In net exporting sectors, exports are reduced by the amount of federal purchases. Since these adjustments were fully compensating, GDO for each individual sector remains unchanged.

TABLE C-8

BASE YEAR (1954) LABOR REQUIREMENTS AND LABOR COEFFICIENTS

Sector	Requirements (employees)	Coefficients (employees per 1,000 GDO)
1	17,680	.052481
2	28,970	.092788
3	58,774	.171082
4	19,302	.097619
5	42,101	.148071
6	95,615	.195997
7	101,106	.297684
8	28,575	.208551
9	33,664	.185781
10	51,625	.175132
11	7,835	.019408
12	19,065	.018578
13	20,493	.035913
14	45,507	.037260
15	59,826	.034639
16	33,700	.038947
17	52,474	.018343
18	246,954	.061777
19	250,069	.054965
20	41,395	.046209
21	348,501	.075593
22	10,053	.032841
23	135,611	.085332
24	394,917	.089063
25	1,274,789	.156365
26	750,306	.073466
27	*	*
28	412,332	.063480
s†	163,000	.042373
f‡	214,889	.022951

* Blanks indicate zero.

† Employese per $1,000 total state and local government expenditures.

‡ Employees per $1,000 total federal government expenditures.

SOURCE: From Zusman and Hoch (72). Coefficients for endogenous sector 28 and exogenous sectors *s* and *f* differ from (72) due to adjustment in GDO for 28 and adjustments in total expenditures for *s* and *f*.

APPENDIX D

ENDOGENOUS SECTOR PROJECTIONS: 28-SECTOR DETAIL

TABLE D-1

INITIAL PROJECTIONS, GDO COMPONENT X[1], 28-SECTOR DETAIL

Sector	1954	1965	1970	1975	1954	1965	1970	1975
	thousand 1954 dollars				*per cent of total*			
1	324,548	549,594	677,428	814,136	0.61	0.60	0.58	0.56
2	311,773	524,467	643,105	769,331	0.59	0.57	0.55	0.53
3	337,690	537,568	643,683	757,829	0.64	0.59	0.55	0.52
4	171,646	275,659	331,080	390,588	0.32	0.30	0.28	0.27
5	263,220	344,485	386,901	438,251	0.50	0.38	0.33	0.30
6	492,609	692,177	791,950	903,556	0.93	0.76	0.68	0.62
7	335,108	466,106	532,956	608,606	0.63	0.51	0.45	0.42
8	136,776	189,711	217,010	250,494	0.26	0.21	0.19	0.17
9	178,278	291,895	354,465	421,676	0.34	0.32	0.30	0.29
10	284,568	427,072	506,359	595,922	0.54	0.47	0.43	0.41
11	400,557	633,616	755,288	886,265	0.75	0.69	0.64	0.61
12	1,023,209	1,733,889	2,137,910	2,569,977	1.92	1.89	1.82	1.76
13	570,117	904,786	1,077,866	1,263,590	1.07	0.99	0.92	0.87
14	1,200,994	1,620,057	1,832,768	2,078,409	2.26	1.77	1.56	1.43
15	1,711,998	2,751,572	3,310,297	3,911,221	3.22	3.00	2.82	2.68
16	811,321	1,387,036	1,747,246	2,143,309	1.53	1.51	1.49	1.47
17	2,770,863	5,557,844	7,521,695	9,912,960	5.21	6.06	6.41	6.80
18	3,639,016	6,132,579	7,895,913	9,843,853	6.85	6.69	6.73	6.76
19	4,548,641	5,247,861	6,348,208	7,585,260	8.56	5.73	5.41	5.21
20	792,632	1,232,459	1,566,438	1,935,747	1.49	1.34	1.34	1.33
21	4,302,120	7,577,276	9,654,742	11,915,121	8.09	8.27	8.23	8.18
22	277,041	439,928	538,261	654,992	0.52	0.48	0.46	0.45
23	1,542,723	2,905,327	3,832,524	4,864,928	2.90	3.17	3.27	3.34
24	4,368,694	8,161,737	10,658,102	13,409,057	8.22	8.90	9.09	9.20
25	7,769,070	13,870,704	17,846,309	22,193,908	14.62	15.13	15.21	15.23
26	9,968,808	18,942,898	24,790,193	31,215,922	18.75	20.67	21.13	21.42
27	214,105	352,017	438,283	532,285	0.40	0.38	0.37	0.37
28	4,405,836	7,908,066	10,258,587	12,839,775	8.29	8.63	8.75	8.81
Total*	53,153,961	91,658,985	117,295,565	145,706,966	100.00	100.00	100.00	100.00

* Entries may not add to totals due to rounding.
SOURCE: Projected by system $X^{-1}{}_T = C^{-1}Y_T$ (see A-2).

TABLE D-2

INITIAL PROJECTIONS, COMPETITIVE IMPORTS, 28-SECTOR DETAIL

Sector	1954	1965	1970	1975	1954	1965	1970	1975
	thousand 1954 dollars				*per cent of total*			
1	238,761	404,321	498,365	598,937	3.92	3.91	3.80	3.70
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	22,036	35,389	42,503	50,143	0.36	0.34	0.32	0.31
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	2,910	4,765	5,786	6,883	0.05	0.05	0.04	0 04
10	0	0	0	0	0	0	0	0
11	43,884	69,338	82,653	96,987	0.72	0.67	0.63	0.60
12	198,502	336,373	414,752	498,573	3.26	3.26	3.16	3.08
13	96,820	153,655	183,048	214,589	1.59	1.49	1.40	1.33
14	0	0	0	0	0	0	0	0
15	182,350	293,078	352,590	416,596	2.99	2.84	2.69	2.58
16	484,655	828,567	1,043,744	1,280,338	7.95	8.02	7.96	7.92
17	0	0	0	0	0	0	0	0
18	1,739,402	2,931,293	3,774,144	4,705,234	28.54	28.37	28.77	29.09
19	0	0	0	0	0	0	0	0
20	797,403	1,239,876	1,575,865	1,947,396	13.08	12.00	12.01	12.04
21	2,224,153	3,917,376	4,991,405	6,159,998	36.49	37.91	38.04	38.09
22	0	0	0	0	0	0	0	0
23	54,666	103,950	135,805	172,389	0.90	1.00	1.04	1.07
24	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0
27	9,732	16,001	19,923	24,196	0.16	0.15	0.15	0.15
28	0	0	0	0		0	0	0
Total*	6,095,224	10,332,982	13,120,584	16,172,258	100.00	100.00	100.00	100.00

* Entries may not add to totals due to rounding.

SOURCE: Projections based on 1954 competitive import coefficients (table D-5) and projected GDO component X^1 table D-1).

TABLE D-3

INITIAL PROJECTIONS, EXPORTS, 28-SECTOR DETAIL

Sector	1954	1965	1970	1975	1954	1965	1970	1975
	thousand 1954 dollars				*per cent of total*			
1	0	0	0	0	0	0	0	0
2	1,602	2,108	2,359	2,680	0.05	0.04	0.04	0.04
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	227,897	286,624	314,969	350,967	6.60	5.70	5.35	4.97
6	141,130	173,458	188,888	208,421	4.09	3.45	3.21	2.95
7	49,722	61,112	66,548	73,420	1.44	1.22	1.13	1.04
8	108,603	146,181	164,997	189,242	3.15	2.91	2.80	2.68
9	0	0	0	0	0	0	0	0
10	44,492	65,387	76,402	90,955	1.29	1.30	1.30	1.29
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	821,868	1,010,131	1,099,988	1,213,734	23.81	20.09	18.68	17.20
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	550,779	1,036,669	1,334,962	1,763,591	15.96	20.61	22.67	224.99
18	0	0	0	0	0	0	0	0
19	630,342	926,368	1,082,433	1,288,611	18.26	18.42	18.38	18.26
20	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0
22	155,542	228,589	267,099	317,975	4.51	4.55	4.54	4.51
23	0	0	0	0	0	0	0	0
24	230,064	352,915	419,386	508,398	6.66	7.02	7.12	7.20
25	205,233	301,858	352,713	419,896	5.95	6.00	5.99	5.95
26	284,502	436,422	518,621	628,695	8.24	8.68	8.81	8.91
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
Total*	3,451,996	5,027,822	5,889,365	7,056,594	100.00	100.00	100.00	100.00

* Entries may not add to totals due to rounding.

SOURCE: Exogenously projected (see table C-4).

TABLE D-4

COMPETITIVE IMPORT COEFFICIENTS RELATIVE TO SECTOR TOTAL SUPPLY*

Sector	Base year 1954	1965			1970			1975		
		A-I	A-II	A-III	A-I	A-II	A-III	A-I	A-II	A-III
1	.423854	.257428	.409410	.407480	.219402	.405840	.403457	.195696	.403558	.400891
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	.113670	.061739	.110763	.109239	.048793	.109910	.107980	.040427	.109337	.107138
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	.015888	.008376	.015137	.015025	.006807	.014897	.014759	.005858	.014742	.014587
10	0	0	0	0	0	0	0	0	0	0
11	.098639	.060602	.096554	.095038	.050112	.095944	.094006	.043074	.095527	.093304
12	.162181	.107029	.157872	.157241	.093324	.156712	.155931	.084572	.155970	.155095
13	.144942	.094664	.144687	.144456	.079669	.144529	.144230	.069293	.144420	.144073
14	0	0	0	0	0	0	0	0	0	0
15	.096260	.061279	.094870	.092360	.051861	.094476	.091291	.045252	.094209	.090578
16	.373969	.201062	.087819	.117548	.170082	.038595	.074088	.153108	.012561	.050578
17	0	0	0	0	0	0	0	0	0	0
18	.322784	.187460	.076426	.107281	.163145	.033649	.069728	.150373	.011340	.050128
19	0	0	0	0	0	0	0	0	0	0
20	.501500	.216633	.351202	.361790	.174809	.329462	.340881	.153343	.318336	.330110
21	.340653	.208705	.095124	.126328	.183080	.049899	.086449	.168677	024806	.064269
22	0	0	0	0	0	0	0	0	0	0
23	.034222	.022700	.032182	.032237	.020818	.031850	.031912	.019017	.031689	.031756
24	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0
27	.043480	.018731	.029971	.030753	.014999	.027847	.028691	.012973	.026684	.027555
28	0	0	0	0	0	0	0	0	0	0

* Each entry shows dollars of competitive imports per dollar total supply of product of corresponding sector.

TABLE D-5

COMPETITIVE IMPORT COEFFICIENTS RELATIVE TO SECTOR GDO*

Sector	Base year 1954	1965			1970			1975		
		A-I	A-II	A-III	A-I	A-II	A-III	A-I	A-II	A-III
1	.735672	.346671	.693222	.687707	.281069	.683048	.676325	.243311	.676609	.669145
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	.128378	.065802	.124560	.122036	.051296	.123482	.121051	.042130	.122759	.119994
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	.010324	.008447	.015370	.015254	.006854	.015122	.014980	.005893	.014963	.014803
10	0	0	0	0	0	0	0	0	0	0
11	.109433	.064512	.106873	.105019	.052756	.106126	.103760	.045013	.105616	.102905
12	.193999	.119857	.187468	.186579	.102930	.185834	.184737	.092385	.184792	.183565
13	.169825	.104562	.169163	.168847	.086566	.168947	.168538	.074452	.168798	.168324
14	0	0	0	0	0	0	0	0	0	0
15	.106513	.065279	.104814	.101758	.054475	.104333	.100462	.047397	.104007	.099600
16	.597365	.251662	.095073	.133206	.204938	.040144	.080016	.180788	.012721	.053272
17	0	0	0	0	0	0	0	0	0	0
18	.477987	.230709	.082750	.120173	.194950	.034821	.074954	.176987	.011470	.052775
19	0	0	0	0	0	0	0	0	0	0
20	1.006018	.276541	.541312	.566882	.211841	.491340	.517177	.181116	.466998	.492782
21	.516990	.263751	.105124	.144594	.224110	.052520	.094030	.202902	.025437	.068683
22	0	0	0	0	0	0	0	0	0	0
23	.035435	.023227	.033252	.033311	.021261	.032898	.032964	.020322	.032726	.032798
24	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0
27	.045456	.019089	.030897	.031729	.015227	.028645	.029538	.013144	.027416	.028336
28	0	0	0	0	0	0	0	0	0	0

* Each entry shows dollars of competitive imports per dollar GDO or corresponding sector.

TABLE D-6

EXPORTS—BASE YEAR, INITIAL PROJECTIONS, AND ADJUSTED PROJECTIONS UNDER A-I AND A-III*

Sector	Base year 1954	Initial projections			Adjusted projections					
		1965	1970	1975	A-I			A-III		
					1965	1970	1975	1965	1970	1975
	thousand 1954 dollars									
1....	0	0	0	0	0	0	0	0	0	0
2....	1,602	2,108	2,359	2,680	2,093	3,731	4,548	2,108	2,359	2,680
3....	0	0	0	0	0	0	0	0	0	0
4....	0	0	0	0	0	0	0	0	0	0
5....	227,897	286,624	314,969	350,967	409,263	505,161	609,944	286,624	314,969	350,967
6....	141,130	173,458	188,888	208,421	249,397	306,657	368,783	173,458	188,888	208,421
7....	49,722	61,112	66,548	73,429	87,884	108,067	129,964	61,112	66,548	73,429
8....	108,603	146,181	164,997	189,242	204,660	255,688	312,733	146,181	164,997	189,242
9....	0	0	0	0	0	0	0	0	0	0
10....	44,492	65,387	76,402	90,955	89,365	113,588	141,590	65,387	76,402	90,955
11....	0	0	0	0	0	0	0	0	0	0
12....	0	0	0	0	0	0	0	0	0	0
13....	0	0	0	0	0	0	0	0	0	0
14....	821,868	1,010,131	1,099,088	1,213,734	1,452,403	1,785,876	2,147,685	1,791,173	2,311,250	2,863,069
15....	0	0	0	0	0	0	0	0	0	0
16....	0	0	0	0	0	0	0	0	0	0
17....	550,779	1,036,609	1,334,962	1,763,591	1,333,069	1,794,628	2,389,502	1,036,609	1,334,962	1,763,591
18....	0	0	0	0	0	0	0	0	0	0
19....	630,342	926,368	1,082,433	1,288,611	1,265,603	1,608,529	2,004,978	926,368	1,082,433	1,288,611
20....	0	0	0	0	0	0	0	0	0	0
21....	0	0	0	0	0	0	0	0	0	0
22....	155,542	228,589	267,099	317,975	312,304	396,926	494,750	228,589	267,099	317,975
23....	0	0	0	0	0	0	0	0	0	0
24....	230,064	352,915	419,386	508,398	476,718	611,383	769,834	352,915	419,386	508,398
25....	205,233	301,858	352,713	419,896	412,438	524,203	653,408	301,858	352,713	419,896
26....	284,502	436,422	518,621	628,695	589,511	756,036	951,974	436,422	518,621	628,695
27....	0	0	0	0	0	0	0	0	0	0
28....	0	0	0	0	0	0	0	0	0	0

* Base year entries and initial projections from table C-4. Adjusted projections for A-I and A-III are based on procedures described in A-3.

TABLE D-7

FINAL PROJECTIONS, GDO, 28-SECTOR DETAIL

Sector	1954	1965	1970	1975	1954	1965	1970	1975
	thousand 1954 dollars				*per cent of total*			
	Projection A-I							
1	336,881	718,485	933,690	1,156,177	0.59	0.65	0.64	0.65
2	312,217	527,590	647,800	775,288	0.55	0.48	0.45	0.43
3	343,543	551,724	664,333	781,033	0.60	0.50	0.46	0.44
4	197,729	296,907	363,080	432,651	0.35	0.27	0.25	0.24
5	284,329	475,900	589,889	711,355	0.50	0.43	0.41	0.40
6	487,839	828,270	1,002,745	1,190,154	0.85	0.75	0.69	0.67
7	339,642	572,151	697,359	832,059	0.60	0.52	0.48	0.47
8	137,017	253,219	315,487	384,572	0.24	0.23	0.22	0.22
9	181,203	301,755	369,013	439,674	0.32	0.27	0.25	0.25
10	294,778	509,372	631,893	764,667	0.52	0.46	0.43	0.43
11	403,698	672,722	814,877	965,044	0.71	0.61	0.56	0.54
12	1,026,189	1,874,519	2,353,700	2,856,653	1.80	1.70	1.62	1.60
13	570,629	965,832	1,171,958	1,389,796	1.00	0.87	0.81	0.78
14	1,221,341	2,074,384	2,537,099	3,036,218	2.14	1.88	1.75	1.70
15	1,727,143	2,933,975	3,590,108	4,282,729	3.03	2.65	2.47	2.40
16	865,274	2,008,928	2,679,496	3,321,021	1.52	1.82	1.84	1.86
17	2,860,687	6,299,718	8,644,713	11,341,305	5.01	5.70	5.95	6.35
18	3,997,514	9,675,487	13,196,502	15,985,101	7.00	8.75	9.08	8.95
19	4,549,607	5,635,565	6,947,580	8,394,842	7.97	5.10	4.78	4.70
20	895,828	2,592,024	3,594,223	4,389,443	1.57	2.34	2.47	2.46
21	4,610,249	10,314,238	13,786,097	17,040,258	8.08	9.33	9.49	9.54
22	306,109	602,188	781,586	953,781	0.54	0.54	0.54	0.53
23	1,589,221	3,114,403	4,140,954	5,228,851	2.79	2.82	2.85	2.93
24	4,434,112	8,401,979	11,149,449	14,000,937	7.77	7.68	7.68	7.84
25	8,152,630	15,335,958	19,932,535	24,471,877	14.29	13.87	13.72	13.70
26	10,213,025	19,587,866	25,740,847	32,333,188	17.90	17.72	17.72	18.11
27	228,660	413,705	528,065	633,196	9.40	0.37	0.36	0.35
28	6,495,488	12,908,279	17,460,133	20,485,458	11.38	11.68	12.02	11.47
Total*	57,062,582	110,537,143	145,265,211	178,577,328	100.00	100.00	100.00	100.00

TABLE D-7—*continued*

Sector	1954	1965	1970	1975	1954	1965	1970	197o
	thousand 1954 dollars				*per cent of total*			
	Projection A-II							
1	336,881	567,435	704,477	849,105	0.59	0.52	0.49	0.48
2	312,217	525,490	644,559	770,849	0.55	0.48	0.45	0.44
3	343,543	547,967	658,716	773,464	0.60	0.50	0.46	0.44
4	197,729	278,228	334,877	395,022	0.35	0.26	0.23	0.23
5	284,329	351,268	396,782	448,467	0.50	0.32	0.28	0.26
6	487,839	693,167	793,275	905,001	0.85	0.64	0.56	0.52
7	339,642	467,016	534,250	609,952	0.60	0.43	0.37	0.35
8	137,017	189,707	217,087	250,584	0.24	0.17	0.15	0.14
9	181,203	295,794	360,117	427,737	0.32	0.27	0.25	0.24
10	294,778	432,061	512,395	602,339	0.52	0.40	0.36	0.34
11	403,698	638,703	762,818	894,862	0.71	0.59	0.53	0.51
12	1,026,189	1,755,363	2,169,968	2,607,979	1.80	1.61	1.52	1.49
13	570,629	908,775	1,083,665	1,269,898	1.00	0.83	0.76	0.73
14	1,221,341	1,622,500	1,836,257	2,082,082	2.14	1.49	1.29	1.19
15	1,727,143	2,773,572	3,342,383	3,946,783	3.03	2.55	2.34	2.25
16	865,274	2,212,778	2,971,237	3,690,001	1.52	2.03	2.08	2.11
17	2,860,687	5,773,959	7,832,790	10,239,125	5.01	5.30	5.49	5.85
18	3,997,514	10,668,772	14,744,680	17,945,450	7.00	9.80	10.33	10.24
19	4,549,607	5,260,590	6,366,266	7,603,556	7.97	4.85	4.46	4.34
20	895,828	2,070,342	2,806,713	3,384,636	1.57	1.90	1.97	1.93
21	4,610,249	11,586,959	15,715,262	19,564,843	8.08	10.64	11.01	11.17
22	306,109	510,517	640,450	762,595	0.54	0.47	0.45	0.44
23	1,589,221	3,026,659	4,007,052	5,048,918	2.79	2.78	2.81	2.88
24	4,434,112	8,326,474	10,895,212	13,657,073	7.77	7.65	7.63	7.80
25	8,152,630	15,038,646	19,490,270	23,884,796	14.29	13.81	13.65	13.64
26	10,213,025	19,321,038	25,332,683	31,782,669	17.90	17.74	17.74	18.15
27	228,660	399,359	507,058	605,784	0.40	0.37	0.36	0.35
28	6,495,488	12,646,434	17,118,364	20,083,947	11.38	11.61	11.99	11.47
Total*	57,062,582	108,889,653	142,779,663	175,087,517	100.00	100.00	100.00	100.00

TABLE D-7—*continued*

Sector	1954	1965	1970	1975	1954	1965	1970	1975
	thousand 1954 dollars				*per cent of total*			
	Projection A-III							
1	336,881	573,468	713,857	861,656	0.59	0.52	0.49	0.49
2	312,217	526,595	646,279	773,206	0.55	0.48	0.45	0.44
3	343,543	549,866	661,647	777,391	0.60	0.50	0.46	0.44
4	197,729	282,594	341,613	404,201	0.35	0.26	0.24	0.23
5	284,329	352,116	397,940	450,190	0.50	0.32	0.28	0.25
6	487,839	795,412	951,808	1,120,796	0.85	0.72	0.66	0.63
7	339,642	604,313	747,164	899,877	0.60	0.55	0.52	0.51
8	137,017	198,511	230,644	260,049	0.24	0.18	0.16	0.15
9	181,203	298,906	364,894	434,236	0.32	0.27	0.25	0.25
10	294,778	490,387	602,575	724,919	0.52	0.45	0.42	0.41
11	403,698	650,775	781,494	920,322	0.71	0.59	0.54	0.52
12	1,026,189	1,769,641	2,192,085	2,638,030	1.80	1.61	1.52	1.49
13	570,629	910,768	1,086,732	1,274,089	1.00	0.83	0.75	0.72
14	1,221,341	2,417,149	3,068,586	3,760,120	2.14	2.20	2.13	2.12
15	1,727,143	2,860,401	3,476,930	4,129,714	3.03	2.60	2.41	2.33
16	865,274	2,191,365	2,946,838	3,665,998	1.52	1.99	2.04	2.07
17	2,860,687	5,796,881	7,867,470	10,285,430	5.01	5.28	5.45	5.80
18	3,997,514	10,468,250	14,436,991	17,570,644	7.00	9.53	10.00	9.91
19	4,549,607	5,261,180	6,367,152	7,604,065	7.97	4.79	4.41	4.29
20	895,828	2,055,901	2,788,221	3,365,335	1.57	1.87	1.93	1.90
21	4,610,249	11,296,739	15,283,441	19,009,253	8.08	10.28	10.59	10.73
22	306,109	512,755	643,784	766,878	0.54	0.47	0.45	0.43
23	1,589,221	3,045,249	4,035,406	5,087,085	2.79	2.77	2.80	2.87
24	4,434,112	8,345,116	10,923,537	13,695,015	7.77	7.60	7.57	7.73
25	8,152,630	15,117,479	19,607,630	24,040,482	14.29	13.76	13.59	13.57
26	10,213,025	19,373,954	25,413,360	31,891,239	17.90	17.64	17.61	18.00
27	228,650	404,192	514,443	615,793	0.40	0.37	0.36	0.35
28	6,495,488	12,705,727	17,198,540	20,181,841	11.38	11.57	11.92	11.39
Total*	57,062,582	109,855,690	144,291,000	177,217,454	100.00	100.00	100 00	100.00

* Entries may not add to totals due to rounding.

SOURCE: Projected by system $\begin{bmatrix} X_T \\ \hline \Delta K_T \end{bmatrix} = \begin{bmatrix} C & -E_k \\ \hline K & -I \end{bmatrix}^{-1} \begin{bmatrix} Y_T \\ \hline K_0 \end{bmatrix}$ (see equation 1.8 on page 20).

TABLE D-8

FINAL PROJECTIONS, COMPETITIVE IMPORTS, 28-SECTOR DETAIL

Sector	1954	1965	1970	1975	1954	1965	1970	1975
	thousand 1954 dollars				*per cent of total*			
	Projection A-I							
1	247,834	249,078	262,431	281,311	3.77	3.51	3.31	3.23
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	25,384	19,537	18,625	18,238	0.39	0.38	0.23	0.21
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	2,958	2,549	2,529	2,591	0.04	0.04	0.03	0.03
10	0	0	0	0	0	0	0	0
11	44,178	43,399	42,990	43,440	0.67	0.61	0.54	0.50
12	199,080	224,674	242,266	263,912	3.02	3.17	3.05	3.03
13	96,907	100,989	101,452	103,473	1.47	1.42	1.28	1.19
14	0	0	0	0	0	0	0	0
15	183,964	191,527	195,571	202,988	2.80	2.70	2.46	2.33
16	516,884	503,571	549,130	600,401	7.86	7.13	6.92	6.89
17	0	0	0	0	0	0	0	0
18	1,910,758	2,232,222	2,572,658	2,829,155	29.04	31.50	32.42	32.47
19	0	0	0	0	0	0	0	0
20	901,219	716,801	761,404	794,998	13.70	10.11	9.60	9.12
21	2,383,451	2,720,390	3,089,602	3,457,502	36.23	38.39	38.94	39.68
22	0	0	0	0	0	0	0	0
23	56,314	72,338	88,041	106,261	0.86	1.02	1.11	1.22
24	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0
27	10,394	7,897	8,041	8,323	0.16	0.11	0.10	0.10
28	0	0	0	0	0	0	0	0
Total*	6,579,325	7,086,973	7,934,740	8,712,582	100.00	100.00	100.00	100.00

TABLE D-8—*continued*

Sector	1954	1965	1970	1975	1954	1965	1970	1975
	thousand 1954 dollars				*per cent of total*			
	Projection A-II							
1	247,834	393,358	481,192	574,512	3.77	8.16	10.63	13.23
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	25,384	34,656	41,351	48,492	0.39	0.72	0.91	1.12
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	2,958	4,546	5,446	6,400	0.04	0.09	0.12	0.15
10	0	0	0	0	0	0	0	0
11	44,178	68,260	80,955	94,512	0.67	1.42	1.79	2.18
12	199,080	329,074	403,264	481,934	3.02	6.83	8.91	11.10
13	96,907	153,731	183,082	214,356	1.47	3.19	4.04	4.93
14	0	0	0	0	0	0	0	0
15	183,964	290,709	348,721	410,493	2.80	6.03	7.70	9.45
16	516,884	210,375	119,277	46,941	7.86	4.37	2.63	1.08
17	0	0	0	0	0	0	0	0
18	1,910,758	882,841	513,424	205,834	29.04	18.32	11.34	4.74
19	0	0	0	0	0	0	0	0
20	901,219	1,120,701	1,379,050	1,580,618	13.70	23.25	30.46	36.39
21	2,383,451	1,218,067	825,366	497,671	36.23	25.27	18.23	11.46
22	0	0	0	0	0	0	0	0
23	56,314	100,642	131,824	165,231	0.86	2.09	2.91	3.80
24	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0
27	10,394	12,339	14,525	16,608	0.16	0.26	0.32	0.38
28	0	0	0	0	0	0	0	0
Total*	6,579,325	4,819,302	4,527,466	4,343,003	100.00	100.00	100.00	100.00

TABLE D-8—*continued*

Sector	1954	1965	1970	1975	1954	1965	1970	1975
	thousand 1954 dollars				*per cent of total*			
	Projection A-III							
1	247,834	394,378	482,799	576,573	3.77	6.87	8.18	9.44
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	25,384	34,656	41,353	48,502	0.39	0.60	0.70	0.79
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	2,958	4,560	5,466	6,428	0.04	0.08	0.09	0.11
10	0	0	0	0	0	0	0	0
11	44,178	68,344	81,088	94,706	0.67	1.19	1.37	1.55
12	199,080	330,178	404,959	484,250	3.02	5.75	6.86	7.93
13	96,907	153,780	183,156	214,460	1.47	2.68	3.10	3.51
14	0	0	0	0	0	0	0	0
15	183,964	291,069	349,299	411,320	2.80	5.07	5.92	6.74
16	516,884	291,903	235,794	195,305	7.86	5.09	3.99	3.20
17	0	0	0	0	0	0	0	0
18	1,910,758	1,258,001	1,082,110	927,291	29.04	21.92	18.33	15.18
19	0	0	0	0	0	0	0	0
20	901,219	1,165,453	1,442,004	1,658,376	13.70	20.30	24.43	27.15
21	2,383,451	1,633,441	1,446,272	1,305,612	36.23	28.46	24.50	21.38
22	0	0	0	0	0	0	0	0
23	56,314	101,440	133,023	166,846	0.86	1.77	2.25	2.73
24	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0
27	10,394	12,825	15,196	17,449	0.16	0.22	0.26	0.29
28	0	0	0	0	0	0	0	0
Total*	6,579,325	5,740,028	5,902,519	6,107,108	100.00	100.00	100.00	100.00

* Entries may not add to totals due to rounding.

SOURCE: Projections based on competitive import coefficients (table D-5) and projected GDO (table D-7) for corresponding years and trade constraint alternatives, A-I, A-II, and A-III.

TABLE D-9

FINAL PROJECTIONS, EXPORTS, 28-SECTOR DETAIL

Sector	1954	1965	1970	1975	1954	1965	1970	1975
	thousand 1954 dollars				*per cent of total*			
	Projection A-I							
1	0	0	0	0	0	0	0	0
2	1,602	2,993	3,731	4,548	0.05	0.04	0.04	0.04
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	227,897	409,263	505,161	609,944	6.60	5.94	5.76	5.56
6	141,130	249,397	306,057	368,783	4.09	3.62	3.50	3.36
7	49,722	87,884	108,007	129,964	1.44	1.28	1.23	1.18
8	108,603	204,660	255,688	312,733	3.15	2.97	2.92	2.85
9	0	0	0	0	0	0	0	0
10	44,492	89,365	113,588	141,590	1.29	1.30	1.30	1.29
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	821,868	1,452,403	1,785,876	2,147,685	23.81	21.09	20.36	19.56
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	550,779	1,333,069	1,794,628	2,389,502	15.96	19.36	20.46	21.76
18	0	0	0	0	0	0	0	0
19	630,342	1,265,603	1,608,529	2,004,978	18.26	18.38	18.34	18.26
20	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0
22	155,542	312,304	396,926	494,756	4.51	4.54	4.53	4.51
23	0	0	0	0	0	0	0	0
24	230,964	476,718	611,383	769,834	6.66	6.92	6.97	7.01
25	205,333	412,438	524,203	653,408	5.95	5.99	5.98	5.95
26	284,502	589,511	756,036	951,074	8.24	8.56	8.62	8.67
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
Total*	3,451,776	6,885,608	8,770,473	10,979,699	100.00	100.00	100.00	100 00

TABLE D-9—*continued*

Sector	1954	1965	1970	1975	1954	1965	1970	1975
	thousand 1954 dollars				*per cent of total*			
	Projection A-II							
1	0	0	0	0	0	0	0	0
2	1,602	2,108	2,359	2,680	0.05	0.05	0.04	0.04
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	227,897	286,624	314,969	350,967	6.60	5.70	5.34	4.97
6	141,130	173,458	188,888	208,421	4.09	3.45	3.21	2.95
7	49,722	61,112	66,548	73,429	1.44	1.22	1.13	1.04
8	108,603	146,181	164,997	189,242	3.15	2.91	2.80	2.68
9	0	0	0	0	0	0	0	0
10	44,492	65,387	76,402	90,955	1.29	1.30	1.30	1.29
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	821,868	1,010,131	1,099,988	1,213,734	23.81	20.09	18.68	17.20
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	550,779	1,036,669	1,334,962	1,763,591	15.96	20.62	22.67	24.99
18	0	0	0	0	0	0	0	0
19	630,342	926,368	1,082,433	1,288,611	18.26	18.42	18.38	18.26
20	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0
22	155,542	228,589	267,099	317,975	4.51	4.55	4.54	4.51
23	0	0	0	0	0	0	0	0
24	230,064	352,915	419,386	508,398	6.66	7.02	7.12	7 20
25	205,233	301,858	352,713	419,896	5.95	6.00	5.99	5.95
26	284,502	436,422	518,621	628,695	8.24	8.68	8.81	8.91
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
Total*	3,451,776	5,027,822	5,889,365	7,056,594	100.00	100.00	100.00	100.00

TABLE D-9—*continued*

Sector	1954	1965	1970	1975	1954	1965	1970	1975
	thousand 1954 dollars				*per cent of total*			
	Projection A-III							
1	0	0	0	0	0	0	0	0
2	1,602	2,108	2,359	2,680	0.05	0.04	0.03	0.03
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	227,897	286,624	314,969	350,967	6.60	4.93	4.44	4.03
6	141,130	173,458	188,888	208,421	4.09	2.99	2.66	2.39
7	49,722	61,112	66,548	73,429	1.44	1.05	0.94	0.84
8	108,603	146,181	164,997	189,242	3.15	2.52	2.32	2.17
9	0	0	0	0	0	0	0	0
10	44,492	65,387	76,402	90,955	1.29	1.13	1.08	1.04
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	821,868	1,791,173	2,311,250	2,863,069	23.81	30.84	32.55	32.89
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	550,779	1,036,669	1,334,962	1,763,591	15.96	17.85	18.80	20.26
18	0	0	0	0	0	0	0	0
19	630,342	926,368	1,082,433	1,288,611	18.26	15.95	15.24	14.80
20	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0
22	155,542	228,589	267,099	317,975	4.51	3.94	3.76	3.65
23	0	0	0	0	0	0	0	0
24	230,064	352,915	419,386	508,398	6.66	6.08	5.91	5.84
25	205,233	301,858	352,713	419,806	5.95	5.20	4.97	4.82
26	284,502	436,422	518,621	628,695	8.24	7.51	7.30	7.22
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
Total*	3,451,776	5,808,864	7,100,627	8,705,929	100.00	100.00	100.00	100.00

* Entries may not add to totals due to rounding.

SOURCE: Exogenously projected exports from table D-6. Under A-II, exports are as intially projected without adjustments.

TABLE D-10

IMPLIED NET INCREMENTS IN EXPANSION CAPITAL GOODS CLASSIFIED BY CAPITAL GOODS PRODUCING SECTORS ANNUAL AVERAGES FOR SUCCESSIVE PROJECTION SPANS

Sector	A-I			A-II			A-III		
	1954–1965	1965–1970	1970–1975	1954–1965	1965–1970	1970–1975	1954–1965	1965–1970	1970–1975
	thousand 1954 dollars								
6	350	428	471	224	277	318	319	391	433
8	*								
10	2,083	2,489	2,686	1,218	1,447	1,622	1,827	2,186	2,374
16	3,449	4,357	4,712	2,245	2,895	3,229	3,169	4,021	4,374
17	1,329	1,653	1,794	802	1,012	1,147	1,230	1,531	1,670
18	1,185,774	1,691,483	1,643,737	1,135,182	1,633,923	1,579,701	1,152,522	1,655,286	1,604,130
19	6,404	9,025	8,895	6,136	8,738	8,616	6,212	8,803	8,710
20	72,816	107,785	117,384	66,004	99,728	109,256	66,683	100,516	110,047
21	167,141	239,185	252,031	156,015	226,076	238,822	160,364	231,277	244,138
22	232	341	359	209	310	333	219	322	344
23	718	920	921	441	569	583	583	760	737
24	9,327	13,308	13,529	8,746	12,636	12,748	9,167	13,125	13,288
25	332,091	470,820	470,271	318,526	455,405	452,840	324,501	462,621	460,676
26	28,740	41,270	44,207	27,526	39,835	42,764	27,958	40,352	43,279
28	4,721,300	6,792,754	7,172,008	4,564,543	6,611,116	6,986,110	4,595,245	6,647,592	7,025,112
Total†	6,531,754	9,375,819	9,733,003	6,287,818	9,093,966	9,438,089	6,350,057	9,168,784	9,519,313

* Less than 0.5.
† Entries may not add to totals due to rounding.

SOURCE: Entry in table is $\frac{\Delta K_T}{s}$, where s is number of years in corresponding projection span; ΔK_T projected by system $\left[\begin{array}{c} X_T \\ \hline \Delta K_T \end{array}\right] = \left[\begin{array}{c|c} C & -E_k \\ \hline K & -I \end{array}\right]^{-1} \left[\begin{array}{c} Y_T \\ \hline \vec{K}_0 \end{array}\right]$ (see equation 1.8 on page 20 and A-2).

TABLE D-11

IMPLIED WATER REQUIREMENTS

(Based on unadjusted water coefficients)

Sector	Base year 1954	Projection A-I			Projection A-II			Projection A-III		
		1965	1970	1975	1965	1970	1975	1965	1970	1975
	acre-feet									
Endogenous										
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	4,609,890	6,922,137	8,464,906	10,086,893	6,486,670	7,807,378	9,209,610	6,588,456	7,964,428	9,423,609
5	2,391,520	4,002,840	4,961,615	5,983,279	2,954,723	3,337,371	3,772,102	2,961,682	3,347,114	3,786,592
6	1,543,630	2,620,827	3,172,905	3,765,910	2,193,332	2,510,097	2,863,621	2,516,858	3,011,730	3,546,446
7	2,618,276	4,410,672	5,375,892	6,414,282	3,600,193	4,118,496	4,702,075	4,658,608	5,759,835	6,937,090
8	442,025	816,899	1,017,782	1,240,654	612,199	700,336	808,398	640,409	744,072	867,968
9	8,458,283	14,085,489	17,224,974	20,523,298	13,807,219	16,809,705	19,966,113	13,952,502	17,032,726	20,269,500
10	1,160,598	2,005,496	2,487,884	3,010,645	1,701,109	2,017,400	2,371,526	1,930,749	2,372,455	2,854,148
11	4,028	6,712	8,130	9,628	6,372	7,611	8,928	6,493	7,797	9,182
12	23,731	43,348	54,429	66,080	40,593	50,181	60,310	40,923	50,692	61,004
13	16,706	28,276	34,310	40,688	26,605	31,725	37,178	26,664	31,815	37,300
14	43,653	74,143	90,651	108,521	57,991	65,631	74,418	86,394	109,677	134,394
15	51,669	87,773	107,402	128,122	82,974	99,991	118,072	85,572	104,016	123,545
16	52,827	122,649	163,589	202,755	135,095	181,400	225,282	133,787	179,910	223,817
17	81,158	178,723	245,251	321,753	163,807	222,216	290,484	164,458	223,200	291,798
18	9,270	22,437	30,603	37,069	24,741	34,193	41,615	24,276	33,479	40,746
19	4,349	5,388	6,642	8,025	5,029	6,086	7,269	5,030	6,087	7,270
20	32,800	94,904	131,599	160,715	75,804	102,765	123,925	75,275	102,088	123,218
21	135,048	302,135	403,836	499,160	339,417	460,347	573,113	330,915	447,698	556,838
22	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0
Exogenous	1,985,306	3,599,710	4,694,314	5,769,954	3,556,143	4,628,409	5,677,171	3,575,997	4,659,438	5,721,075
Total	23,664,767	39,430,558	48,676,744	58,377,411	35,870,016	43,191,338	50,931,210	37,805,048	46,188,257	55,015,540

SOURCE: Each entry is product of unadjusted water coefficient from table 2-8 and projected GDO for corresponding sector and projection alternative from table D-7.

TABLE D-12

IMPLIED WATER REQUIREMENTS

(Based on adjusted water coefficients)

Sector	Base year 1954	Projection A-I			Projection A-II			Projection A-III		
		1965	1970	1975	1965	1970	1975	1965	1970	1975
	acre-feet									
Endogenous										
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	4,609,890	6,222,145	7,248,592	8,227,482	5,830,714	6,685,544	7,511,917	5,922,207	6,820,028	7,686,467
5	2,391,520	3,477,103	4,043,696	4,574,372	2,566,646	2,719,944	2,883,870	2,572,691	2,727,884	2,894,948
6	1,543,630	2,258,166	2,554,674	2,833,642	1,889,826	2,021,012	2,154,719	2,168,584	2,424,903	2,668,508
7	2,618,276	4,130,616	4,886,730	5,659,328	3,371,598	3,743,747	4,148,646	4,362,809	5,235,737	6,120,602
8	442,025	757,932	912,645	1,075,183	568,008	627,991	700,579	594,182	667,210	752,204
9	8,458,263	12,828,315	15,035,760	17,169,997	12,574,881	14,673,276	16,703,851	12,707,197	14,867,952	16,957,667
10	1,160,598	2,005,496	2,487,884	3,010,645	1,701,109	2,017,400	2,371,526	1,930,749	2,372,455	2,854,148
11	4,028	6,712	8,130	9,628	6,372	7,611	8,928	6,493	7,797	9,182
12	23,731	43,348	54,429	66,060	40,593	50,181	60,310	40,923	50,692	61,004
13	16,706	28,276	34,310	40,688	26,605	31,725	37,178	26,664	31,815	37,300
14	43,653	74,143	90,681	108,520	57,991	65,031	74,418	86,394	109,677	134,394
15	51,609	87,773	107,402	138,122	82,974	99,991	118,072	85,572	104,016	123,545
16	52,827	122,649	163,589	202,755	135,095	181,400	225,282	133,787	179,910	223,817
17	81,158	178,723	245,251	321,753	163,807	222,216	290,484	164,458	223,200	291,798
18	9,270	22,427	30,603	37,069	24,741	34,193	41,615	24,276	33,479	40,746
19	4,349	5,388	6,642	8,025	5,029	6,086	7,269	5,030	6,087	7,270
20	32,800	94,904	131,599	160,715	75,804	102,765	123,925	75,275	102,088	123,218
21	135,048	302,135	430,836	499,160	339,417	460,347	573,113	330,915	447,698	556,838
22	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0
Exogenous	1,985,306	3,599,710	4,694,314	5,769,954	3,556,143	4,628,409	5,677,171	3,575,997	4,659,438	5,721,075
Total	23,664,767	36,245,971	43,140,773	49,903,098	33,017,353	38,379,469	43,712,873	34,814,203	41,072,066	47,264,731

SOURCE: Each entry is product of appropriate adjusted water coefficient from table 2-8 and GDO or corresponding sector and projection alternative from table D-7.

TABLE D-13

IMPLIED SECTOR WATER REQUIREMENTS AS PERCENTAGE OF TOTAL

(Based on unadjusted water coefficients)

Sector	Base year 1954	Projection A-I			Projection A-II			Projection A-III		
		1965	1970	1975	1965	1970	1975	1965	1970	1975
	per cent									
Endogenous										
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	19.48	17.56	17.39	17.28	18.08	18.08	18.08	17.43	17.24	17.13
5	10.11	10.15	10.19	10.35	8.24	7.73	7.41	7.83	7.25	6.88
6	6.52	6.65	6.52	6.45	6.11	5.81	5.62	6.66	6.52	6.45
7	11.06	11.19	11.04	10.99	10.04	9.54	9.23	12.32	12.47	12.61
8	1.87	2.07	2.09	2.13	1.71	1.62	1.59	1.69	1.61	1.58
9	35,74	35,72	35.39	35.16	38.49	38.92	39.20	36.91	36.88	36.84
10	4.90	5.09	5.11	5.16	4.74	4.67	4.66	5.11	5.14	5.19
11	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
12	10	.11	.11	.11	.11	.12	.13	.11	.11	.11
13	.07	.07	.07	.07	.07	.07	.07	.07	.07	.07
14	.18	.19	.19	.19	.16	.15	.15	.23	.24	.24
15	.22	.22	.22	.22	.23	.23	.23	.23	.23	.22
16	.23	.31	.34	.35	.38	.42	.44	.35	.39	.41
17	.34	.45	.50	.55	.46	.51	.57	.44	.48	.53
18	.04	.06	.06	.06	.07	.08	.08	.06	.07	.07
19	.02	.01	.01	.01	.01	.01	.01	.01	.01	.01
20	.14	.24	.27	.28	.21	.24	.24	.20	.22	.22
21	.57	.77	.83	.86	.95	1.07	1.13	.88	.97	1.01
22	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0
Exogenous	8.39	9.12	9.64	9.88	9.91	10.72	11.15	9.46	10.09	10.40
Total*	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

* Entries may not add to totals due to rounding.

SOURCE: Calculated from table D-11.

TABLE D-14

IMPLIED SECTOR WATER REQUIREMENTS AS PERCENTAGE OF TOTAL
(Based on adjusted water coefficients)

Sector	Base year 1954	Projection A-I			Projection A-II			Projection A-III		
		1965	1970	1975	1965	1970	1975	1965	1970	1975
	per cent									
Endogenous										
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	19.48	17.17	16.80	16.49	17.66	17.42	17.18	17.01	16.61	16.26
5	10.11	9.59	9.37	9.17	7.77	7.09	6.60	7.39	6.64	6.12
6	6.52	6.23	5.92	5.68	5.72	5.27	4.93	6.23	5.90	5.65
7	11.06	11.40	11.33	11.34	10.21	9.75	9.49	12.53	12.75	12.95
8	1.87	2.09	2.12	2.15	1.72	1.64	1.60	1.71	1.62	1.59
9	35.74	35.39	34.85	34.41	38.09	38.23	38.21	36.50	36.20	35.88
10	4.80	5.53	5.77	6.03	5.15	5.26	5.43	5.55	5.78	6.04
11	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
12	.10	.12	.13	.13	.12	.13	.14	.12	.12	.13
13	.07	.08	.08	.08	.08	.08	.09	.08	.08	.08
14	.18	.20	.21	.22	.18	.17	.17	.25	.27	.28
15	.22	.24	.25	.26	.25	.26	.27	.25	.25	.26
16	.22	.34	.38	.41	.41	.47	.52	.38	.44	.47
17	.34	.49	.57	.67	.50	.58	.66	.47	.54	.62
18	.04	.06	.07	.07	.07	.09	.10	.07	.08	.09
19	.02	.01	.02	.02	.02	.02	.02	.01	.01	.02
20	.14	.26	.31	.32	.23	.27	.28	.22	.25	.26
21	.57	.83	.94	1.00	1.03	1.20	1.31	.95	1.09	1.18
22	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0
Exogenous	8.39	9.93	10.88	11.56	10.77	12.06	12.99	10.27	11.34	12.10
Total*	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

* Entries may not add to totals due to rounding.
SOURCE: Calculated from table D-12.

APPENDIX E

OBSERVED GROWTH RATES AND RELATED DATA, 1954–1962: SELECTED SECTORS AND SECTOR AGGREGATES

TABLE E-1

MEAN ANNUAL GROWTH RATES

Sector	Production		Employment			Value added	
	1954	1962	1954	1961	1962	1954	1961
	1	2	3	4	5	6	7
	thousand 1954 dollars		*thousand persons*			*thousand 1954 dollars*	
1.....	256,786	331,538					
2.....	295,831	452,202					
3.....	313,866	369,231					
4.....	187,171	219,666					
5.....	284,379	363,117					
6.....	444,733	543,504					
7.....	337.948	392,588					
8.....	136,649	108,353					
9.....	132,498	147,982					
10.....	.....	.....					
11.....	.....	.....					
12.....	.....	.....	.....	.....	.....	131,537	233,330
13.....	.....	.....					
14.....	.....	.....	49.3	52.8	54.3	374,361	558,038
15.....	.....	.....					
16.....	.....	.....	30.3	41.7	42.9	424,136	637,341
17.....	.....	.....	35.5	29.9	29.2	275,705	325,218
18.....	.....	.....	247.8	401.4	441.6	1,568,924*	3,235,011*
19.....	.....	.....	221.3	177.5	173.3		
20.....	.....	.....	41.6	51.2	51.8	355,083	523,359
21.....	.....	.....	307.2	364.4	379.7	2,372,237	4,026,001
22.....	.....	.....					
23.....	.....	.....					
24.....	.....	.....					
25.....	.....	.....					
26.....	.....	.....					
27.....	.....	.....					
28.....	.....	.....					
1–10.....	2,584,916	3,099,462					
11–15†.....	.....	.....	137.0	164.2	165.8	1,400,877	2,127,117
16–21†.....	.....	.....	911.6	1,153.1	1,221.0	7,196,596	11,252,616
22–28.....	.....	.....	2,817.5	.....	3,622.6		
11–21†.....	.....	.....	1,048.6	1,317.3	1,386.8	8,597,453	13,381,722

TABLE E-1—*continued*

Sector	Geometric mean annual growth rate						Arithmetic mean annual growth rate, 1954–1962	
	Production 1954–1962	Employment				Value added 1954–1961	Production	Adjusted employment
		1954–1961		1954–1962				
		Unadjusted	Adjusted	Unadjusted	Adjusted			
	8	9	10	11	12	13	14	15
	per cent							
1	3.2	...	...	...	...	...	3.4	
2	5.4	...	...	...	...	...	5.5	
3	2.3	...	...	...	...	...	2.4	
4	2.0	...	...	...	...	...	2.2	
5	3.1	...	...	...	...	...	4.0	
6	2.5	...	...	...	...	...	2.2	
7	1.9	...	...	...	...	...	2.4	
8	−2.8	...	...	...	...	...	−1.4	
9	1.4	...	...	...	...	...	1.4	
10	...							
11	...							
12	...	...	...	...	...	9.6		
13	...							
14	...	1.0	4.0	1.2	4.5	6.9	4.8	
15								
16	...	2.0	5.1	2.1	5.5	7.6		
17	...	−2.4	0.5	−2.4	0.8	3.9		
18	...	7.1*	10.3*	7.5*	11.1*	10.9*		
19	...	−3.1	−0.2	−3.0	0.2	...	...	0.8
20	...	3.0	6.1	2.8	6.2	6.5	...	6.4
21	...	2.5	5.6	2.7	6.1	7.8		
22	...							
23	...							
24	...							
25	...							
26	...							
27	...							
28	...							
1–10	2.4							
11–15†	...	2.6	5.7	2.4	5.8	7.2		
16–21†	...	3.4	6.5	3.7	7.1	6.6		
22–28	...	...	...	3.9	5.9	...	...	5.8
11–21†	...	3.3	6.4	3.6	7.0	6.5	...	7.2

* Composition of adjusted employment aggregate not strictly comparable to that of value added aggregate. The former corresponds to SIC industries 34, 35, 36, and 37, excluding 372. The latter corresponds to SIC industries 34, 35, and 36. Sector 18 composition corresponds to that indicated for the adjusted employment measure.

† Employment and value added aggregates embrace all manufacturing industries, including sectors for which individual sector measures are not presented.

SOURCES:

Cols. 1 and 2: From table E-3.
Cols. 3–5: From (12) and (50).
Cols. 6 and 7: From table E-5.
Cols. 8–13. Computed from corresponding measures in columns 1–7.
Cols. 14 and 15: Computed from corresponding measures in table E-3.

TABLE E–2

OBSERVED PRODUCTION AS PERCENTAGE OF GDO PRIMARY AGRICULTURE SECTORS, 1954

Sector	Production	GDO	Production as percentage of GDO
	1	2	3
	thousand 1954 dollars		
1	256,786	336,881	76.2
2	295,831	312,217	94.8
3	313,866	343,543	91.4
4	187,171	197,729	94.7
5	284,329	284,329	100.0
6	485,762	487,839	99.6
7	337,870	339,642	99.5
8	136,612	137,017	99.7
9	132,498	181,203	73.1
10	154,140	294,778	52.3
1–10	2,584,916	2,915,178	88.7

SOURCES:
Col. 1: From table E–3.
Col. 2: From (27).

TABLE E-3
ANNUAL PRODUCTION AND EMPLOYMENT, SELECTED SECTORS AND SECTOR AGGREGATES

Year	Production sector									
	1	2	3	4	5	6	7	8	9	1–10
	1	2	3	4	5	6	7	8	9	10
	thousand 1954 dollars									
1954	256,786	295,831	313,866	187,171	284,379	485,762	337,870	136,612	132,498	2,584,916
1955	282,415	291,832	324,386	195,720	230,057	521,063	372,112	133,198	133,763	2,035,861
1956	281,149	313,914	328,551	197,073	274,352	556,802	387,353	135,747	136,619	2,767,582
1957	268,632	312,626	344,156	211,168	292,354	548,918	346,698	107,327	141,882	2,723,517
1958	262,614	329,415	340,211	195,298	304,286	548,336	322,400	148,213	142,412	2,747,379
1959	286,325	347,060	354,151	211,626	366,304	552,538	396,588	126,640	143,126	2,932,217
1960	308,341	377,390	361,165	209,896	369,391	558,300	374,345	103,453	145,636	2,947,094
1961	326,323	427,897	366,644	206,124	321,762	572,597	385,368	97,673	149,777	2,999,226
1962	331,538	452,202	369,231	219,666	303,117	574,076	392,588	108,353	147,982	3,099,462

Year	Employment				
	14	19	20	11–21	22–28
	11	12	13	14	15
	thousand employees				
1954	49.3	221.3	41.6	1,048.6	2,817.5
1955	51.5	228.8	47.5	1,121.1	2,961.8
1956	55.9	256.4	52.5	1,218.0	3,134.3
1957	52.3	272.5	53.6	1,283.8	3,241.4
1958	52.1	232.9	47.3	1,215.3	3,281.2
1959	52.6	230.1	50.1	1,311.4	3,462.2
1960	53.1	193.7	51.2	1,315.6	3,578 8
1961	52.8	177.5	51.2	1,317.3	3,677.9
1962	54.3	173.3	51.8	1,386.8	3,822.6

SOURCES:

Col. 1: From (34), (64), (35), (69), (70), and (71). Products included: cattle and calves, hogs, sheep and lambs, wool, and mohair.

Col. 2: From (32), (62), (63), (33), (67), (68), and (10). Products included: eggs, farm chickens, commercial broilers, turkeys, and commercial hatchery production.

Col. 3: From (31), (65), and (66). Products included: total milk.

Col. 4: From (3) and (4). Products included: barleyk corn, grain sorghum, oats, rice, and wheat.

Col. 5: From (3) and (4). Products included: cotton lint and cottonseed.

Col. 6: From (3), (4), (5), and (9). Products included: artichokes, asparagus, beans (including dry beans), broccoli, Brussels sprouts, cabbage, carrots, cauliflower, celery, sweet corn, cucumbers, garlic, lettuce, onions, peas, peppers, potatoes, spinach, tomatoes, miscellaneous vegetables, strawberries, and melons.

Col. 7: From (6) and (8). Products included: almonds, apples, apricots, avocados, cherries, dates, figs, grapes, nectarines, olives, peaches, pears, persimmons, plums, pomegranates, prunes, and walnuts.

Col. 8: From (6) and (8). Products included: grapefruit, lemons, and oranges.

Col. 9: From (3) and (4). Products included: all hay.

Col. 10: Sum of columns 1-9 plus a subset of sector 10 products comprising around 50 per cent of sector 10 GDO in 1954. Sector 10 production from (3), (4), (7), and (42). Sector 10 products included: legume and other seeds (red clover, alfalfa, ladino clover, sudan grass, vetch, and mustard), honey, beeswax, flaxseed, hops, sugar beets, and fisheries production.

Cols. 11-15: From (50).

TABLE E-4

UNITED STATES OUTPUT PER EMPLOYEE, INDEXES AND ANNUAL RATES OF PRODUCTIVITY GROWTH

Year	Total manufacturing	Nonmanufacturing	Year	Annual rates of productivity growth	
				Manufacturing	Nonmanufacturing
	index, 1957–1959 = 100			*per cent*	
1954	89.5	93.7			
1955	97.7	96.4	1954–55	9.2	2.9
1956	98.4	95.0	1955–56	0.7	−1.5
1957	97.3	98.1	1956–57	−1.1	3.3
1958	98.0	99.4	1957–58	0.7	1.3
1959	104.7	102.5	1958–59	6.8	3.1
1960	105.8	103.5	1959–60	1.1	1 0
1961	110.4	105.2	1960–61	4.3	1.6
1962	116.4	108.7	1961–62	5.4	3.3
Mean annual rates					
Arithmetic mean				3.4	1.9
Geometric mean				3.3	1.9

SOURCE: Derived from data in (51), table VI-1. Output-per-man-hour indexes converted to output per employee by adjusting for man-hours per employee.

TABLE E-5

CURRENT AND CONSTANT DOLLAR MEASURES OF VALUE ADDED AND PRICE DEFLATORS EMPLOYED, SELECTED MANUFACTURING SECTORS

Year	Sector									
	12	14	16	17	18	20	21	11–15	16–21	11–21
	thousand current dollars									
1954	131,537	374,361	424,136	275,705	1,568,924	355,083	2,372,237	1,400,857	7,196,596	8,597,453
1958	157,566	520,509	596,735	313,801	2,432,291	505,561	3,729,877	1,906,895	10,141,088	12,047,983
1959	167,433	541,424	681,287	380,780	2,916,189	561,792	4,268,459	2,027,328	11,494,071	13,501,399
1960	243,706	607,499	692,205	441,196	3,120,721	560,664	4,448,624	2,209,110	11,965,240	14,174,350
1961	249,663	597,101	707,448	360,341	3,406,467	551,097	4,372,237	2,276,015	12,029,046	14,305,061
	thousand 1954 dollars									
1954	131,537	374,361	424,136	275,705	1,568,924	355,083	2,372,237	1,400,857	7,196,596	8,597,453
1958	148,507	490,583	549,986	291,808	2,318,677	481,946	3,485,866	1,797,262	9,576,098	11,376,754
1959	159,917	517,119	621,046	350,949	2,743,357	528,497	3,941,329	1,936,321	10,703,424	12,641,759
1960	230,782	575,283	623,608	396,403	2,935,768	527,436	4,081,306	2,091,960	11,109,786	13,210,019
1961	233,330	558,088	637,341	325,218	3,235,011	523,359	4,026,001	2,127,117	11,252,616	13,381,722
	price deflators, per cent									
1954	100.0*	100.0*	100.0†	100.0‡	100.0¶	100.0¶	100.0§	100.0*	100.0‖	100.0‖
1958	106.1	106.1	108.5	107.5	104.9	104.9	107.0	106.1	105.9	105.9
1959	104.7	104.7	109.7	108.5	106.3	106.3	108.3	104.7	107.2	106.8
1960	105.8	105.6	111.0	111.3	106.3	106.3	109.0	105.6	107.7	107.3
1961	107.0	107.0	111.0	110.8	105.3	105.3	108.6	107.0	106.9	106.9

* Based on "food and beverages" deflator.
† Based on "other nondurable goods" deflator.
‡ Based on "gasoline and oil" deflator.
¶ Based on "durable goods" deflator.
§ Average of durable goods and other nondurable goods deflators, weighted by 1954 value added, California.
‖ Average of minor sector deflators, weighted by 1954 value added, California.
SOURCES: Current dollar measures of value added from (38) and (40). Implicit price deflators from (57) and (59).

LITERATURE CITED

1. ALLEN, R. G. D.
Mathematical economics. New York: The Macmillan Company. (1956)
2. BRUBAKER, STERLING
The impact of federal government activities on California economic growth, 1952. Unpubl. Ph.D. dissertation, Dept. of Agr. Econ., University of California, Berkeley. (1959)
3. CALIFORNIA CROP AND LIVESTOCK REPORTING SERVICE
California field crop statistics, 1949–1961. Sacramento. (1961)
4. ——— California annual field crop summary. Sacramento, annual issues.
5. ——— California vegetable crops—acreage, production and value, 1954–1961. Sacramento. (1962)
6. ——— California fruit and nut crops—acreage, production, utilization and value, 1949–1961. Sacramento. (1962)
7. ——— California annual livestock report for 1963. Sacramento. (1964)
8. ——— California fruit and nut crop statistics, 1961–1963. Sacramento. (1964)
9. ——— California vegetable crops—acreage, production and value, 1960–1963. Sacramento. (1964)
10. ——— Poultry and hatchery production in California. Sacramento, annual issues.
11. CALIFORNIA DEPARTMENT OF FINANCE
Provisional projections of California areas and counties to 1980. Sacramento. (1963)
12. CALIFORNIA DEPARTMENT OF INDUSTRIAL RELATIONS
Handbook of California labor statistics, 1953–1954. San Francisco. (1955)
13. CALIFORNIA ECONOMIC DEVELOPMENT AGENCY
California statistical abstract, 1963. Sacramento. (1963)
14. CHENERY, HOLLIS B.
Inter-regional and international input-output analysis. *In:* The structural interdependence of the economy. (T. Barna, ed.) New York: John Wiley and Sons. (1954)
15. CHENERY, HOLLIS B., and PAUL G. CLARK
Interindustry economics. New York: John Wiley and Sons. (1959)
16. DALY, REX F.
The long-run demand for farm products, Agricultural economics research, 8(3). (July, 1956)
17. ——— Demand for farm products at retail and the farm level—some empirical measurements and related problems, American statistical association proceedings. Annual meeting of the Business and Economic Statistics Section. (1957)
18. DEAN, G. W., and C. O. MCCORKLE, JR.
Projections relating to California agriculture in 1975. Calif. Agr. Exp. Sta. Bul. 778. Berkeley. (1961)
19. DORFMAN, ROBERT, PAUL A. SAMUELSON, and ROBERT M. SOLOW
Linear programming and economic analysis. New York: McGraw-Hill Book Company. (1958)
20. GERSHENSON, MAURICE I.
Labor force projections for California, 1960–1975. Paper presented at the 120th annual meeting of the American Statistical Assoc., Stanford University, Palo Alto, California. (August 25, 1960)
21. ISARD, WALTER, DAVID F. BRAMHALL, GERALD A. P. CARROTHERS, JOHN H. CUMBERLAND, LEON N. MOSES, DANIEL O. PRICE, and EUGENE W. SCHOOLER
Methods of regional analysis: An introduction to regional science. Regional Science Studies, Vol. II. Cambridge: Technology Press of the Massachusetts Institute of Technology; and New York: John Wiley & Sons, Inc. (1960)
22. ISARD, WALTER, and JAMES GANSCHOW
Awards of prime military contracts by county, state and metropolitan area of the United States, fiscal year 1960. Regional Science Res. Inst., University of Pennsylvania. (n.d.)
23. LANDSBERG, HANS H., LEONARD L. FISCHMAN, and JOSEPH L. FISHER
Resources in America's future. Baltimore: The Johns Hopkins Press. (1963)
24. LEONTIEF, WASSILY
The structure of the American economy, 1919–1939. 2nd ed. New York: Oxford University Press. (1951)

25. LEONTIEF, WASSILY, HOLLIS B. CHENERY, PAUL G. CLARK, JAMES S. DUESENBERRY, ALLEN R. FERGUSON, ANNE P. GROSSE, ROBERT N. GROSSE, MATHILDA HOLZMAN, WALTER ISARD, and HELEN KISTIN
Studies in the structure of the American economy: Theoretical and empirical explorations in input-output analysis. New York: Oxford University Press. (1953)
26. MARTIN, WILLIAM E., and HAROLD O. CARTER
A California interindustry analysis emphasizing agriculture. Part I: The input-output models and results. University of California, Giannini Foundation Res. Rept. 250. Berkeley. (1962)
27. ——— A California interindustry analysis emphasizing agriculture. Part II: Statistical supplement. University of California, Giannini Foundation Res. Rep. 250. Berkeley. (1962)
28. MOSES, LEON N.
The stability of interregional trading patterns in input-output analysis, American economic review 45(5). (December 1955), pp. 803–32.
29. U. S. DEPARTMENT OF DEFENSE, OFFICE OF THE SECRETARY OF DEFENSE
The changing patterns of defense procurement. (June, 1962)
30. PERLOFF, HARVEY S., EDGAR S. DUNN, JR., ERIC E. LAMPARD, and RICHARD F. MUTH
Regions, resources and economic growth. Baltimore: The Johns Hopkins Press. (1960)
31. U. S. AGRICULTURAL MARKETING SERVICE
Milk: Production, disposition and income, revised estimates, 1950–54. Dept. of Agr. Statistical Bull. 175. (1956)
32. ——— Chickens and eggs: Farm production, disposition, cash receipts, gross income, by states, revised estimates, 1950–54. Dept. of Agr. Statistical Bull. 183. (1956)
33. ——— Turkeys: Farm production, disposition, cash receipts, gross income, by states, revised estimates, 1950–54. Dept. of Agr. Statistical Bull. 182. (1956)
34. ——— Meat animals: Farm production, disposition and income, by states, 1950–54. Dept. of Agr. Statistical Bull. 184. (1956)
35. ——— Livestock and meat statistics. Dept. of Agr. Supplement to Statistical Bull. 230. Annual issues.
36. U. S. BUREAU OF THE CENSUS
U. S. census of agriculture, 1954, 1. (1956)
37. ——— U. S. census of agriculture, 1959, 1. (1961)
38. ——— U. S. census of manufacturers, 1954, 3. (1957)
39. ——— U. S. census of manufacturers, 1958, 3. (1961)
41. ——— Statistical abstract of the United States, 77. (1956)
42. ——— Statistical abstract of the United States, 79. (1958)
43. ——— Statistical abstract of the United States, 80. (1959)
44. ——— Statistical abstract of the United States, 82. (1961)
45. ——— Statistical abstract of the United States, 83. (1962)
46. ——— Statistical abstract of the United States, 84. (1963)
47. U. S. BUREAU OF LABOR STATISTICS
The 1947 interindustry relations study, Table I. (1952)
48. ——— Employment and earnings staitstics for the U. S., 1909–60. Dept. of Labor Bul. 1312. (1961)
49. ——— Indexes of output per man-hour for selected industries, 1939 and 1947–61. (1962)
50. ——— Employment and earnings statistics for states and areas, 1939–62. Dept. of Labor Bul. 1370. (1963)
51. ——— Statistical supplement—monthly labor review. (1962)
52. U. S. DEPARTMENT OF COMMERCE
Construction review. (Nov., 1959)
53. ——— Construction review. (Nov., 1961)
54. ——— Construction review. (Dec., 1961)
55. U. S. OFFICE OF BUSINESS ECONOMICS
U. S. income and output: A supplement to the survey of current business. (1958)
56. ——— Survey of current business. (July, 1961)
57. ——— Survey of current business. (July, 1962)
58. ——— Survey of current business. (Aug., 1962)
59. ——— Survey of current business. (July, 1963)
60. ——— Survey of current business. (Aug., 1963)
61. U. S. PRESIDENT
Economic report of the President to the Congress. (1963)

62. U. S. Statistical Reporting Service
Chickens and eggs: Farm production, disposition, cash receipts, gross income, revised estimates, 1955–1959. Statistical Bul. 287. (1961)
63. ——— Chickens and eggs: Farm production, disposition, cash receipts, and gross income, by states. Annual issues.
64. ——— Meat animals: Farm production, disposition and income, by states, 1955–1959, revised estimates. Statistical Bul. 284. (1961)
65. ——— Milk: Production, disposition and income, revised estimates, 1955–1959. Statistical Bul. 282. (1961)
66. ——— Milk: Production, disposition and income. Annual issues.
67. ——— Turkeys: Farm production, disposition, cash receipts, gross income, by states, revised estimates, 1955–1959. Statistical Bul. 286. (1961)
68. ——— Turkeys: Farm production, disposition and gross income. Annual issues.
69. ——— Wool and mohair: Production and value, United States and by states, 1909–1959. Statistical Bul. 309. (1962)
70. ——— Mohair: Production and value. Annual issues.
71. ——— Wool: Production and value. Annual issues.
72. Zusman, Pinhas, and Irving Hoch
Resource and capital requirement matrices for the California economy. University of California, Giannini Foundation Res. Rept. 284. Berkeley. (1965)

GIANNINI FOUNDATION MONOGRAPHS TO DATE

The first 17 titles in the Giannini Foundation Monograph Series were published in *Hilgardia* and are listed below. Numbers 18 *et seq.* are published in the present format. See back cover for information on obtaining copies.

No. 1. Major Economic Forces Affecting Agriculture, with Particular Reference to Agriculture, by S. V. Ciriacy-Wantrup. (*Hilgardia,* Volume 18, Number 1, December, 1947) 76 pages.

No. 2. Characteristics of Demand for California Plums, by Jerry Foytik. (*Hilgardia,* Volume 20, Number 20, April, 1951) 121 pages.

No. 3. Pricing Efficiency in the Manufactured Dairy Products Industry, by James B. Hassler. (*Hilgardia,* Volume 22, Number 8, August, 1953) 100 pages.

No. 4. Statistical Analysis of Supply Response in Late Spring Potatoes in California, by Chester O. McCorkle, Jr., and Yair Mundlak. (*Hilgardia,* Volume 24, Number 16, April, 1956) 39 pages.

No. 5. Economic Efficiency in Plant Operations With Special Reference to the Marketing of California Pears, by B. C. French, L. L. Sammet, and R. G. Bressler. (*Hilgardia,* Volume 24, Number 19, July, 1956) 179 pages. (Out of print—available on microfilm only.)

No. 6. Soil Variables for Use in Economic Analysis, by David Weeks and J. Herbert Snyder. (*Hilgardia,* Volume 26, Number 11, April, 1957) 24 pages.

No. 7. Economies of Scale for Evaporated Milk Plants in California, by James N. Boles. (*Hilgardia,* Volume 27, Number 21, October, 1958) 102 pages.

No. 8. Income, Price, and Yield Variability for Principal California Crops and Cropping Systems, by H. O. Carter and G. W. Dean. (*Hilgardia,* Volume 30, Number 6, October, 1960) 44 pages.

No. 9. The Impact of Irrigation on Farm Output in California, by Vernon W. Ruttan. (*Hilgardia,* Volume 31, Number 4, July, 1961) 43 pages.

No. 10. Interregional Competition in the Frozen Strawberry Industry, by C. C. Dennis and L. L. Sammet. (*Hilgardia,* Volume 31, Number 15, December, 1961) 113 pages.

No. 11. Econometric Analysis of the Market for Californa Early Potatoes, by Pinhas Zusman. (*Hilgardia,* Volume 33, Number 11, December, 1962) 120 pages.

No. 12. Orderly Marketing for California Avocados, by Stephen H. Sosnick. (*Hilgardia,* Volume 33, Number 14, December, 1962) 70 pages.

No. 13. Regional Location of Cattle Feeding—A Spatial Equilibrium Analysis, by G. A. King and L. F. Schrader. (*Hilgardia,* Volume 34, Number 10, July, 1963) 86 pages.

No. 14. Optimal Cooperative Pools for California Avocados, by Stephen H. Sosnick. (*Hilgardia,* Volume 35, Number 4, September, 1963) 38 pages.

No. 15. The Economics of Conjunctive Use of Ground and Surface Water, by Oscar R. Burt. (*Hilgardia,* Volume 36, Number 2, December, 1964) 81 pages.

No. 16. Size and Location Factors Affecting California's Beef Slaughtering Plants, by S. H. Logan and G. A. King. (*Hilgardia,* Volume 36, Number 4, December, 1964) 50 pages.

No. 17. Interregional Competition in the United States Turkey Industry, by D. Lee Bawden, H. O. Carter, and G. W. Dean. (*Hilgardia,* Volume 37, Number 13, June, 1966) 95 pages.

No. 18. World Trade in Fresh Oranges: An Analysis of the Effect of European Economic Community Tariff Policies, by Gerald W. Dean and Norman R. Collins. (*Giannini Foundation Monograph,* January, 1967) 70 pages.

GIANNINI FOUNDATION MONOGRAPH SERIES

What it is

The Giannini Foundation Monograph Series is comprised of technical research reports relating to the economics of agriculture. The series, introduced in 1967, is published by the California Agricultural Experiment Station. Similar technical economic research studies formerly were published in *Hilgardia.*

Each Monograph is a separate report of research undertaken in the California Experiment Station by staff members of the Department of Agricultural Economics and the Giannini Foundation of Agricultural Economics in the University of California. Topics covered range from analyses of farm and processing firms to broader problems of interregional resource use and public policy.

The Monographs are written in technical terms with professional economists as the intended audience. No attempt is made to reduce the writing to terms understandable to the layman. Each Monograph carries an abstract on the inside front cover.

Monographs are published at irregular intervals as research is completed and reported.

How to obtain copies

In general, copies will be sent free on request to individuals or organizations. The limit to California residents is 20 titles; the limit to nonresidents is 10. There is no distribution through agencies or stores.

A list of available Monographs in the series is published annually and may be obtained by writing to Agricultural Publications (address below). The list also explains how some out-of-print issues, including reports that formerly appeared in *Hilgardia,* may be obtained on microfilm or as record prints. To obtain the *Giannini Foundation Monograph Series* regularly, certain minimum qualifications must be met:

As a gift. Some libraries, educational institutions, or agricultural experiment stations may receive Monographs as issued where there is a definite need for the material and it will be made available to a considerable number of interested economists. Address requests to Agricultural Publications. Please give particulars.

As an exchange for similar research material. Address requests to Librarian, Giannini Foundation of Agricultural Economics, University of California, Berkeley, California 94720.

With the exception of comunications about exchange agreements (see above), address all correspondence concerning the *Giannini Foundation Monograph Series* to:

Agricultural Publications
University Hall
University of California
Berkeley, California 94720