AN EXPLORATION OF THE ECONOMICS OF TASTE AND DEMAND FOR FOOD

A THESIS
SUBMITTED TO THE FACULTY OF THE GRADUATE SCHOOL
OF THE UNIVERSITY OF MINNESOTA

By

SACHIKO YAMASHITA

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

July 1973

ACKNOWLEDGEMENTS

I wish to express my sincere appreciation to Dr. Vernon W. Ruttan for his guidance, encouragement and continued patience in the preparation of this thesis. The impetus for this research grew from earlier discussions with Dr. Yujiro Hayami, to whom I express my special thanks.

I am also grateful to Dr. Willis L. Peterson, Dr. W. Keith Bryant, Dr. Thomas J. Muench, and Dr. Peter K. Clark, the members of my thesis committee, for their helpful suggestions and guidance.

My very special thanks go to Mrs. Barbara B. Miller for her help in data processing and correcting my Japanese-English.

Financial support for this research was provided by grants to the University of Minnesota Economic Development Center from the Rockefeller Foundation and the U. S. Agency for International Development, for which I am grateful.

Sachiko Yamashita
590 words

AN EXPLORATION OF THE ECONOMICS OF TASTE AND DEMAND FOR FOOD

In consumer theory tastes are traditionally treated as given, even though there is a history of economists who think tastes can be both the cause and result of economic activities. In this research an attempt was made to identify economic determinants of changes and formation of tastes in the case of food commodities.

The broad hypothesis under investigation was that relative prices are an inducing mechanism for taste formation. Specifically, two hypotheses were investigated: (1) the commodities which have a comparative advantage in production induce formation of relative taste preferences favorable to them; and (2) when the relative availability of commodities changes, as a result of technical developments in production and marketing or by the opening up of international trade, people change their tastes in response to change in relative prices. A critical assumption for this analysis was the existence of a universal preference function which is common for people all over the world and which forms the outer envelope of country specific taste preference functions.

In order to test the first hypothesis a standard demand model modified by adding a taste variable as a demand shifter was used. This model was applied to data for forty-three countries and twenty-two food commodities. The usual variables for this model (consumption as the dependent variable, prices and income as the independent variables) are measured as the average for the period 1957-62. The taste variable for each commodity was constructed as a ratio of the production of the commodity to the total food production in a country during 1934-38. This variable supposedly captures the influences of country specific factor endowments and climatic conditions in production, thus reflecting the historical differences in the relative price of the commodity among countries.

Econometric results indicated that both the size (the estimate was obtained in an elasticity measure) and the t-value of the coefficients for the taste variable are larger in the case of regressions for individual commodities than when commodities were grouped. Also in the case of commodity groups there was little decline in the fits when the taste variables were omitted from the estimating equations. The inference of these results is that taste preferences across countries are largely similar for broad commodity groups but that there exists considerable differences in the country specify taste preferences in the case of individual commodities depending upon differences in the production patterns of countries.

The second hypothesis was investigated through a time series analysis by using poultry versus meats in the case of the United States and rice versus other cereals and fish versus meats in the case of pre- and postwar Japan.

For this purpose the standard demand model was modified by adding a taste variable comprised of cumulated sums of the past consumptions of own and substitutable commodities. The logic of this approach was that if changes in tastes are induced by changes in relative prices, it should be possible to capture the taste changes by changes in the consumption experience of a commodity relative to that of its substitutable commodities. This is viewed to occur through a process of learning by consumption. In the short-run, consumers respond to changes in relative prices by changing their consumption patterns. As experience with new consumption patterns is prolonged over an extended period, tastes gradually change to adjust to the price changes.

Econometric results indicated considerable taste shifts for those commodities for which the relative prices declined sharply over time, that is, poultry in the United States and fish in prewar Japan. This seems to be a reasonable support for the second hypothesis.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

In a traditional economic analysis of consumer demand, economists have generally ignored questions pertaining to the formation of tastes and changes in taste. Tastes are generally assumed to be given. Economists have recognized that consumer tastes do, in fact, change.[1] However, the general attitude has been that the analysis of change in taste does not fall in the domain of economics.[2] Determinants of tastes have been regarded as primarily psychological and sociological in nature. Part of the problem may be that since tastes change slowly, to give tastes an explicit empirical treatment has been a difficult problem.

---

[1] This recognition is quite clear in the case of A. Marshall in his Principles of Economics, 8th ed., Macmillan (1962).

[2] M. Friedman, for instance, says: "The economist has little to say about the formation of wants; this is the province of the psychologist," and he leaves the whole area to other fields of science on the grounds of division of labor (Price Theory, Aldine Publishing Company (1962), cited from p. 13). G. J. Stigler also appears to be quite explicit in his defense of the assumption of constant tastes. However, his treatment of diversity and variation in tastes seems to admit the possibility of the nature of production activities interacting and influencing the formation of taste (The Theory of Price, 3rd ed., Macmillan (1966), pp. 38-41).

In empirical studies it has been traditional to treat the effect of tastes on demand as a residual. In the case of time-series analyses, the residual is sometimes explained by adding a time-trend term in various forms. Even though it is possible to explain variations in consumption in time-series data by fitting complicated time functions, the approach has little economic meaning. Time, as such, represents only a proxy variable for the real causal factors or determinants of taste. The basic question is what causes tastes to change. Satisfaction of human wants is the fundamental starting point of economic reasoning about demand. The primary concern in this study, therefore, is to attempt to identify economic determinants of tastes, a problem that has been a relatively neglected aspect of the economic theory of consumer behavior. It is possible that psychological and sociological considerations are not the dominant factors in shaping consumer preferences. It is hardly arguable that these factors are quite important in producer behavior in the sense of learning and grasping the newer technologies. Yet explanations of producer behavior and of technical change are customarily discussed primarily in terms of economic variables. In this study the effect of taste changes on consumption are treated as analogous to technical changes in production.

The view that tastes can be both the cause and the result of economic activities has been acknowledged by some researchers,[1] who view taste changes as endogenous. If this is true, when these endogenously influencing factors on tastes are ignored in demand analysis, the resulting misspecification of a model could lead to unreliable predictions. Further, a failure to consider this endogeniety of changes in tastes could result in errors in evaluation of the welfare losses and gains of alternative pricing or taxation policies. Thus, the question of endogenous changes in tastes seems to be quite important. When the assumption of constant tastes is relaxed, consumer tastes are commonly believed to be formed (learned) through consumption experiences. There is a long line of economists[2] who considered that current

---

[1] See F. H. Knight, "Ethics and Economic Interpretation," Quarterly Journal of Economics, Vol. 36 (May 1922), pp. 454-481, and J. M. Clark, "Toward a Concept of Workable Competition," American Economic Review, Vol. 30 (June 1940), pp. 241-256.

[2] A. Marshall, op. cit.; O. Morgenstern, "Demand Theory Reconsidered," Quarterly Journal of Economics, Vol. 62 (February 1948), pp. 165-201; M. E. Peston, "Changing Utility Function," in M. Shubik, ed., Essay in Mathematical Economics in Honor of Osker Morgenstern, Princeton University Press (1967); W. H. Gorman, "Tastes, Habits and Choices," International Economic Review, Vol. 8 (June 1967), pp. 218-222; R. A. Pollak, Habit Formation and Dynamic Demand Functions, Discussion Paper No. 79, Wharton School of Finance and Commerce, Department of Economics, University of Pennsylvania (1968); and C. C. von Weizsäcker, "Notes on Endogenous Change on Tastes," Journal of Economic Theory, Vol. 3 (December 1971), pp. 345-372.

consumer tastes for commodities depend on the quantities of past consumption. Wine and tobacco have been cited as examples. Presently physiological psychologists and cerebral physiologists hold the general view that not only consumption behavior but human behavior, in general, is subject to the memories of past behavior.[1] Thus, the notion that past consumption experience has induced current tastes may be applicable to commodities in general rather than being limited only to addictive commodities.

Empirical studies using the framework that tastes are induced by past consumption are mostly confined to broad groups of consumption items under the assumption of the additive utility function.[2] The effect on demand of a taste change for a commodity is implicitly treated as independent of the taste change for another commodity. In economic theory, tastes are usually assumed to

---

[1] See for example M. C. Burk, Consumption Economics: A Multidisciplinary Approach, John Wiley and Sons (1968), Chapter 5, for these observations.

[2] Examples are: H. S. Houthakker and L. D. Taylor, Consumer Demand in the United States: Analyses and Projections, 2nd ed., Harvard University Press (1970); and R. A. Pollak and T. J. Wales, "Estimation of the Linear Expenditure System," Econometrica, Vol. 37 (October 1969), pp. 611-628.

determine the shape of the indifference map. A change in tastes is referred to as a change in the shape of the indifference map.[1] Empirical examination of taste changes, therefore, seems to be a more appropriate approach to study a shift in demand resulting from a shift of tastes from one commodity to another.

It could be argued that in the case of individual commodities considerable differences exist in tastes among countries. Yet differences in consumption for broad groups of consumption items are mainly explained by differences in income and prices.[2] If the hypothesis that past consumption experiences induce tastes is true, it may be possible to explain cross-country differences in tastes by variations in past consumption levels across countries. This is what is attempted in this study. The main objective is to test the usual--implicit or explicit--assumption that consumer

---

[1] S. Ichimura, "A Critical Note on the Definition of Related Goods," Review of Economic Studies, Vol. 18 (1950-51), pp. 179-183. It is perhaps because of this reason that in the line of the empirical work mentioned above economic researchers usually define tastes as constant and shifts in demand induced by past consumption as changes in habits.

[2] H. S. Houthakker, "New Evidence on Demand Elasticities," Econometrica, Vol. 33 (April 1965), pp. 277-288; T. Watanabe, "A Note on an International Comparison of Private Consumption Expenditure," Weltwirtschaftliches Archiv, Bd. 88, Heft 1 (1962), pp. 145-149.

tastes are constant. The test is carried out by postulating an alternative hypothesis that consumer tastes are formed and, in fact, change with past consumption experiences. Consumption behavior is viewed as responding, in the short-run, to change in relative prices. As experience with the new consumption pattern is acquired over a longer run, tastes gradually change to reflect the consumption opportunities reflected by the relative price change.

It is hypothesized that relative prices are an inducing mechanism for taste formation. More specifically, the following hypotheses are investigated:

(1) The commodities which have a comparative advantage in production, consistent with resource endowment and climatic conditions of a country, induce formation of relative taste preferences favorable to them.

(2) When the relative availability of commodities changes, as a result of technical development in production and marketing or by the opening up of international trade, people change their tastes in response to changes in relative prices.

In order to investigate the first hypothesis, intercountry cross-sectional data for forty-three countries and twenty-two food commodities are used. The model utilized is the standard demand model modified by adding a taste variable--representing historical differences in relative prices[1]--as a demand shifter across countries in addition to the usual income and price variables. The implicit assumption for this model is that taste differences among countries can be described by the same demand function.[2] We draw support for this assumption from Houthakker's statement: "In fact there is no reason to postulate that differences among countries are of a more fundamental type than differences among aggregates for the same country in different years, or differences among households in the same country. The latter differences are not usually regarded as insuperable obstacles in time-series or cross-section analysis."[3]

For the second hypothesis, that consumer tastes change over time as a result of changes in relative prices in consequence of technical developments in production or trade which change relative availability of commodities, the change is viewed as a sequential process over time. In the short-run a change in relative prices changes the consumption mix via the substitution

---

[1] See Chapter III, pp. 36-40, for development of this and other variables.

[2] See Chapter III, for a detailed discussion of the model.

[3] H. S. Houthakker, "New Evidence on Demand Elasticities," op. cit., p. 277.

effect. The persistence of this changed relative price over the longer time period enables the consumer to gain experience for consuming the new (changed) mix of commodities and thus leads to a change in tastes. This is the process of inducement of tastes as a result of the cumulated stock of experience with the new mix. Again, to test this hypothesis, we use the standard demand model by introducing cumulated quantities of past consumption levels of the concerned commodity and that of its substitute commodity as the taste variable, in addition to the usual price and income variables. Three sets of time-series data from the United States and Japan for a few selected food commodities are employed to carry out this test.

In this study we have limited our investigation of taste formation and taste changes to the case of food commodities.[1]

---

[1] There is an empirical advantage to dealing with food commodities. We should distinguish the change in demand due to a relative price change between the price effect realized in a relatively short period and the effect due to change in tastes which is induced by the price change realized over a longer period. However, even the price effect itself may be realized fully only after a lag in time, due to contractually and technically fixed commitments, lack of knowledge of changes in prices, etc. If this is the case, the distinction of long-term effect from short-term effect cannot be claimed as the distinction of taste effect from price effect. However, in the case of food commodities this may not be a serious problem if annual observations are used for empirical study. It might be safe to assume that in the case of food commodities the time required for adjustment in response to a price change is less than a year. See W. G. Tomek, The Theory and (continued next page)

This is primarily due to data availability. Another limitation of this study is the use of single equation models. For the formation of tastes in our framework, one would normally expect some kind of simultaneous system. The number of food commodities which are related in consumption is simply too large and the data requirements impossible to meet for this purpose.

The plan of this thesis is as follows. A brief review of the literature about tastes is presented in Chapter II. In Chapter III, first a conceptual framework is established to construct a model for an intercountry cross-sectional analysis to explain differences in tastes among the countries examined. Then the estimating equations developed and the data and variables used are discussed. In Chapter IV the results of the cross-section study are presented and their meanings are explored. In Chapter V, first the model for estimating the demand function from time-series data to explain the changes in tastes induced by past consumption is developed. Second, the data and variables are discussed. And then the results of the time-series analysis

---

Measurement of Long-Run Demand (with Special Emphasis on Demand for Food Products), unpublished Ph. D. thesis University of Minnesota (1961) and C. H. Berry, G. K. Brinegar, and S. Johnson, "Short Run Effects Following Controlled Price Changes: Skim Milk," Journal of Farm Economics, Vol. 40 (November 1958), pp. 892-902.

are presented and their meanings are explored. In Chapter VI a summary of the research findings and their implications for policy and further research are presented. A tentative conceptual hypothesis about the mechanism of endogenous changes of tastes in the framework of induced innovation theory in production is presented. Data used in the intercountry cross-sectional analysis is presented in Tables A.1 - A.5 in the Appendix.

CHAPTER II

TASTES AND DEMAND THEORY -A REVIEW

In consumer theory tastes are traditionally treated as constant or fixed. The view seems to have its roots in the concepts of "consumers' sovereignty," according to which production is a means for the satisfaction of human wants, and that consumers' wants are independent and basic forces to dominate production. The concept of consumer's sovereignty has been challenged frequently. In this respect two broad lines of thought seem to be conspicuous. One is based on the argument of "seller's sovereignty" instead of on "consumers' sovereignty," and the other treats taste formation as a social process. In this chapter we review some economic literature which has some bearing on the formation of tastes. First is the popular view that tastes are shaped by advertisement. Then the literature which considers formation of taste as a social process through social interaction is reviewed. Thirdly, we critically examine the Houthakker and Taylor dynamic demand model[1] and attempt to clarify the concepts of habit formation and taste changes.

---

[1] H. S. Houthakker and L. D. Taylor, Consumer Demand in the United States: Analyses and Projections, 2nd ed., Harvard University Press (1970).

Galbraithian View

The concept of "seller's sovereignty" may be summarized by saying that human wants can be created by seller's efforts in such a way that consumers become conditioned to desire what business wants to sell. Galbraith, the leading spokesman of this view, expresses his viewpoint stating: ". . . the producing firm reaches forward to control its markets and on beyond . . . to shape the social attitudes of those, ostensibly, that it serves."[1]

The possibility of change in consumer tastes through advertising has a long history in economic literature. Chamberlin[2] distinguished selling cost as a part of production cost on the basis that the former creates demand while the latter creates supply.

In spite of a popular support of this view, the attack on the concept of "seller's sovereignty" also has as long a history as the concept itself.[3] Abramson[4] pointed out that there are

---

[1] J. K. Galbraith, The New Industrial State, Houghton Mifflin (1967), p. 212.

[2] E. Chamberlin, The Theory of Monopolistic Competition, Harvard University Press (1938).

[3] For instance, see S. Chase, The Tragedy of Waste, Macmillan (1926).

[4] A. V. Abramson, "Advertising and Economic Theory: A Criticism," American Economic Review, Vol. 21 (December 1931), pp. 685-690.

many limitations on sellers to control the desires of consumers. Katona's proposition[1] that "affluence makes for discretion in action," is also contrary to Galbraith's view that affluence opens the way for control over the consumer.

According to Houthakker, examples in which advertising changed the demand for a substantial commodity are difficult to find in empirical studies. He states that ". . . a large part of advertising does no more than inform the public of changes in prices and products. Most of the remainder is merely an attempt to sway consumers from one brand to another, a matter important to the firm's concerned and to the students of marketing, but hardly to those interested in the basic patterns of consumption, which is the proper concern of the economics of consumption."[2]

Social Interaction and Tastes

The view of taste formation as a social process stems from commonly held ideas about the social nature of human behavior. The approach became famous following Veblen's

---

[1] G. Katona, "Consumer Behavior: Theory and Findings on Expectation and Aspirations," American Economic Review, Vol. 58 (May 1968), pp. 19-30, quoted from p. 29.

[2] H. S. Houthakker, "The Present State of Consumption Theory: A Survey Article," Econometrica, Vol. 29 (October 1961), pp. 704-740, quoted from p. 734.

theory of conspicuous consumption at the turn of this century. This line of argument, however, has a long history and perhaps started with the Roman poet Horace.[1] It is argued that tastes of individuals are interdependent, and that they are formed through social interaction in which imitation and differentiation are important elements. An example in point is Dusenberry's "relative income hypothesis," where he attempts to explain why the consumption estimated from cross-section data drifts upward over time.[2] He argues that the increased frequency of contact of an individual belonging to a lower income group with people of a higher income group who consume superior goods induces his consumption level. He calls this the "demonstration effect."

The view of formation of tastes as a social process through interaction may explain the transmission of tastes, but it does not say anything about the origins of tastes. Further, it has been shown that if the budget constraint is properly taken into

---

[1] H. Leibenstein, "Bandwagon, Snob and Veblen Effects in the Theory of Consumer's Demand," Quarterly Journal of Economics, Vol. 64 (May 1950), pp. 183-208, provides a summary of the past literature on this subject.

[2] J. S. Dusenberry, Income, Saving and the Theory of Consumer Behavior, Harvard University Press (1949).

account, the consequences of social interaction are not as straightforward as they seem to be.[1]

The concept of social interaction is important to Katona's view on formation of tastes and changes in tastes.[2] However, he treats social interaction as a subset in the broader process of social learning and stresses the importance of learning rather as a mere interaction in acquiring tastes.

The concept that tastes are socially learned also provides a rationale for the critics of the Galbraithian view of the formation of tastes through seller's efforts.[3] Thus, most schools of thought seem to accept the view that the formation of tastes is to some extent a social process, even though interpretations offered may be different.

---

[1] Examples are seen in J. Tobin, "Relative Income, Absolute Income, and Savings," in Money, Trade and Economic Growth, Essays in Honor of John H. Williams, Macmillan (1951), and S. J. Prais and H. S. Houthakker, The Analysis of Family Budgets, 2nd Impression, Cambridge University Press (1971).

[2] G. Katona, Psychological Analysis of Economic Behavior (1951) and The Mass Consumption Society, McGraw-Hill (1964).

[3] Besides Katona, those who strongly support this view are K. E. Boulding, "Economics As a Moral Science," American Economic Review, Vol. 59 (March 1969), pp. 1-12, and M. C. Burk, Consumption Economics: A Multi-Disciplinary Approach, John Wiley (1968).

Habit Formation and Taste Change

The view that past consumption patterns are important determinants of present consumption patterns is generally acknowledged.[1] This view has its roots in the long-run concept in consumer demand theory.

The rationale for the introduction of the long-run concept in demand theory is that consumer response to a price change is realized fully only after a lag in time. Thus, we ought to distinguish between short-run and long-run demand functions. This is also true in the case of an income change. Factors responsible for this delayed response are generally believed to be habit, uncertainty of future changes, and technical and institutional rigidities.[2]

Habit establishes the way of life. For example, given prices and income, current tobacco consumption is positively influenced by past consumption, and demand in the short-run may be very inelastic in this case. Full response to price changes are delayed, since making a new decision is often experimental in nature and likely to be costly. The consumer may think the change in his income is only temporary and he prefers to stay on

---

[1] See references cited in footnote 2 on p. 3, Chapter I.

[2] M. Nerlove, Distributed Lags and Demand Analysis for Agricultural and Other Commodities, USDA Agricultural Handbook No. 141 (1958).

the same consumption pattern rather than to readjust again in the near future. Also full adjustment tends to be delayed when a commodity is complementary to another commodity. For example, it is not possible to increase greatly the use of frozen foods without acquiring adequate freezer storage space. The consumer who has recently purchased a durable good may not respond quickly to a change in price or income. Certain contractural obligations also delay the response to income or price changes.

In long-run demand analysis, traditionally, consumer tastes are assumed to remain constant for the period of analysis, while habits are allowed to change. To ignore changes in tastes in a long-run analysis is considered permissible or sometimes even desirable.[1] However, in general, habits have not been distinguished from tastes, and both terms have been used interchangeably in economic literature. Also, there has been the view that by the time a complete adjustment to a change in price takes place, other influencing factors on demand, which include tastes, might change autonomously or be induced to change as

---

[1] G. J. Stigler, The Theory of Price, 3rd ed., Macmillan (1966), p. 36.

a result of the price change.[1] If this is the case, the effect of a price change and a complex of other changes are obviously not separable. This view point is also reflected in Houthakker's statement: "We conclude that in demand analysis it is essential to specify the period of adjustment. It is vain to search for 'the' elasticity of demand."[2]

From the literature reviewed above it is obvious that the concepts of habits and tastes are not clearly distinguishable from each other and that it is quite confusing to study demand analysis holding tastes constant and allowing a change in habits. In our approach, therefore, we may consider habits as a part of tastes in the sense that habits establishes a way of living and changes in habits occur as a result of a learning process induced by changes in consumption pattern.

---

[1] See for instance, J. M. Clark, "Toward a Concept of Workable Competition," American Economic Review, Vol. 30 (June 1940), pp. 241-256 and W. G. Tomek, The Theory and Measurement of Long-Run Demand (with Special Emphasis on the Demand for Food Products), unpublished Ph. D. thesis, University of Minnesota (1961).

[2] H. S. Houthakker, "New Evidence on Demand Elasticities," Econometrica, Vol. 33 (April 1965), pp. 277-288, quoted from p. 283. This is his conclusion from an empirical study of time-series data for several Western countries. He argues that demand equations estimated within countries capture primarily short-run effects, and that cross-country demand equations are of a long-run nature.

Post-war development of consumer theory produced several new ideas about consumption. In their empirical work Houthakker and Taylor[1] synthesized the notions of habit formation and stock adjustment into an operational variable called a "state variable." This variable is designed to measure past consumption experience and is introduced in the demand equations as an influencing variable for current consumption. Ignoring the price effect, the basic core of their model developed for the United States time-series data lies in the equation:

(2.1) $q(t) = a + b\,S(t) + c\,x(t)$.

Demand for a commodity at time t, $q(t)$, is expressed as a function of income at time t, $x(t)$, and the state variable at time t, $S(t)$.

The state variable for consumption commodities--especially for nondurable commodities--is not directly measurable. To overcome this problem, they use the accounting identity:

(2.2) $\dot{S}(t) \equiv q(t) - dS(t)$

where $\dot{S}(t)$ is the rate of change in the (physical or psychological) stock around time t and d is a straight line depreciation rate of the state variable $S(t)$ and is directly estimable. By substituting

---

[1] _Op. cit._

(2. 1) into (2. 2) and by some manipulations they convert equation (2. 1) to an estimable form which involves only observable quantities of q and x, and thus eliminate the problem of direct measurement of S(t).

Their hypothesis for b in equation (2. 1) is that it would have a negative sign in the case of durable commodities since the more one has, the less he is likely to buy. It should be positive in the case of nondurable commodities--like food, tobacco, and alcoholic beverages--since the more one has been using the more of them he will use in the future.

The Houthakker-Taylor model, as expressed above in equation (2. 1), means that demand is affected by its own state variable and by prices and income. It does not attempt to incorporate the effect of state variables of other commodities. The effect of state variables, however, should be considered in a relative sense. For example, even though the level of a state variable for the i^{th} commodity has increased during a certain period, if the levels of the state variables of other commodities have also increased during a certain period, demand effect of the state variable for i^{th} commodity could be offset. Thus, the estimate of the coefficient of a state variable of the i^{th} commodity in equation (2. 1) does not represent it's "pure" effect but is a combined effect, including the effects of state variables of other commodities. Thus, there is no easy interpretation of these coefficients in all cases.

The Houthakker-Taylor model, on the whole, is a major step forward in demand analysis. It provides better predictions compared to other models which do not include a state variable in their dynamic analysis.

However, the proposition put forth by Houthakker and Taylor that over a long period of time, more than three decades in a dynamic economy, "habits" change, while "tastes" remain constant, does not appeal to the intuitive idea of tastes.

The differences in consumption patterns among countries are generally considered as differences in tastes due to variations in cultural and climatic conditions in each country. If we can assume tastes as constant for one country--as Houthakker and Taylor did for the United States--and that only habits change, then it should be possible to make a similar assumption about other countries as well. This means the gaps in consumption patterns among countries will persist. It seems contradictory to the usual assumption in many economic analyses of changes in consumption patterns in different countries that such changes ultimately will follow the trend of the United States consumption patterns.

Later, in Chapter V, in our time-series analysis the Houthakker-Taylor idea of state variables as representing the psychological stock of past consumption will be extended to the case of two commodities.

CHAPTER III

INTERCOUNTRY CROSS-SECTION ANALYSIS: THEORETICAL FRAMEWORK

There is some recognition that taste can be both the cause and the result of economic activities. However, the existing theory of consumer demand does not provide any mechanism to explain the interaction between the formation of taste and production opportunities prevailing in a country.

In this chapter we first attempt to develop a conceptual relation between the formation of taste and the prevailing country-specific production opportunities. We then construct a partial demand model to analyze the problem of taste. Finally the data and the variables used in this study are discussed.

Before going further, however, it seems necessary to briefly define "taste." Quirk and Saposnik[1] define taste as consumer's feelings concerning alternative states of the economy, which are expressed through the ability of the consumer to decide between any two states of the economy--which he likes better or whether he likes them equally well. In the framework of an ordinal utility function, taste shapes or determines the form of

---

[1] J. Quirk and R. Saposnik, Introduction to General Equilibrium Theory and Welfare Economics, McGraw-Hill (1968), p. 9.

the utility function, and a change in taste is defined as a change in the form of the utility function. These definitions of taste and taste changes are similar to the definitions of technology and technical change in the theory of production.[1]

Conceptual Framework

From an anthropological viewpoint, consumption for all people takes place within their own cultural pattern which has important unique elements for all the individuals in the group.[2] It can be argued that in traditional societies a cultural pattern which provides a framework for choice is influenced deeply by the supply situation (production opportunities). Every economy has different endowments and the commodity which has a comparative advantage in production may force the people to form a relatively favorable taste for it.

Norris,[3] in her attempt to synthesize the conflicting views of "consumers' sovereignty" and "seller's sovereignty" about human tastes, also argues that tastes are culture-based. A few direct quotes from her book will illustrate her viewpoint:

---

[1] For a one to one correspondence (isomorphism) between technical change in the theory of production and taste change in the theory of consumer demand see F. M. Fisher, and K. Shell, The Economic Theory of Price Indices, Academic Press (1972).

[2] E. E. Hoyt, "Want Development in Underdeveloped Areas," Journal of Political Economy, Vol. 59 (June 1951), pp. 194-202.

[3] R. T. Norris, The Theory of Consumer's Demand, Yale University Press (1941). A similar line of argument to that of Norris is seen in K. E. Boulding, "Economics as a Moral Science," America Economic Review, Vol. 59 (March 1969), pp. 1-12.

"Man, it is now generally accepted, is endowed by nature with very few native drives, and such as he has are exceedingly general in nature." (p. 62); ". . . rather than man being born with 'infinite wants,' . . ., he is probably born with no specific wants and, indeed, very few general wants; and the precise degree of intensity of the want structure as a whole is a purely cultural growth. . . ." (p. 63); "Since human beings are not equipped by nature with wants for anything in particular, the kind of goods which a society is able to produce tends providentially to coincide with the sort of things which are wanted" (p. 65).

There is some evidence to support Norris' point of view. Milton Gilbert and associates[1] studied demand for various food commodities with a cross-section sample of western Europe and the United States. It is clearly indicated in their study that the residuals in regressions with income and price as explanatory variables are positively related to the production level of the commodity; with positive values for countries with high production levels and negative values with low production levels.

From the above discussion it can be argued that human tastes are learned in the matrix of culture, and that, as this matrix of culture changes, tastes also change. It can be further

---

[1] M. Gilbert and Associates, Comparative National Products and Price Levels, OEEC (1958). Similar results are observed in a study by Jureen (L. Jureen, "Long-Term Trends in Food Consumption: A Multi-Country Study," Econometrica, Vol. 24 (January 1956), pp. 1-21).

argued that a large part of the cultural pattern of an economy is made up of its production and marketing activities and, thus, changes in cultural matrix imply changes in the economic organization of the country concerned and vice versa. For example, effects of changes in production technology and the opening up of foreign trade induce changes in both the economic organization and cultural patterns.

In the development of the conceptual framework of this study, it is assumed that all people possess potentially quite general and similar taste preferences and that specific tastes are acquired and developed through consumption experiences. Since every economy has different resource endowments and climatic conditions, the commodities which have comparative advantages in production would induce formation of taste preferences consistent with production opportunities. This hypothesis may be stated as follows: The commodities which have a comparative advantage in production, consistent with resource endowments and climatic conditions of a country, induce formation of relative taste preferences favorable to them.

In the next section we develop a model to investigate this hypothesis. The basic point of our approach is that if the above hypothesis is correct it should be possible to explain taste differences in a cross-section of countries by the differences in production patterns in each country.

The Model

As argued in the previous section let us start by assuming that there exists a common demand function for a cross-section of countries, and introduce tastes as a demand shifter in this function. We write this demand function as follows:

(3.1) $$Q_{ij} = f\ (P_{ij},\ I_j,\ Z_{ij})$$

where Q_{ij} = per capita annual consumption of commodity i in country j

P_{ij} = price of commodity i in country j

I_j = per capita annual income in country j

Z_{ij} = taste variable for commodity i in country j.

There are three basic points that should be discussed before an estimating equation is developed for the demand equation (3.1). First, we need a justification for the implicit assumption that taste differences among countries can be described by the same demand function. Second, we need to discuss the meaning and operational specification of the taste variable Z. And third, the problem of model specification has to be discussed.

With regard to the first point, one may object to the use of data from different countries in a demand function. Houthakker's analysis,[1] which shows differences in estimates of the Engel function for different countries could be a basis for this objection. This objection, however, does not seem to be very serious. Houthakker himself justifies, in a later article, the use of intercountry data for estimations of demand equations.[2] Moreover, the basic Houthakker model includes only two explanatory variables, total expenditures and family size. This seems to be an underspecification for the model. Also, it seems to be a common practice to estimate production functions from the cross-section of intercountry data, where any country differences are attributable to misspecification.[3]

---

[1] H. S. Houthakker, "An International Comparison of Household Expenditure Patterns, Commemorating the Centenary of Engel's Law," Econometrica, Vol. 25 (October 1957), pp. 532-551.

[2] ________, "New Evidence on Demand Elasticities," Econometrica, Vol. 33 (April 1965), pp. 277-288. See his direct statement quoted on p. 7, Chapter I.

[3] See, for instance, Nelson's argument (R. R. Nelson, "A Diffusion Model of International Productivity Differences in Manufacturing Industry," American Economic Review, Vol. 58 (Decembe 1968), pp. 1219-1248), that cross-country differences in production estimates by Arrow, et al. (K. J. Arrow, H. B. Chenery, B. S. Minhas and R. M. Solow, "Capital-Labor Substitution and Economic Efficiency," Review of Economics and Statistics, Vol. 45 (August 1961), pp. 225-250) are due to misspecification and that the underlyi cross-country production function is the same. Also see Y. Hayami and V. W. Ruttan, Agricultural Development: An International Perspective, Johns Hopkins Press (1971), Chapter 4.

With regard to our explicit use of a taste variable Z in the demand equation (3.1), we have two problems to clarify. We need to provide a conceptual meaning to this variable and then to develop an operational specification for it. Both aspects are obviously interrelated.

In the light of our hypothesis, that taste preferences develop consistent with the comparative advantage in production of countries, conceptually in an intercountry cross-section demand function tastes should be represented by some measure of commodity price ratios--which have prevailed over the relevant historical period--that affected present tastes. But this raises a difficult problem in giving an operational meaning to this variable. We do not know what should be the relevant historical period for individual commodities and countries, and thus we do not know which period price ratios are relevant for our purpose. The relevant period may differ for commodities and for a given commodity among countries. Obviously, we need an alternative procedure to overcome this problem.

One way could be to measure this variable as a ratio of production of commodity i to total food production at some given period in the past. The production of food commodities in a country, to a considerable extent, depends upon the country's resource endowments and climatic conditions. Since these factors do not vary much over time, and since relative prices among commodities are reflected by the relative production of commodities, the production of commodity i in the total food production of a country--in the past period under consideration--could be a plausible proxy variable for the taste variable of the "commodity price ratio." We call the variable Z the "taste" variable.

Our selection of the past period to measure this ratio is, however, constrained by the availability of data and thus is quite arbitrary. Moreover, whatever past time-period we may use for this purpose, trade and technical progress might already have affected the production patterns of the country. The measured ratios, thus, may be different from the ones that should have prevailed in the absence of technical change and/or trade. In the case of trade the measured shares in the total production would be larger for export commodities and smaller for import commoditie than the "true" shares. This would cause a downward bias to the estimated coefficient of the variable Z, measured as a ratio of the commodity i to the total food production in the country, from the application of regression techniques.

In order to account for this trade effect, therefore, we have to add another variable, which we will call the "trade" variable M. We may write (3.1) as:

$$(3.2) \qquad Q_{ij} = f\,(P_{ij},\ I_j,\ Z_{ij},\ M_{ij}).$$

This "trade" variable M_{ij} is measured as a ratio of the net import of commodity i in country j to the total production of commodity i in the same country during the period for which the "taste" variable Z is measured. This should improve the specification of our basic demand model (3.1).

Another problem that we face is the question of a proper specification of the demand model. We have postulated the demand relation (3.2) in the form of a single equation. The interdependent natures of supply and consumption, and consumption of individual commodities, can hardly be denied. Thus, ideally one would like to have a complete set of demand and supply equations estimated simultaneously. This may be more important because of the relative nature of taste preferences.

Information for such a procedure, however, seems to be very difficult, if not impossible, to obtain, especially on the supply side. There have been some attempts to use complete systems of demand equations where interest was limited only to the analysis of the broad characteristics of demand. These analyses are applied to major commodity groups of consumption items under the assumption of the additive utility function[1] rather than to individual commodities. The problem of taste formation, however, can be better studied in the case of individual commodities than groups. In view of these difficulties, our single equation model, even though inadequate in some sense, seems to be the best possible approach for the problem in hand.[2]

Our next step is to develop a suitable estimating form for the demand equation (3.2). With regard to the functional specification of the demand equation, we find very little theoretical discussion in the literature on demand. Most discussions pertain to the relationship between consumption of a particular commodity and income (Engel function).[3]

---

[1] Examples are R. A. Pollak and T. J. Wales, "Estimation of the Linear Expenditure System," Econometrica, Vol. 37 (October 1969), pp. 611-628 and H. Theil, "Value Share Transitions in the Consumer Demand Theory," Econometrica, Vol. 38 (January 1970), pp. 118-127.

[2] Recently A. Brown and A. Deaton in "Surveys in Applied Economics: Models of Consumer Behavior," Economic Journal, Vol. 82 (December 1972), pp. 1145-1236, have spotlighted such problems and argue that to obtain plausible estimates from complete demand systems for a large number of commodities is still impossible (p. 1221).

[3] S. J. Prais and H. S. Houthakker, The Analysis of Family Budgets, 2nd impression, Cambridge University Press (1971) and C. E. V. Leser, "Forms of Engel Functions," Econometrica, Vol. 31 (October 1963), pp. 694-703.

An Engel curve for an infinite range of income would have the following properties: (1) an income level below which the commodity is not purchased; (2) a positively sloped part; and (3) a maximum of the quality of the commodity consumed, indicating a satiation level. For some commodities, a fourth property will be added: (4) negatively sloped curve beyond the satiation level, but still having positive values. Within the income range covered by our data for some commodities, all four properties may be observed. For some others the satiation level may not be reached.

One of the mathematical forms which embodies all the above properties of an Engel curve is:

$$\ln Q = b_o + b_j \ln I + b_2 1/I \tag{3.3}$$

where Q and I denote quantity demanded and income, respectively. The income elasticity of demand from this equation is given by

$$\eta = b_1 - b_2 1/I, \tag{3.4}$$

which varies with income. An interesting feature of this form is that it permits testing of several hypotheses. For example, to test: (1) if income elasticity is constant; and (2) if there is a satiation level for consumption. This can be done by testing the significance of the partial regression coefficients b_1 and b_2. In case we fail to reject both hypotheses, income elasticity tends to be constant at high income levels, taking the value of b_1. If both coefficients have negative signs, the Engel curve would have all of the four properties described earlier.

The considerations cited above should be important in regard to the selection of the functional form for explanatory variables other than income as well. However, from the literature little guidance is available for this purpose. We assumed that the variables other than income have a proportionality relationship with the quality demanded of a certain commodity. Accordingly, the following mathematical form of the demand equation is developed for estimation purposes using intercountry cross-section data:

$$\ln Q_{ij} = a + b_1 \ln I_j + b_2\, 1/I_j + c \ln P_{ij} + d_1 \ln Z_{ij} + d_2 \ln M_{ij} + u_{ij}, \tag{3.5}$$

where variables are as defined earlier for equations (3.1) and (3.2). u_{ij} is an error term, representing both the effect of omitted variables and errors of measurement in the dependent variables. The data sources and development of the variables will be discussed in more detail in the next section.

Ordinary least squares is applied to estimate the parameters in equation (3.5). We assume that the explanatory variables are independent of the error term u_{ij}.

The model has the advantage of considerable simplicity in computation and interpretation of estimates, and usually satisfies the assumption of homoschedastic residuals.

The Data and the Variables

Data from forty-three countries are used. The selection of countries depended upon the availability of data.[1]

Consumption and income are expressed on a per capita basis because the underlying theory of consumer choice refers basically to individuals. It can, however, be argued that for consumption it would not be correct to give all individuals equal weight regardless of their differences in sex, age, and other demographic factors. Nevertheless, it is suggested that equal weights do not produce much of a distortion.[2] To use income on a per capita basis it can be argued that income distribution may differ among countries and actual purchasing power may not be well reflected by average per capita income. But data limitations do not permit construction of any better measures.

---

[1] The countries included are: Argentina, Australia, Austria, Belgium and Luxembourg, Brazil, Canada, Ceylon, Chile, Colombia, Denmark, Finland, France, Germany (Fed. Rep.), Greece, Honduras, India, Ireland, Israel, Italy, Japan, Libya, Mexico, Netherlands, New Zealand, Norway, Pakistan, Paraguay, Peru, Philippines, Portugal, South Africa, Spain, Sweden, Switzerland, Syria, Taiwan, Turkey, U.A.R., U.K., U.S.A., Uruguay, Venezuela, Yugoslavia.

[2] S. J. Prais and H. S. Houthakker (1971), *op. cit.* and A. Agarwala and J. Drinkwater, "Consumption Function with Shifting Parameters Due to Socio-Economic Factors," *Review of Economics and Statistics*, Vol. 54 (February 1972), pp. 89-96.

Consumption[1]

Consumption Q is the per capita average annual quantity consumed for the period of 1957-1962 expressed in international prices in wheat units.[2] It is defined as net production adjusted for changes in stocks less exports, the amounts used for manufacturing other commodities, and waste, plus imports. Net production is equal to total production less seed and feed, and the commodities manufactured are mainly alcoholic beverages.

Income[3]

Income I is the per capita two-year average income for 1958 and 1962 in United States dollars adjusted by the United Nations' purchasing power parity rates.

---

[1] Data sources: Food Balance Sheets, FAO, issues of 1957-59 and 1960-62.

[2] To offset the extreme bias in the Laspyers type index by using a price series in a particular country, aggregation is carried out by using international prices in wheat units at the 1960 level. See Y. Hayami, et al., An International Comparison of Agricultural Production and Productivities, Technical Bulletin 277, Agricultural Experiment Station, University of Minnesota (1971), p. 22. The calculation method is as follows: each commodity in the group is weighted by United States, Japan, and India farm-gate prices which are standardized by their wheat prices, and summed up separately. The geometric mean of these three values is used as the value for the commodity group. In case of a single commodity, consumption is also expressed in wheat units.

[3] Data source: 1964 Yearbook of National Accounts Statistics, Statistical Office, United Nations, pp. 327-331.

In using international data, it is necessary to convert income measured in currencies of individual countries to some common denominator to make it comparable. For this purpose United Nations' purchasing power parity rates are used instead of the official exchange rates to United States dollars. It is assumed that the former measures purchasing power better than the latter, which may overvalue United States dollars in any comparison involving the United States.[1]

Price[2]

Price P is expressed as a ratio of price of commodity concerned to price of related commodity. The price variable is constructed by averaging retail prices deflated by the consumer price index for food at the 1960 level for the period of 1957-62. To construct price for a commodity group, first, three consumption-weighted price indices are obtained by using per capita consumption in the United States, Japan and India as weights. The cubic root of the products of these three indices is used as the price

---

[1] M. Gilbert and Associates, op. cit., demonstrate this evidence.

[2] Main data sources: 1958-1963 issues of International Labor Reviews, I L O.

variable.[1] Laspyers type index bias in this case would be less than if we use one particular country as a weight. The selection of the United States, Japan, and India as weights is quite arbitrary.

Taste[2]

The production pattern variable Z as a proxy variable for "taste" is expressed as a ratio of production of a commodity to total food production for the period of 1934-1938. The period is

---

[1] For example price of commodity group k in country h, P_{kh}, is obtained by:

$$p_{kh} = 3 \frac{(\sum_{i=1}^{m} p_{ih}q_{iU})(\sum_{i=1}^{m} p_{ih}q_{iJ})(\sum_{i=1}^{m} p_{ih}q_{iI})}{(\sum_{i=1}^{m} p_{iU}q_{iU})(\sum_{i=1}^{m} p_{iJ}q_{iJ})(\sum_{i=1}^{m} p_{iI}q_{iI})} \times 100$$

where p_{ih} = the price of commodity i (i=1, . . ., m) in country h, adjusted by the United Nations' Purchasing Power Parity Rate (UNPPPR).
p_{iU} = the price of commodity i in the United States.
p_{iJ} = the price of commodity i in Japan, adjusted by UNPP
p_{iU} = the United States per capita consumption of commodi i in kilograms.
q_{iJ} = Japan per capita consumption of commodity i in kilograms.
q_{iI} = India per capita consumption of commodity i in kilograms.

[2] 1955 and 1957 issues of <u>Production Yearbook</u>, FAO with supplements of 1949 and 1950 issues of <u>Food Balance Sheets</u>, FAO.

the earliest years for which the data are available in most countries. There are some countries for which pre-World War II production data is not available.[1] They are mostly less developed countries where the production pattern before and immediately after World War II may have undergone little if any change. It is assumed that the time period differences in this variable will have little affect upon our analysis.

To compose the variable Z the international prices in wheat units at the 1960 level are used to aggregate commodity groups and total food production. In the case of a single commodity, production is also expressed in wheat units.

Trade[2]

The trade variable M is expressed as a ratio of net import of a commodity to the total production of the commodity at the period for which the variable Z is measured. In case the value takes a negative sign, the reciprocal of the value is used, reflecting that the parameter of M takes the opposite sign from that of the

---

[1] The annual averages for the period of 1948-1952 are used. These countries are: Honduras, India, Israel, Libya, Pakistan, Paraguay, Syria and Venezuela. Data sources: 1955 and 1969 issues of Production Yearbook, FAO with supplement of Food Supply Time Series, FAO (1960).

[2] Data sources for net imports: 1957 and 1962 issues of Trade Yearbook, FAO, with supplement of 1949 and 1955 issues of Food Balance Sheets, FAO.

case where the net import is positive.

For the aggregation of net imports as well as for a single commodity, the international prices in wheat units at the 1960 level are used.

CHAPTER IV

INTERCOUNTRY CROSS-SECTION ANALYSIS

In this chapter we test the hypothesis that tastes are formed consistent with the production opportunities of the respective countries. Intercountry cross-section data from forty-three countries (averages of 1957-62) are used to estimate the basic model, equation (3.5), presented in Chapter III. Empirical estimates of the demand functions for twenty-two commodities are presented in Tables 4.1 and 4.2. Our estimates are then compared with some earlier demand studies which have a bearing on our findings, and are followed by some concluding remarks.

Empirical Estimates of Per Capita Demand Functions

In Chapter III, we presented heuristic support from the arguments of Norris and Gilbert[1] that people in the world have potentially common tastes and country specific tastes are formed by past consumption experiences. Since every economy has different resource endowments and climatic conditions, the commodities which have relative advantages in production induce

---

[1] See pp. 24-25.

the formation of taste preferences consistent with production. Estimating equation (3.5) in Chapter III is developed to test this hypothesis:

$$\ln Q_{ij} = a + b_1 \ln I_j + b_2\, 1/I_j + c \ln P_{ij} + d_1 \ln Z_{ij} + d_2 \ln M_{ij} + u_{ij},$$

where Q_{ij} is per capita consumption of commodity i in country j, I is per capita income, P is price, Z is the "taste" variable, M is the "trade" variable, and u is an error term.[1] The variable "taste" in this equation is designed to represent differences in production patterns across countries and to capture taste differences among them. In this section an attempt is made to empirically test this hypothesis. Statistical estimates of ordinary least squares regressions for this equation for the forty-three countries data (1957-62 averages) are presented in Table 4.1. In Table 4.2 the regressions which are selected from alternative specifications of the income variable on the basis of the highest value of the coefficient of determination adjusted for degree of freedom, are presented.

Production Impact on Country Specific Taste Formation

In the cross-section analysis of countries, differences in tastes among countries may be explained by differences in

---

[1] For the more detailed definition of variables, see pp. 36-40.

TABLE 4.1. ESTIMATES OF PER CAPITA DEMAND FUNCTION ON INTERCOUNTRY CROSS-SECTION DATA, 1957-62 AVERAGES.

	Number of		Coefficients of							
					Prices		Taste			
Commodity	Observations	Constant	Income	1/Income	(1)	(2)	(1)	(2)	Trade	R^2
Wheat	41	4.511	-0.010	-78.52	-0.534		0.237		0.037	0.511
		(1.324)	(0.171)	(50.59)	(0.257)		(0.052)		(0.032)	
		2.989	0.040	-118.30	-0.851					0.253
		(1.578)	(0.211)	(61.33)	(0.299)					
Rice	26	10.506	-0.804	-132.43	-0.145		0.572		0.092	0.886
		(1.818)	(0.247)	(55.85)	(0.254)		(0.058)		(0.037)	
		4.632	-0.459	69.23	-0.556					0.382
		(3.808)	(0.539)	(121.00)	(0.564)					
Potatoes	42	4.011	-0.007	-89.74	-0.270		0.342		-0.012	0.604
		(2.171)	(0.218)	(64.68)	(0.185)		(0.099)		(0.022)	
		-0.408	0.166	-42.54	-0.663					0.475
		(1.822)	(0.244)	(71.93)	(0.176)					
Sugar	40	0.964	0.363	-44.19	-0.472		0.043		0.022	0.744
		(0.810)	(0.103)	(28.46)	(0.121)		(0.031)		(0.015)	
		0.586	0.377	-35.37	-0.521					0.738
		(0.766)	(0.103)	(28.03)	(0.116)					
Pulses	41	6.666	-0.420	-43.30	0.173		0.375		0.054	0.615
		(1.444)	(0.220)	(59.92)	(0.205)		(0.074)		(0.028)	
		6.858	-0.793	-98.84	-0.253					0.337
		(1.878)	(0.268)	(76.68)	(0.247)					
Oilseeds	33	0.302	0.528	5.94	0.107		0.120		0.005	0.295
		(1.660)	(0.250)	(5.97)	(0.238)		(0.077)		(0.053)	
		0.607	0.387	3.52	0.124					0.274
		(1.658)	(0.238)	(60.46)	(0.240)					

TABLE 4.1. (continued)

			Coefficients of							
					Prices		Taste			
Commodity	Observations	Constant	Income	1/Income	(1)	(2)	(1)	(2)	Trade	R^2
Vegetables	31	6.600	-0.077	-134.77	0.186		0.474		0.018	0.511
		(2.427)	(0.305)	(78.79)	(0.253)		(0.118)		(0.027)	
		6.444	-0.497	-245.07	0.076					0.346
		(2.388)	(0.354)	(91.08)	(0.298)					
Fruits	43	3.032	0.330	0.09	-0.067		0.306		0.019	0.447
		(1.448)	(0.195)	(53.73)	(0.132)		(0.067)		(0.030)	
		3.314	0.124	-39.35	-0.263					0.160
		(1.671)	(0.233)	(60.70)	(0.153)					
Coffee-Cocoa-Tea	42	-1.116	0.921	-44.06	-0.543		0.041	1.435		0.703
		(1.713)	(0.236)	(65.27)	(0.221)		(0.034)	(0.406)		
		0.544	0.793	-75.30	-0.789					0.617
		(1.748)	(0.256)	(70.31)	(0.232)					
Beef	39	3.638	0.506	-17.71	-0.143	-0.013	0.839		0.029	0.864
		(1.487)	(0.199)	(68.07)	(0.189)	(0.215)	(0.078)		(0.021)	
		-2.697	1.115	147.92	-1.009	0.117				0.403
		(2.856)	(0.398)	(138.58)	(0.358)	(0.449)				
Pork	34	6.147	0.235	-106.21	0.322	-0.176	1.063		0.040	0.910
		(1.638)	(0.214)	(88.45)	(0.196)	(0.196)	(0.081)		(0.018)	
		-1.603	0.908	-45.44	-0.414	0.466				0.379
		(4.021)	(0.547)	(23.21)	(0.513)	(0.516)				
Mutton and Other Meats	39	-0.935	1.014	284.34	-0.148	-0.538	0.777		0.006	0.631
		(2.580)	(0.361)	(125.10)	(0.400)	(0.329)	(0.102)		(0.037)	
		3.545	0.763	181.67	0.390	-0.805				0.014
		(1.868)	(0.582)	(202.48)	(0.643)	(0.523)				

TABLE 4.1. (continued)

			Coefficients of							
					Prices		Taste			
Commodity	Number of Observations	Constant	Income	1/Income	(1)	(2)	(1)	(2)	Trade	R^2
Fish	37	5.240	-0.200	-114.03	-0.135		0.338		-0.043	0.548
		(1.759)	(0.222)	(62.46)	(0.166)		(0.063)		(0.044)	
		2.121	-0.257	-120.43	-0.511					0.168
		(2.050)	(0.284)	(79.06)	(0.204)					
Milk	43	2.597	0.439	40.50	-0.368		0.519		0.044	0.876
		(1.460)	(0.169)	(41.80)	(0.201)		(0.070)		(0.017)	
		-4.573	1.123	105.94	-1.228					0.698
		(1.697)	(0.221)	(62.04)	(0.257)					
Eggs	39	1.971	0.477	-130.46	0.071		0.300		-0.021	0.813
		(1.488)	(0.184)	(69.60)	(0.285)		(0.137)		(0.023)	
		0.249	0.565	-96.05	0.250					0.783
		(1.406)	(0.195)	(71.64)	(0.289)					
Grains	43	6.924	0.236	-29.37	-0.025		0.171		0.031	0.459
		(0.898)	(0.097)	(27.09)	(0.153)		(0.059)		(0.016)	
		6.392	-0.237	-13.17	0.013					0.271
		(1.030)	(0.109)	(31.04)	(0.174)					
Fruits and vegetables	43	4.345	0.269	-19.82	-0.099		0.321		0.013	0.478
		(1.158)	(0.179)	(47.94)	(0.125)		(0.076)		(0.024)	
		6.037	-0.370	-85.78	-0.158					0.248
		(1.174)	(0.184)	(50.12)	(0.149)					
Pulses, Nuts and Oilseeds	43	2.380	0.545	13.93	-0.243		0.279		0.042	0.390
		(1.503)	(0.178)	(43.64)	(0.217)		(0.058)		(0.031)	
		4.577	0.098	-31.61	-0.324					0.061
		(1.737)	(0.188)	(52.72)	(0.257)					

TABLE 4. 1. (continued)

			Coefficients of							
					Prices		Taste			
Commodity	Observations	Constant	Income	1/Income	(1)	(2)	(1)	(2)	Trade	R^2
Meats	40	2.260	0.729	46.04	-0.177		0.651		0.028	0.783
		(1.424)	(0.206)	(65.63)	(0.130)		(0.098)		(0.025)	
		-0.621	1.126	80.88	-0.537					0.524
		(2.001)	(0.292)	(96.07)	(0.142)					
Meats, Poultry and Fish	43	5.126	0.549	-32.54	-0.447		0.574		-0.003	0.797
		(1.169)	(0.177)	(44.98)	(0.232)		(0.135)		(0.002)	
		5.479	0.723	-66.58	-0.944					0.710
		(1.393)	(0.199)	(51.51)	(0.227)					
Plant Foods	43	5.815	0.081	-10.55	-0.024		0.117		0.007	0.211
		(0.545)	(0.070)	(17.12)	(0.100)		(0.058)		(0.010)	
		6.096	0.003	-21.24	0.007					0.158
		(0.544)	(0.061)	(16.22)	(0.103)					
Animal Foods	43	5.026	0.626	6.42	-0.540		0.387		0.031	0.814
		(1.123)	(0.173)	(3.75)	(0.219)		(0.179)		(0.019)	
		4.604	0.876	26.52	-0.886					0.780
		(1.143)	(0.149)	(40.06)	(0.200)					

Estimating equations are:

$$\ln Q_i = A_i + b_{1i} \ln I + b_{2i} 1/I + C_i \ln P_i + d_{1i} \ln Z_i + d_{2i} \ln M_i + u_i$$

$$\ln Q_i = A_i + b_{1i} \ln I + b_{2i} 1/I + C_i \ln P_i + u_i$$

For the definition of variables see pp. 36-40. Standard errors are in parentheses. R^2 is coefficient of determination adjusted for degree of freedom. Prices used are relative prices of various commodities as follows: potatoes/grains for potatoes; beef/pork and beef/mutton for beef; pork/beef and pork/mutton for pork; mutton/beef and mutton/pork for mutton. Prices for the remaining commodities are divided by the United Nations' purchasing power parity rate in U. S. dollars.

Footnotes for Table 4.1 (continued).

For the commodity group coffee-cocoa-tea, since there are many non-producing countries, the variable "taste" is measured by zero-one variables as follows: (1) the countries which produce coffee, cocoa, and tea between 1 and 15 per cent of the total food production of the respective country, take the value one and all other countries take the value of zero; (2) the countries which produce more than 30 per cent take the value of one (there is no country in the sample which produces 16 to 30 per cent) and all other countries take the value of zero.

historical levels of relative prices specific to each country. The "taste" variable is introduced into the demand equation (3.5) as a proxy for historical relative price differences among countries, and therefore is a demand shifter, measured as the production share of the commodity in the total food production of the country in the 1930's. In order to adjust for the impact of trade on production patterns, another variable--trade--measured as a ratio of net import to the total production of the commodity in a country in the 1930's is introduced. The estimates for demand equation (3.5) without these two variables are also presented in Table 4.1.

In general the introduction of "taste" and "trade" variables in the demand equation increases considerably the explained variations in consumption among countries. It should be noted that in most cases estimated coefficients of the "taste" variable have large t-values. The magnitudes of these coefficients represent the percentage differences in demand for a commodity due to a one per cent difference in the production share of the commodity to total food production in the period of 1934-38. It should also be noted that in general estimated coefficients for commodities when they are grouped together are smaller than the estimated coefficients for separate commodities. This is what one would expect. Since tastes are relative, taste differences should be revealed among individual commodities. Because grouping of commodities reduces the substitution possibilities, the possibility of inducement of country specific taste formation by production patterns is reduced.

Another important finding that emerges from the estimates presented in Table 4.1 is that the contribution of the "taste" variable to explain variations in consumption among countries are much smaller for grouped commodities than for single commodities. If we compare the two values of the R^2's in the estimating equations with and without the "taste" and trade variables, we notice that fits of the equation for commodity groups do not improve much when we add these variables. This may be interpreted to mean that country specific tastes are stronger in the case of individual commodities than commodity groups. It seems to support the point made by Norris that man is born with exceedingly general tastes and specific tastes are developed through consumption experiences.[1]

Exceptions

The estimated coefficient of the "taste" for sugar is small relative to the coefficients for other commodities, and also is not statistically significantly different from zero at the 90 per cent

---

[1] Op. cit. See also earlier discussion on this point in Chapter III.

level. There could be two reasons for this. First, the commodity has a long history of trade, but the trade variable is not successful in capturing the trade effect. Second, perhaps more importantly, there is no good substitute for sugar. The relatively large and similar values of the R^2's for estimating equations with and without "taste" and trade variables seem to support the basic similarity in food preferences across countries.

In the case of oilseeds not only is the coefficient of the "taste" variable not statistically significantly different from zero at the 90 per cent level, but the total explained variation in consumption also is quite small. There could be two possible explanations. First, the "taste" variable includes copra, palm kernels, rapeseed, olives, cottonseed, groundnuts, sesame seed, soybeans, and sunflower seed. In some countries a large portion of oilseeds is used for manufacturing soaps and other nonfood items. Since, due to data limitations, those nonfood uses are not separated out, the measured variable might not serve appropriately for our purpose. Second, oilseeds are widely traded commodities. Since the trade variable, which also has the same measurement problem as the "taste" variable, is not effective, it could cause a downward bias for the production variable.

Estimate of the Coefficient of Trade Variable

The "trade" variable in equation (3.5) is introduced in order to capture any effects on the "taste" variable due to trade, making the coefficient for the "taste" variable free from specification problems. It is also assumed that the variable will capture the trade effect on taste change, in case the trade had prevailed for an extended period. As seen in Table 4.1 this variable does not seem to make any significant contribution except in the case of rice and milk. For some commodities the coefficients have a wrong sign even though they are not statistically significant. There could be several reasons for this. First, there are some measurement problems for this variable. For example, in some cases the variable includes feeds and amounts used for nonfood purposes. Second, in a cross-section analysis we cannot incorporate the time dimension of trade into the variable. The effect of trade on demand depends upon the length of time for which the trade has persisted in a country. Since our trade variable is measured at a point in time, it does not capture the effects of any differences in the length of time for which trade had been in existence for certain countries. This may be a cause of the failure of this variable to capture the true trade effect on demand. To measure the effect of this variable properly, time-series analyses are also required.

Income Effect on Demand for Food Commodities

Since income is an important variable influencing per capita food consumption, quantitative information of its effect on consumption provides a sound basis for demand projections. As was argued in Chapter III, two different forms of the income variables are introduced in equation (3.5) so that four stages of consumption response to a wide range of income should be represented.[1] For rice all the four stages are observed within the income range covered by our data. Table 4.1 shows that the estimates of the two income variables for rice have negative signs and are both significantly different from zero. We also note that for demand equation (3.5) the estimated coefficients for sugar, pork, the group of mutton and other meats, and eggs are significantly different from zero for both income variables, indicating that for demand projections both forms of the income variable should be included.[2] For some commodities only one of the two

---

[1] Literature in demand analysis usually comprehends these four stages as follows: (1) an income level below which the commodity is not purchased; (2) a positive response to income increase; (3) no response for income change, indicating a satiation level; and (4) a negative response to increase in income.

[2] Except for the group of mutton and other meats the income variable in logarithms has a positive sign and the inverse of the income variable has a negative sign, indicating that the income elasticities for these commodities continue to decrease as income increases and reach positive constant income elasticities at a high level of income. In the case of mutton and other meats both (continued next page)

income variables is significant and for some other commodities coefficients for both income variables are nonsignificant. In the latter case, it does not necessarily mean that income has no effect on consumption. High intercorrelation between the two income variables seems to be the cause for the nonsignificant coefficient.

In order to ascertain the proper form in which the income variable should enter the consumption relation, two additional demand equations are estimated by dropping either of the two forms of the income variable. Selected relations (from the three types of demand equations) which gave the highest value of the coefficient of determination adjusted for degree of freedom are presented in Table 4.2.

The estimates of Table 4.2 are used to calculate income elasticities at various income levels and are presented later in Table 4.4. Income and consumption relationships are discussed at some length in the next section.

---

coefficients have a positive sign, indicating the income elasticity continues to increase as income increases and reaches a constant value as a high income level. The income elasticity is negative at a low income level, reaches zero around 300 dollars, and continues to increase, approaching the constant value of 1.014. This commodity group includes mutton, goat, camel, horse, game, and unidentified meats in processed meats. The consumption measure of this group may be a cause for the estimates obtained for income variables.

TABLE 4.2. REGRESSION ESTIMATES PER CAPITA DEMAND FUNCTION ON INTERCOUNTRY CROSS-SECTION DATA, 1957-62 AVERAGES.

			Coefficients of							
					Prices		Taste			
Commodity	Number of Observations	Constant	Income	1/Income	(1)	(2)	(1)	(2)	Trade	R^2
Wheat	41	4.437		-76.06	-0.535		0.237		0.037	0.525
		(0.466)		(28.48)	(0.253)		(0.051)		(0.031)	
Rice	26	10.506	-0.804	-132.43	-0.145		0.572		0.092	0.886
		(1.818)	(0.247)	(55.85)	(0.254)		(0.058)		(0.037)	
Potatoes	43	4.619		-77.23	-0.286		0.358			0.623
		(0.357)		(26.82)	(0.173)		(0.088)			
Sugar	40	0.964	0.363	-44.19	-0.472		0.043		0.022	0.744
		(0.810)	(0.103)	(28.46)	(0.121)		(0.031)		(0.015)	
Pulses	41	5.745	-0.278		0.221		0.386		0.053	0.620
		(0.675)	(0.099)		(0.193)		(0.072)		(0.027)	
Oilseeds	33	0.454	0.507		0.108		0.120		0.005	0.320
		(0.648)	(0.126)		(0.233)		(0.075)		(0.052)	
Vegetables	43	6.010		-117.60	0.018		0.498			0.574
		(0.686)		(22.97)	(0.162)		(0.085)			
Fruits	43	3.035	0.329		-0.067		0.306		0.019	0.462
		(0.525)	(0.072)		(0.125)		(0.066)		(0.027)	
Coffee-Tea-Cocoa	42	-2.180	1.061		-0.528		0.107	1.486		0.708
		(0.668)	(0.111)		(0.218)		(0.323)	(0.396)		
Beef	39	3.281	0.553		-0.163	-0.005	0.835		0.029	0.868
		(0.562)	(0.081)		(0.171)	(0.210)	(0.076)		(0.021)	

TABLE 4.2. (continued)

	Number of		Coefficients of							
					Prices		Taste			
Commodity	Observations	Constant	Income	1/Income	(1)	(2)	(1)	(2)	Trade	R^2
Pork	34	6.147	0.235	-106.21	0.322	-0.176	1.063		0.040	0.910
		(1.638)	(0.214)	(88.45)	(0.196)	(0.196)	(0.081)		(0.018)	
Mutton and Other Meats	39	-0.935	1.014	284.34	-0.148	-0.538	0.777		0.006	0.631
		(2.580)	(0.361)	(125.10)	(0.400)	(0.329)	(0.102)		(0.037)	
Fish	43	4.378		-105.88	-0.120		0.424			0.642
		(1.075)		(27.70)	(0.179)		(0.069)			
Milk	43	3.747	0.297		-0.314		0.536		0.042	0.876
		(0.851)	(0.085)		(0.193)		(0.068)		(0.017)	
Eggs	43	3.307	0.379	-110.99	0.184		0.490			0.893
		(1.076)	(0.145)	(41.20)	(0.217)		(0.104)			
Grains	43	6.104	-0.155		0.020		0.167		0.029	0.459
		(0.486)	(0.061)		(0.148)		(0.059)		(0.016)	
Fruits and Vegetables	43	3.931	0.338		-0.115		0.327		0.017	0.489
		(0.578)	(0.061)		(0.117)		(0.074)		(0.021)	
Pulses, Nuts, and Oilseeds	43	2.759	0.497		-0.254		0.275		0.040	0.405
		(0.911)	(0.093)		(0.212)		(0.056)		(0.031)	
Meats	40	3.183	0.606		-0.177		0.658		0.026	0.786
		(0.563)	(0.106)		(0.133)		(0.097)		(0.025)	
Meats, Poultry, and Fish	43	4.455	0.649		-0.442		0.594			0.804
		(0.708)	(0.101)		(0.219)		(0.129)			
Plant Foods	43	5.580	0.118		-0.030		0.124		0.010	0.224
		(0.386)	(0.036)		(0.100)		(0.057)		(0.009)	
Animal Foods	43	5.158	0.602		-0.530		0.392		0.032	0.819
		(0.802)	(0.099)		(0.209)		(0.174)		(0.018)	

Footnotes for Table 4.2.

For the definition of variables see pp. 36-40. Variables are all in natural logarithms except for the inverse of income. Standard errors are in parentheses. R^2 is the coefficient of determination adjusted for degree of freedom. Prices used are relative prices of various commodities as follows: Potatoes/grains for potatoes; beef/pork and beef/mutton for beef; pork/beef and pork/mutton for pork; mutton/beef and mutton/pork for mutton. Prices for remaining commodities are divided by the United Nations' purchasing power parity rate in U. S. dollars.

For the commodity coffee-cocoa-tea, since there are many non-producing countries, the variable "taste" is measured by zero-one variables as follows: (1) the countries which produce coffee, cocoa, and tea between 1 and 15 per cent of the total food production of the respective country, take the value of one and all other countries take the value of zero; (2) the countries which produce more than 30 per cent take the value of one (there is no country in the sample which produced 16 to 30 per cent) and all other countries take the value of zero.

Price Effect on Demand for Food Commodities

The estimated coefficients of price presented in Table 4.2 are of a short-run nature. The short-run effect is the substitution effect due to a relative price change, and the long-run effect implies the short-run effect plus the effect of taste change induced by the price change. In Table 4.2 the price coefficients generally have the right sign, with the exception of pulses, oilseeds, vegetables and eggs which are not statistically significantly different from zero. The poor performance of the price variable in the case of fruits (and also in the case of vegetables) may be due partly to the measuring problem of the variable.[1] The wrong signs for eggs and pulses may be due to the positive correlation of the price and income variables.

Long-Run Demand Estimates for All Food

In Table 4.1 we see that after the "taste" and trade variables are added, there is a little improvement in the fits of the equation for the grouped commodities. Also the estimated coefficients for the "taste" variable in the case of commodity group equations are less significant as compared to the case

---

[1] Due to data limitations, the price for fruits used in this study is the prices of oranges or apples, whichever is lower. The same procedure is applied for the price variable of vegetables from the prices of cabbage and onions. See Table A.3 in Appendix.

of individual commodity equations. Thus, when we estimate the demand equation for all food with only income and price as explanatory variables, it seems legitimate to interpret them as long-run estimates.[1] In Table 4.3 long-run demand estimates for all food commodities grouped together are compared with those of Houthakker.[2] Our estimates for forty-three countries are quite similar to those of Houthakker's study which pertained to twelve western countries. The striking similarity in our estimates seems to point out a basic similarity in food demand across countries in the world.

Comparisons with Earlier Studies

In this section our estimates are compared with some earlier studies. First, comparison is made for income elasticity estimates. Secondly, the goodness of fits in the estimating equation of our model--equation (3.5)--are compared with that of an intercountry cross-section study based on data for rather homogeneous western countries.

---

[1] From a time-series analysis for twelve western countries using annual observations, Houthakker concludes that "within" country demand equations capture primarily short-run effects and that "between" country demand equations are of a long-run nature (H. S. Houthakker, "New Evidence on Demand Elasticities," Econometrica, Vol. 33 (April 1965), pp. 277-288.

[2] Ibid., p. 284.

TABLE 4.3. DEMAND ELASTICITIES FOR ALL FOOD, ESTIMATED FROM INTERCOUNTRY CROSS-SECTION DATA

Elasticity	This Study	Houthakker's Study[1]
Income	0.416 (0.038)	0.452 (0.040)
Price	-0.317 (0.134)	-0.399 (0.222)
R^2	0.777	0.941

The estimating equations for both studies are linear in logarithms. Standard errors are in parentheses. [1]Estimated for ten European countries, the United States and Canada. Variables are twelve-year averages for the period of 1948-58. Income is measured as total consumers' expenditures (H. S. Houthakker, "New Evidence on Demand Elasticities," Econometrica, Vol. 33 (April 1965), pp. 277-288).

Comparisons of Income Elasticity Estimates

In the empirical literature on demand analysis most intercountry studies use broad aggregate groups of consumption expenditures. Gilbert[1] and Goreux[2] are two studies for which individual commodities, closely related groups of commodities, and intercountry cross-section data were used. In this section

---

[1] M. Gilbert and Associates, Comparative National Products and Price Levels, OEEC (1958).

[2] L. M. Goreux, "Income and Food Consumption," Monthly Bulletin of Agricultural Economics and Statistics, Vol. 9 (October 1960), pp. 1-13.

we compare our results with these two studies. We also compare our results for certain commodities, particularly where satiation in demand is involved, with the result of the study for the United States by George and King.[1]

Income elasticity estimates derived from the estimates of the demand functions presented in Table 4.2 are compared in Table 4.4 with the elasticity estimates from the studies by Goreux, Gilbert, and George and King.

Goreux measures the consumption variable as the quantity consumed per capita at the retail level, except for the all foods group, which is measured by expenditure. Income is measured as the total consumption expenditure in U. S. dollars converted at official exchange rates. His elasticity estimates are evaluated at the mean value of his sample (around 700 U. S. dollars at 1955 prices). Our estimates compare quite favorably with his estimates, except for potatoes and milk.

Gilbert uses a constant elasticity form for his estimating equation. His elasticity estimates should be comparable to our estimates evaluated at 700 U. S. dollars, which is the mean income level for our sample. Out of the ten comparisons the values of

---

[1] P. S. George and G. A. King, Consumer Demand for Food Commodities in the United States with Projection for 1980, Giannini Foundation Monograph No. 26, University of California, Davis (1971).

TABLE 4.4. COMPARISON OF INCOME ELASTICITY ESTIMATES DERIVED FROM TABLE 4.2 WITH OTHER STUDIES.

Commodity	Equation[1] Code	Income Levels[2]					Goreux[3] Estimates	Gilbert[4] Estimates	George-[5] King Estimates
		$100	$300	$700	$1,000	$2,000			
Wheat	3	0.761	0.251	0.109	0.076	0.038			0.083
		(0.285)	(0.095)	(0.041)	(0.028)	(0.014)			
Rice	1	0.520	-0.363	-0.615	-0.672	-0.758			0.055
		(0.398)	(0.157)	(0.191)	(0.206)	(0.225)			
Potatoes	3	0.772	0.257	0.110	0.077	0.039	-0.34		0.048
		(0.268)	(0.089)	(0.038)	(0.027)	(0.013)	(0.08)		
Sugar	1	0.805	0.510	0.426	0.407	0.385	0.53	0.42	0.032
		(0.199)	(0.048)	(0.107)	(0.116)	(0.102)	(0.08)	(0.25)	
Pulses	2	-0.278	-0.278	-0.278	-0.278	-0.228			0.217
		(0.099)	(0.099)	(0.099)	(0.099)	(0.099)			
Oilseeds[6]	2	0.507	0.507	0.507	0.507	0.507	0.55	0.37	0.029
		(0.126)	(0.126)	(0.126)	(0.126)	(0.126)	(0.04)	(0.17)	
Vegetables	3	1.176	0.392	0.167	0.118	0.059		0.75	0.197
		(0.230)	(0.077)	(0.033)	(0.023)	(0.011)		(0.27)	
Fruits	2	0.329	0.329	0.329	0.329	0.329		0.71	0.358
		(0.072)	(0.072)	(0.072)	(0.072)	(0.072)		(0.15)	
Coffee-Cocoa-Tea[7]	2	1.061	1.061	1.061	1.061	1.061	0.66	1.13	0.047
		(0.111)	(0.111)	(0.111)	(0.111)	(0.111)		(0.12)	
Beef	2	0.553	0.553	0.553	0.553	0.553	0.81		0.312
		(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.16)		
Pork	1	1.257	0.576	0.387	0.361	0.287			0.133
		(0.699)	(0.140)	(0.115)	(0.140)	(0.175)			
Mutton and other meats	1	-1.829	-0.066	0.608	0.730	0.872			0.571
		(0.936)	(0.177)	(0.213)	(0.253)	(0.305)			

TABLE 4.4. (continued)

Commodity	Equation[1] Code	Income Levels[2] $100	$300	$700	$1,000	$2,000	Goreux[3] Estimates	Gilbert[4] Estimates	George-[5] King Estimates
Fish	3	1.054	0.353	0.151	0.106	0.053		0.62	0.004
		(0.277)	(0.092)	(0.040)	(0.028)	(0.014)		(0.39)	
Milk[8]	2	0.297	0.297	0.297	0.297	0.297	-0.06	0.60	0.204
		(0.085)	(0.085)	(0.085)	(0.085)	(0.085)	(0.05)	(0.10)	
Eggs	1	1.489	0.749	0.538	0.490	0.434	0.74		0.055
		(0.306)	(0.087)	(0.103)	(0.114)	(0.129)	(0.07)		
Grains	2	-0.155	-0.155	-0.155	-0.155	-0.155	-0.26	0.20	
		(0.061)	(0.061)	(0.061)	(0.061)	(0.061)	(0.03)	(0.14)	
Fruits and Vegetables	2	0.338	0.338	0.338	0.338	0.388			
		(0.061)	(0.061)	(0.061)	(0.061)	(0.061)			
Pulses, Nuts, and Oilseeds	2	0.497	0.497	0.497	0.497	0.497			
		(0.093)	(0.093)	(0.093)	(0.093)	(0.093)			
Meats[9]	2	0.606	0.606	0.606	0.606	0.606	0.72	0.86	
		(0.106)	(0.106)	(0.106)	(0.106)	(0.106)	(0.06)	0.18	
Meats, Poultry, and Fish	2	0.649	0.649	0.649	0.649	0.649			
		(0.101)	(0.101)	(0.101)	(0.101)	(0.101)			
Plant foods	2	0.118	0.118	0.118	0.118	0.118			
		(0.036)	(0.036)	(0.036)	(0.036)	(0.036)			
Animal foods	2	0.602	0.602	0.602	0.602	0.602			
		(0.099)	(0.099)	(0.099)	(0.099)	(0.099)			

Footnotes for Table 4.4.

Standard errors of estimates are in parenthesis.

[1] Equation codes 1, 2, 3, which apply only to this study, refer to the equation forms as follows:
1. $\ln Q = A + b_1 \ln I + b_2\ 1/I + c \ln P + d_1 \ln Z + d_2 \ln M + u,$
2. $\ln Q = A + b \ln I + c \ln P + d_1 \ln Z + d_2 \ln M + u,$
3. $\ln Q = A + b\ 1/I + c \ln P + d_1 \ln Z + d_2 \ln M + u.$

For the definition of variables see pp. 36-40.

[2] In U. S. Dollars at 1960 prices.

[3] L. M. Goreux, "Income and Food Consumption," Monthly Bulletin of Agricultural Economics and Statistics, Vol. 9 (October 1960), pp. 1-13. He uses cross-section and time-series data mostly from U. S., Canada, and Western European countries on a per capita basis. Commodities are measured in kilograms, [redacted] Total consumption expenditures in U. S. dollars at 1955 prices converted at official exchange rates are used for income. The functional forms used are semilog or the log-inverse type, and income elasticities are evaluated at the mean of the sample, around 700 U. S. dollars at 1955 prices.

[4] M. Gilbert and Associates, Comparative National Products and Price Levels, OEEC (1958). The functional form used by Gilbert is of the constant elasticity type. He measures income in total expenditure terms, and uses data from the U. S. and Western European countries.

[5] P. S. George and G. A. King, Consumer Demand for Food Commodities in the United States with Projection for 1980, Giannini Foundation Monograph No. 26, University of California (1971). The constant elasticity equation for the estimation is used. The data pertain to 1955 and 1965 cross-sections and 1946-1968 time-series for the United States. Commodities are expressed in expenditure terms and the total expenditure is used for income. Elasticities for the groups of potatoes, vegetables, and fruits are calculated from elasticities for individual commodities within those groups and weights in Tables 33 and 39.

Footnotes for Table 4.4. (continued)

[6] Goreux includes fats and oils, including butter. Gilbert includes fats and oils. The George-King estimate is for shortening.

[7] Goreux and George-King estimates are for coffee only. The Gilbert estimate is for non-alcoholic beverages.

[8] Goreux and George-King estimates are for liquid milk.

[9] Goreux and Gilbert include poultry.

fruits, vegetables, fish, and milk seem to diverge, which in his case seems to be rather too large compared to the United States estimates in the George and King study.

George and King measure consumption as per capita expenditures and use the constant elasticity form for the estimating equation. In the case of wheat, potatoes, vegetables, fruits, pork, fish, and milk, if we evaluate our estimates at 2,000 U. S. dollars, they are quite similar to the ones in the George and King study. In the cases of sugar, oilseeds, and eggs, and also, perhaps, the group coffee-cocoa-tea, their elasticity estimates are much smaller than ours. In our case except for eggs, the elasticity equations are of the constant elasticity type. The average income in the George and King study should be much higher than the average income for our sample. Therefore their estimates could be smaller than ours.

The elasticity estimates in Table 4.4 give very important information which could be used in food demand projections for various countries of the world depending upon their income levels. Since our variables of consumption and income are constructed from national aggregates and consumption is measured at the level of the food commodities before processing, for purposes of food supply planning these elasticity estimates are more important than the ones obtained from sample survey data.[1]

Comparison of the Goodness of Fits

Comparison of coefficients of determination of per capita demand equations estimated by using intercountry data among various studies could give some idea of how well our model performs. For this purpose Gilbert's study is quite applicable since his dependent variable is in logarithms.[2] Table 4.5 is constructed to make this comparison.

Since the number of explanatory variables in the two studies differs, a meaningful comparison of the coefficient of determination is made by adjusting them for degrees of freedom. Our estimates of the coefficients are adjusted, while those in Gilbert's study are unadjusted, which always give higher values than adjusted.

---

[1] The data problems relating to derive income elasticity at the level of the commodities before processing from the estimates based on household budget surveys, as they are in general made available in developing countries, are discussed. See Q. Paris, An Appraisal of "Income" Elasticities for Total Food Consumption in Developing Countries, OECD (1970).

[2] Goreux study, in some cases, has the dependent variable in logarithms; but, unfortunately, he does not provide the coefficient of determination.

TABLE 4.5. VALUES OF COEFFICIENTS OF DETERMINATION FROM TABLE 4.2 WITH THOSE OF GILBERT, PER CAPITA DEMAND FUNCTIONS ON INTERCOUNTRY CROSS-SECTION DATA

Commodity	This Study	Gilbert[1]
Grains	0.459	0.37
Meats[2]	0.783	0.79
Fish	0.642	0.46
Milk	0.876	0.87
Oilseeds[3]	0.320	0.60
Vegetables	0.574	0.67
Fruits	0.462	0.90
Sugar	0.744	0.69
Coffee-Cocoa-Tea[4]	0.708	0.97

M. Gilbert and Associates, Comparative National Products and Price Levels (1958), p. 66. Data in Gilbert's study pertain to the countries of U. S., U. K., Norway, Belgium, France, Netherlands, West Germany and Italy.

The estimating equation for a commodity is:

$$\text{Log } Q_i = A_i + a_i \log Q + b_i \log (P_i/P) + e_i,$$

where Q_i = per capita consumption in constant weights

Q = per capita total consumption in constant weights

P_i = price

P = purchasing power parity rate of total consumption

e_i = an error term.

[1] Coefficients of determination in Gilbert's study are not adjusted for degrees of freedom.

[2] Meats include poultry in Gilbert's study.

[3] Fats and oils in Gilbert's study.

[4] Nonalcoholic beverages in Gilbert's study.

Gilbert uses data from a rather homogeneous group of countries--the United States and seven Western European countries--while we use data from forty-three countries which are quite heterogeneous in cultural and climatic characteristics as well as in factor endowments.

It is important to note that the fits obtained in the two studies are quite similar with a few exceptions. These exceptions are in the cases of oilseeds, fruits, and the commodity group coffee-cocoa-tea. This may well be due to the problem of definition of these variables. Gilbert, for example, uses fats and oils (not oilseeds) and nonalcoholic beverages (not coffee-cocoa-tea). Part of the problem in our data may also be due to the procedure for measuring the "taste" variable for oilseeds, as discussed earlier on page 50. A bad fit in the case of fruits in our estimates seems to be partly due to the measuring problem of the price variable for fruits as discussed on page 57.

On the whole it seems our results compare very well with those of Gilbert's study, in spite of a considerable heterogeniety in the countries in our sample as compared to the countries included in Gilbert's sample. It seems that the addition of the "taste" variable in our model makes a better specification of the demand model on intercountry data and the tastes which, in general, are treated as residuals are at least in part explained by this variable.

Conclusions

In conclusion we may say that large t-values for the coefficient of the "taste" variable, except sugar and oilseeds, indicate that production patterns induce taste formation. Both the size and the t-value of the coefficients are larger in the case of regressions for individual commodities than when commodities are grouped. This is what we should expect if indeed tastes are induced by production opportunities. There would be stronger inducement in the case of individual commodities relative to a group. This is also supported by the fact that there are little improvements in the fits of the equation for commodity groups when we add the "taste" variable, indicating a larger degree of similarity in the basic taste functions of countries.

The variable "taste" for a commodity is constructed as a ratio of the production of the commodity to the total food production in the country in the period of 1934-38 and reflects the influence of factor endowments and climatic conditions. In other words the "taste" variable reflects the relative price differences of food commodities among countries which prevailed historically. Thus, significant coefficients for this variable, indirectly support our hypothesis that relative prices induce tastes.

If people in the world have potentially common tastes, and country specific tastes are developed through consumption experience, a change in the supply situation, if it persists for an extended period, should induce a change in tastes reflecting the changes in consumption opportunities resulting from a relative price change. In Chapter V we provide an operational framework for the effect of changes in consumption experience on tastes which will be applied to the time-series analysis in the same chapter.

CHAPTER V

TIME-SERIES ANALYSIS

In Chapters III and IV we discussed how country specific tastes are formed. More favorable tastes are formed for the commodities which are relatively abundant (or inexpensive). The empirical evidence in Chapter IV shows that country specific tastes are formed consistent with production opportunities, from which one could argue that tastes are formed consistent with relative prices. It is also shown that the effect on demand of differences in tastes among countries are more pronounced in the case of individual commodities than in the case of commodity groups. In this Chapter we develop a model to study changes in tastes induced by changes in supply situations over time.

The changes in supply may result from technical changes in production or from trade, but in either case the result is a change in the relative price for the commodity in question. In the short-run, consumer responds to changes in relative prices by adjusting the quantities of the various commodities consumed, resulting in a changed consumption pattern. As experience with this new consumption pattern (mix) is prolonged over a longer time period, tastes gradually change to adjust to the new (changed) supply situation (consumption opportunities). We view this gradual adjustment of tastes as a process of learning by consumption.[1] For this reason, for operational purposes, we view changes in tastes as induced by changes in consumption of commodity i relative to commodity j, $i \neq j$, rather than to relative prices changes. The operational model is presented, the data and the variables are discussed, and finally the empirical results are presented and explored.

The Model

Let the demand for commodity i during year t be expressed in linear form as:

(5.1) $Q_{ti} = a_o + a_1 I_t + a_2 P_{ti} + a_3 P_{tj} + a_4 Z_{ti}$

where Q_{ti} = per capita quantity consumed of commodity i during year t ($t = 1, \ldots, n$)

I = per capita income

P_i = price of commodity i

P_j = price of commodity j (substitutable for commodity i)

Z_i = taste variable for commodity i

---

[1] The idea is similar to Arrow's learning-by-doing hypothesis (K. J. Arrow, "The Economic Implication of Learning by Doing," Review of Economic Studies, Vol. 39 (June 1962), pp. 155-173). He suggests the use of cumulated gross investments as a measure of learning. Nelson (R. R. Nelson, "A Diffusion Model of International Productivity Differences in Manufacturing Industry," American Economic Review, Vol. 58 (December 1968), pp. 1219-1248) argues that the use of cumulated output is equivalent to the use of the cumulated investment in Arrow's framework.

Let the taste variable of commodity i, Z_{ti} be expressed as:

$$(5.2) \qquad Z_{ti} = S_{ti} + \emptyset S_{tj}$$

Following Houthakker and Taylor[1] we call S_{ti} and S_{tj} the "state variables" of commodities i and j during year t, respectively. The state variables can be interpreted as the level of psychological stock built up through past consumption. The value by which the state variable of substitutable commodity j affects tastes for commodity i in the opposite direction is given by the parameter $\emptyset$.[2]

The state variable for commodity i can be expressed as the cumulated sum of all the past consumption of the commodity i and we assume that this stock does not depreciate by itself.[3] S_{ti}, the state variable for commodity i at year t, can be expressed as follows:

---

[1] H. S. Houthakker and L. D. Taylor, Consumer Demand in the United States, 1929-1970. Analyses and Projections, 2nd ed. Harvard University Press (1970). State variables are discussed in Chapter II, pp. 19-20.

[2] We have introduced the state variables into the demand equation based on the assumption that the marginal utility of commodity i is influenced by its own state variable S_i in the positive direction and by the quantities consumed of commodities i and j. This assumption assures that the demand for commodity i is influenced by the state variable of substitutable commodity j, S_j, in the opposite direction.

[3] See our earlier remarks on page 72 and footnote 1 for arguments of Arrow and Nelson for using cumulated investments and output, respectively, as measures for learning. That cumulated output is commonly used as a measure of production experience see also L. Dubley, "Learning and Productivity Change in Metal Products," American Economic Review, Vol. 62 (September 1972) pp. 662-669, footnote 3, p. 662.

$$(5.3) \qquad S_{ti} = \sum_{\tau=1}^{t-1} Q_{\tau i}$$

where $Q_{\tau i}$ = quantity consumed of commodity i during year τ ($\tau = 1, \ldots, t$). We can obtain values of S_{ti} for $t = 2, \ldots, n$ by setting the value of $S_{1i} = 0$. By substituting for S_{ti} and S_{tj} in (5.2) from (5.3) and then substituting (5.2) for Z_{ti} in (5.1) we can rewrite equation (5.1) as follows:

$$(5.4) \qquad Q_{ti} = A_0 + a_1 I_t + a_2 P_{ti} + a_3 P_{tj} + a_4 \sum_{\tau=1}^{t-1} Q_{\tau i} + a_5 \sum_{\tau=1}^{t-1} Q_{\tau j}$$

where A_0 is the sum of a_0 in equation (5.1) and the effect of state variables at $t = 1$, and a_5 is $a_4 \emptyset$.[1]

Our interest now is to obtain estimates for equation (5.4). If our hypothesis that intensification of the consumption experience with a particular commodity intensifies (or induces) taste for this commodity is correct, the coefficient a_4 should have a positive sign. And since tastes are relative, the sign for the coefficient of the state variable for substitutable commodity a_5 should be negative.[2]

At this stage it is necessary to point out that equation (5.4) is a considerable underspecification of a complete model. For

---

[1] It may be too restrictive to assume constant values for a_4 and a_5 for a substantially long period of time, especially when the relative price has a continuous trend over the period. However, it may not be a serious problem in the periods covered in our analysis.

[2] See footnote 2, p. 73.

example, in the real world there could be more than one substitute. But, because of the problem of high intercorrelation among these variables, we have specified this by grouping the important substitutes into a commodity group. This underspecification could cause some biases in our estimates. In the empirical section this problem will be pointed out wherever it exists.

For statistical estimation purposes we assume that the error term u_{ti} enters additively in the demand equation (5.4):

(5.5) $Q_{ti} = A_0 + a_1 I_t + a_2 P_{ti} + a_3 P_{tj} + a_4 S_{ti} + a_5 S_{tj} + u_{ti}$

We further assume that the u's are uncorrelated over time. In the context of the framework that tastes are learned through past consumption experiences, this is a plausible assumption. Normally one would expect interdependence of error terms over time if a high level of consumption of commodity i in the previous year is associated with a high level of consumption of the commodity in the current year. But, in our model, this relationship has already been taken into account since a higher level of u_{t-1i} implies a higher level of Q_{t-1i} which, in turn, implies a higher level of Q_{ti}. Thus, there is no reason to assume that the u's are serially correlated.[1]

---

[1] The argument for no problem of serial correlation in the estimation of the demand function in habit models is presented by R. A. Pollak and T. R. Wales, "Estimation of the Linear Expenditure System," Econometrica, Vol. 37 (October 1969), pp. 611-628.

We also assume that each u_{ti} (1) has a zero expectation, (2) has a constant variable over time,[1] and (3) has a normal distribution. With these assumptions, equation (5.5) can be estimated by ordinary least squares.

The Data and the Variable

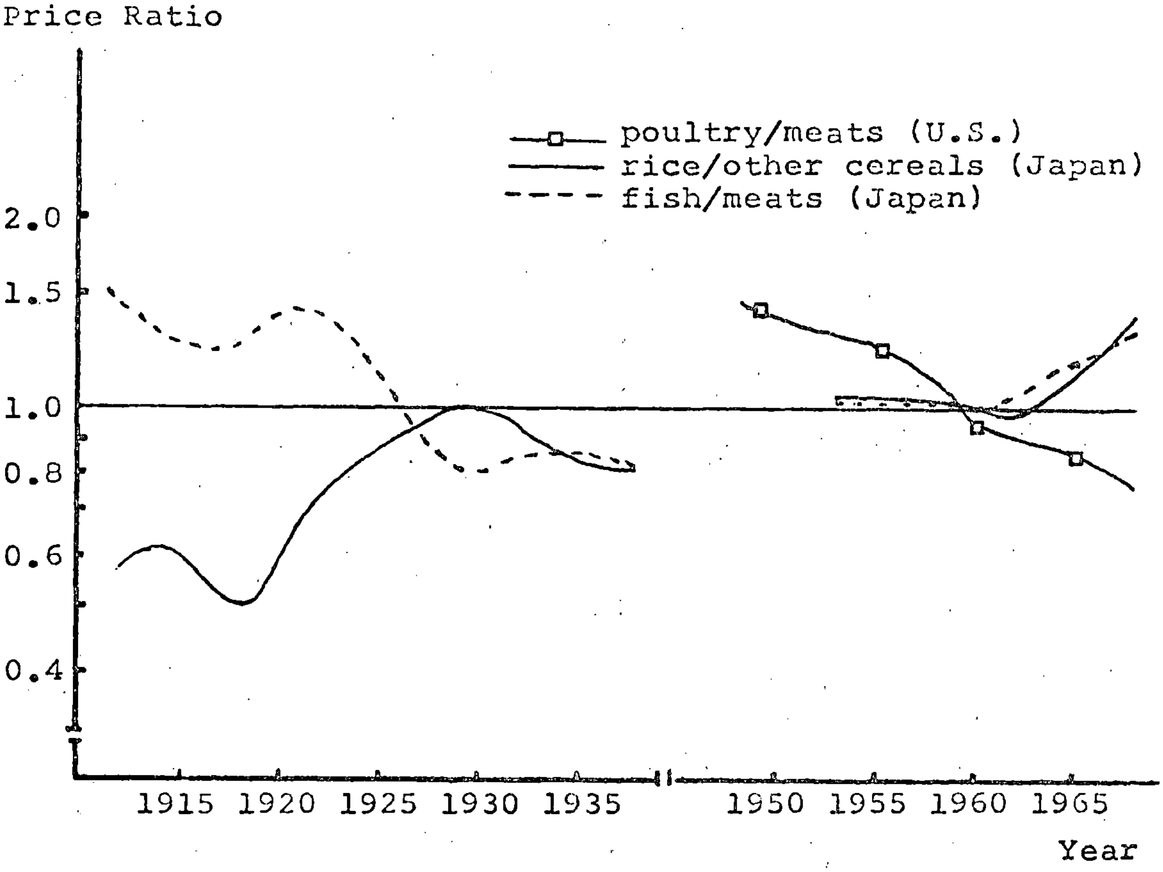
Three sets of data are employed in the empirical analysis in the next section. First, in the case of the United States, we find that after the World War II period the price of poultry relative to other meats declined sharply due to the technical advance in poultry production. Thus, to test whether a shift of tastes from meats to poultry after World War II occurred, we use these two commodities for the period 1948-1970. Decline of the poultry/meats price ratio after World War II is shown in Figure 5.1.

Second, in the case of Japan, we use rice versus other cereals, since the rice price has been rising relative to other cereals starting in 1911. This series is split into pre- and post-war periods (1911 to 1938 and 1951 to 1969): (1) in order to avoid complications in the analysis due to war period distortions; and (2) because there have been large increases in income during

---

[1] Usually in the estimation of Engel functions it is believed that the error term is correlated with the level of income or consumption. However, it is believed that the variance of the u's in the demand equation for the selected commodities in this study may only be slightly sensitive to changes in income or consumption, if at all. Therefore, the assumption of constant variance over time is considered more appropriate than heteroscedastic disturbances.

FIGURE 5.1. FIVE YEAR MOVING AVERAGE PRICE RATIOS: POUTRY/MEATS IN U.S., RICE/OTHER CEREALS IN JAPAN AND FISH/MEATS IN JAPAN.



Data sources:
For the United States:
U.S. Department of Agriculture, U.S. Food Consumption, Statistical Bulletin No. 364 (1965), and Supplement to Agricultural Economic Report No. 138 for 1970 (1972).
For Japan:
M. Shinohara, Personal Consumption Expenditures, Vol. 6 of K. Ohkawa et. al. eds., Estimates of Long Term Economic Statistics of Japan Since 1868 (1967), Japan Office of the Prime Minister, General Report on the Family Income and Expenditure Survey 1946-1962 (1964), and 1969 Annual Report on the Family Income and Expenditure Survey (1971).

the period of 1911-1969, to estimate common (constant) demand coefficients for the entire period may be inappropriate.

Third, in the case of Japan, the fish price relative to meats declined during the period of 1911 to 1938; that is, the prewar period showed a moderately reverse trend after World War II. Fish versus meats data are used for the two separate periods: 1911 to 1938 and 1951 to 1969. Price movements of the selected commodities, poultry versus meats in the United States, and rice versus other cereals and fish versus meats in Japan are plotted in Figure 5.1.

The United States and Japan have distinctly different production opportunities, in general, and the commodity combination selected for each country have specific importance for each country. In Table 5.1 production shares of the selected commodities in the total food production of the respective country are compared with the forty-three country averages of shares of the commodities in the total food production in each country. It should be noted that there are considerable differences in the relative importance of these commodities measured as shares in the total food production. How these differences in the relative importance of commodities influence taste changes as relative prices of these commodities change over time will be examined in the next section.

TABLE 5.1. PRODUCTION SHARES IN TOTAL FOOD PRODUCTION, 1934-1938 AVERAGE[1]

Commodity[2]	43 Country average[3]	U. S.	Japan
	%	%	%
Poultry	1.5	2.2	0.3
Fish	2.1	1.0	12.7
Meats	20.2	22.6	2.9
Rice	5.5	0.5	41.3
Other Cereals	16.1	28.4	8.1

For data sources, See Table A.4 in Appendix.

[1] For some countries the years covered differ from this period. See Table A.4 for detail.

[2] Measured in international wheat units as defined on pp. 36.

[3] The list of forty-three countries is presented on footnote 1, p. 35.

Definitions of Variables

Consumption:[1]

Meats and poultry for the United States are expressed as the per capita consumption (price weighted quantity index, 1957-59 = 100). Meats include beef, veal, pork, lamb, and mutton. Quantities are measured at the retail level. Rice, other cereals,

---

[1] Data sources: For the United States: U. S. Department of Agriculture, Food Consumption, Prices and Expenditures, Agricultural Economic Report No. 138 (1968) and Supplement to Agricultural Economic Report No. 138 for 1970, (1972). For Japan: M. Shinohara, Personal Consumption Expenditures, Vol. 6, of K. Ohkawa, M. Shinohara, and M. Umemura eds. Estimates of Long-Term Economic Statistics of Japan Since 1868 (1967), and Japan Department of Agriculture, Agricultural Statistics, issues from 1950 to 1970.

meats, and fish for Japan are measured in kilograms at the retail level, and expressed at the index, 1957-59 = 100. Meats include beef, veal, pork, lamb, mutton, and poultry.

Prices:[1]

Prices are expressed in the index form. The base period is the average of 1957-59, both for the United States and Japan.

Income:[2]

Per capita total consumption expenditures at 1957-59 prices, dollars in case of the United States and 100 yen in case of Japan, are used as income variables.

In demand analysis the usual approach is to use disposable income as the relevant budget constraint. However, according to

---

[1] Data sources; For the United States: U. S. Department of Agriculture, U. S. Food Consumption, Statistical Bulletin No. 364 (1965), and Supplement to Agricultural Economic Report No. 138 for 1970 (1972). For Japan: M. Shinohara, op. cit.; and Japan Office of the Prime Minister, General Report on the Family Income and Expenditure Survey 1946-1962 (1964) and 1969 Annual Report on the Family Income and Expenditure Survey (1971).

[2] Data sources: For the United States: U. S. Department of Commerce, The National Income and Product Accounts of the United States 1929-65 (1967), and Survey of Current Business (July 1971). For Japan: M. Shinohara, op. cit. (1967), and Japan Economic Planning Agency, 1970 Annual Report on National Income (1971).

the permanent income hypothesis, the consumer responds to normal or permanent income rather than to current income. Our interest is in changes in tastes induced by consumption experiences, which are realized over time. It is necessary that we separate these true taste changes from the lagged response to income changes implicit in the permanent income hypothesis. It is generally agreed that the total consumption expenditures are more stable than income because income changes are adjusted with savings, at least over short periods of time.[1] One may thus argue that total consumption expenditures are a better measure of the "true" income than current income.

In the next section we present the estimation results of equation (5.5) for these data and explore their meaning in relation to the question of taste changes.

---

[1] One could also confuse true taste changes with a lagged response to price changes. But it is generally considered that for food commodities the time requirement for adjustment is less than a year. See W. G. Tomek, The Theory and Measurement of Long-Run Demand (with Special Emphasis on the Demand for Food Products), unpublished Ph. D. thesis, University of Minnesota (1961), and C. H. Berry, G. K. Brinegar and S. Johnson, "Short Run Effects Following Controlled Price Changes: Skim Milk," Journal of Farm Economics, Vol. 40 (November 1958), pp. 892-902.

Empirical Results

The results of estimating equation (5.5) by ordinary least squares are presented in Table 5.2. The table also presents estimates of the demand function with "time" as an independent variable instead of the state variables and the usual demand equation with only income and prices as independent variables.

A general comment about the results presented in Table 5.2 is that in most cases the estimated coefficients of both state variables have the correct signs. This result implies that the consumption experience with a particular commodity induces a taste for it and that with it's substitute commodities diminishes the taste for the particular commodity.

Taste Change and Time Trend

In estimating demand equations from time-series data it is a common practice to introduce time as a trend variable into the demand equation. This usually improves the fit of the equation but does not explain what factors contribute to "time." In other words, the use of time has no economic meaning. It should be noted that when we replace the time-trend variable with the state variables, there is little change in the estimates. But against time the state variables explain taste changes, since as a cumulated sum of past consumption of a commodity, they represent

TABLE 5.2. REGRESSION ESTIMATES OF PER CAPITA DEMAND FUNCTION ON TIME SERIES DATA, U.S. AND JAPAN.

Country Period	Commodity	Equation Number	Constant	Coefficients of Income	Price (1)	Price (2)	State (1)	State (2)	Time	SEE	R^2
U.S.											
1948-1970	Poultry	(1)	44.280	0.030	0.514	0.591	0.052	0.045		1.989	0.993
			(24.613)	(0.015)	(0.142)	(0.103)	(0.020)	(0.026)			
		(2)	-144.025	0.050	-0.358	0.714			70.022	2.480	0.989
			(265.187)	(0.016)	(0.143)	(0.118)			(157.959)		
		(3)	-26.287	0.057	-0.418	0.724				2.424	0.990
			(13.260)	(0.004)	(0.045)	(0.113)					
	Meats	(1)	126.403	0.011	-0.629	0.138	-0.010	0.017		1.941	0.909
			(24.008)	(0.015)	(0.139)	(0.100)	(0.025)	(0.019)			
		(2)	-145.482	0.013	-0.587	0.248			0.015	1.927	0.910
			(205.987)	(0.012)	(0.091)	(0.111)			(0.012)		
		(3)	98.417	0.027	-0.567	0.123				1.948	0.908
			(10.656)	(0.004)	(0.091)	(0.036)					
Japan											
1911-1938	Rice	(1)	50.070	0.197	-0.308	0.072	0.005	-0.019		3.872	0.446
			(17.720)	(0.049)	(0.102)	(0.042)	(0.022)	(0.030)			
		(2)	54.929	0.176	-0.278	0.071			-1.078	3.863	0.448
			(17.048)	(0.039)	(0.090)	(0.037)			(0.298)		
		(3)	95.598	0.047	-0.103	0.044				4.809	0.145
			(15.954)	(0.022)	(0.094)	(0.046)					

TABLE 5.2. (continued)

Country Period	Commodity	Equation Number	Constant	Coefficients of						SEE	R^2
				Income	Price (1)	Price (2)	State (1)	State (2)	Time		
	Other cereals	(1)	74.001	0.062	-0.038	0.211	0.035	-0.042		4.634	0.868
			(21.206)	(0.059)	(0.050)	(0.122)	(0.036)	(0.026)			
		(2)	75.798	0.098	-0.084	0.143			-2.330	4.622	0.869
			(20.394)	(0.047)	(0.045)	(0.108)			(0.356)		
		(3)	163.705	-0.177	-0.141	0.522				7.867	0.619
			(26.096)	(0.035)	(0.074)	(0.154)					
	Fish	(1)	31.781	0.021	-0.247	0.086	0.288	-0.145		3.423	0.758
			(11.704)	(0.028)	(0.115)	(0.081)	(0.154)	(0.081)			
		(2)	33.011	0.020	-0.174	-0.030			0.613	3.440	0.755
			(12.379)	(0.030)	(0.109)	(0.109)			(0.269)		
		(3)	15.840	0.077	-0.270	0.017				3.754	0.709
			(10.720)	(0.018)	(0.110)	(0.069)					
	Meats	(1)	-4.049	0.188	-0.100	-0.252	0.117	-0.218		3.795	0.924
			(12.978)	(0.031)	(0.090)	(0.128)	(0.089)	(0.171)			
		(2)	1.415	0.175	-0.032	-0.310			0.187	3.877	0.903
			(13.951)	(0.034)	(0.075)	(0.123)			(0.303)		
		(3)	-3.834	0.192	-0.017	-0.339				3.822	0.923
			(10.914)	(0.018)	(0.070)	(0.112)					

TABLE 5.2. (continued)

Country Period	Commodity	Equation Number	Constant	Coefficients of						SEE	R^2
				Income	Price (1)	Price (2)	State (1)	State (2)	Time		
Japan 1951-1969	Rice	(1)	121.981	-0.064	-0.220	0.142	0.050	-0.001		2.062	0.871
			(35.820)	(0.012)	(0.184)	(0.183)	(0.025)	(0.021)			
		(2)	-61.495	-0.064	-0.272	0.195			4.504	1.953	0.883
			(39.054)	(0.010)	(0.150)	(0.172)			(0.548)		
		(3)	101.705	0.009	-0.501	0.347				4.831	0.287
			(83.219)	(0.015)	(0.363)	(0.423)					
	Other cereals	(1)	96.646	0.064	-0.167	0.063	0.025	-0.080		3.543	0.767
			(61.560)	(0.021)	(0.315)	(0.317)	(0.036)	(0.043)			
		(2)	287.500	0.053	-0.247	0.227			-4.783	3.542	0.767
			(70.848)	(0.019)	(0.312)	(0.271)			(0.994)		
		(3)	114.213	-0.021	-0.409	0.470				5.825	0.370
			(100.334)	(0.018)	(0.510)	(0.438)					
	Fish	(1)	69.424	-0.046	-0.030	0.345	0.040	0.011		6.650	0.877
			(67.425)	(0.074)	(0.517)	(0.378)	(0.031)	(0.036)			
		(2)	-85.462	-0.002	0.127	0.319			3.013	6.629	0.878
			(111.960)	(0.047)	(0.369)	(0.366)			(2.388)		
		(3)	47.043	0.055	-0.196	0.297				6.779	0.872
			(39.649)	(0.013)	(0.273)	(0.374)					
	Meats	(1)	-6.663	0.207	-0.568	0.136	0.045	-0.039		8.968	0.989
			(90.930)	(0.100)	(0.509)	(0.700)	(0.045)	(0.041)			
		(2)	50.005	0.283	-0.700	0.517			-2.931	8.796	0.989
			(148.548)	(0.062)	(0.486)	(0.490)			(3.169)		
		(3)	-78.893	0.227	-0.680	0.830				8.747	0.989
			(51.162)	(0.017)	(0.483)	(0.352)					

Footnotes for Table 5.2.

Estimating equations are:

$$(1)\quad Q_{ti} = A_0 + a_1 I_t + a_2 P_{ti} + a_3 P_{tj} + a_4 \sum_{\mathcal{T}=1}^{t-1} Q_{\mathcal{T}i} + a_5 \sum_{\mathcal{T}=1}^{t-1} Q_{\mathcal{T}j} + u_{ti}$$

$$(2)\quad Q_{ti} = a_0 + a_1 I_t + a_2 P_{ti} + a_3 P_{tj} + a_6 T_t + u_{ti}$$

$$(3)\quad Q_{ti} = a_0 + a_1 I_t + a_2 P_{ti} + a_3 P_{tj} + u_{ti}$$

where T_t is time (year).

For the definition of the remaining variables see pp. 72, 79, 80. Standard errors are in parentheses. R^2 is the coefficient of determination adjusted for degrees of freedom. Price (1) is own price and Price (2) is that of the substitutable commodity, and State (1) is own state variable and State (2) is that of the substitutable commodity.

the tastes as the psychological stock. It seems we have been successful in providing an explanation for the residuals.

It could be argued that since the values for state variables for each year are measured as the cumulated sum of the past consumption, they are monotonically increasing and thus could provide similar results as a time-trend variable. However, it must be emphasized that in spite of high intercorrelation problems the coefficients of the state variables have in general proper signs and in several cases significant t values. These results do not seem to be accidental. Rather they lend support to the hypothesis that a prolonged past consumption experience affects tastes.

Taste Change and Price Change

In the United States both poultry and meats are important food commodities. Estimates for the poultry equation appear to substantiate our hypothesis very well. During the period of analysis poultry prices declined substantially. From the estimated regression we see that the coefficients for both state variables not only have proper signs but are also statistically significantly different from zero. Using the estimates of equation (5.5) we can divide the change in consumption from 1948 to a particular year into the individual effects resulting from changes in variables. From 1948 to 1970, the poultry consumption in the United States increased 57.0 per cent based on the 1970 consumption. Our estimates indicate that 51.2 per cent of the increase is attributable to the change in prices, 29.1 per cent to the change in income, and 17.4 per cent results from the change in state variables.[1]

Further, for the poultry equation we compute income elasticity estimates from equations with and without state variables for the 1957-59 average level of income. These values, respectively, are 0.49 and 0.88. Studies by Brandow[2] and George and King[3] give income elasticity estimates of demand for poultry in the United States of 0.47 and 0.28, respectively. Their estimates are obtaine from combined cross-sectional and time-series models and are supposedly "pure income" effects. It seems that the introduction of state variables in the equation not only provides an explanation of the residuals in terms of taste changes but also helps us to better measure the "pure income" effects in this case.

---

[1] The discrepancy between 100 per cent and the sum of percentages of three effects is the part unexplained by the estimated equation (5.5).

[2] G. E. Brandow, Interrelations Among Demand for Farm Products and Implications for Control of Market Supply, Pennsylvani Agricultural Experiment Station Bulletin 680 (1961).

[3] P. S. George and G. A. King, Consumer Demand for Food Commodities in the United States with Projections of 1980, Giannini Foundation Monograph No. 26, University of California, Davis (1971).

The case of fish in pre-war Japan also offers results similar to that for poultry in the United States. Fish prices relative to meats continued to decline during this period and we find that from both the fish and meat equations the estimated coefficients indicate support for the hypothesis that tastes are induced by the consumption experience which is the result of relative prices of substitute commodities. The increase in consumption of fish in Japan from 1911 to 1938 is 41.9 per cent based on the 1938 consumption. Using the estimates of the state variables in the fish demand function we see that 63.7 per cent of the total increase is attributable to the change in state variables between the two years.

The case of the equation for meats in the United States (1948-1970) is difficult to understand. Both state variables have insignificant values. It seems that in this case, perhaps, income and price effects are more dominant.

Taste Change and Nature of Commodity

The results from the remaining equations both for pre- and postwar Japan do not provide any conclusive evidence. Even though the signs of the coefficients of the state variables are correct in most cases, the coefficients are not statistically significant. But in these cases in the postwar period we also do not find strong trends in price movements. Furthermore, a correct specification of our equation would require including all related commodities, which in our case is impossible because of the problem of intercorrelation. In the case of rice both in pre- and postwar Japan and fish in postwar Japan, tastes perhaps did not shift away from rice and fish because their shares in total food production are large (see Table 5. 1) and are thus important and familiar commodities.

Conclusions

The finding of mostly correct signs for the estimated coefficients of "taste" variables indicate that consumption experience with a particular commodity intensifies the taste for it and that with it's substitute commodities has an adverse effect on the taste for the particular commodity. The strong evidence of positive taste shifts are observed only in the cases of those commodities for which the relative prices declined sharply. It is a support for the hypothesis that tastes are induced by relative price changes and implies that the relative strength of price changes are important for the inducement. In the case of Japan no conclusive evidence is provided by our results in the cases of rice for the pre- and postwar periods, and for fish for the postwar period. It may be partly due to the rather weak upward trends in the price ratios of these commodities to their substitute commodities during the periods of analysis and partly due to the nature of the commodities. Rice and fish are important food commodities in Japan in the sense of their relatively large production shares in the total food production. To diminish tastes for "important" commodities in a country may require a sharp rise in their prices relative to the prices of substitute commodities.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Economists have largely bypassed the problem of formation and development of consumer tastes, even though the fact that consumer tastes do change has always been recognized. In conventional economic theory of consumer's choice, tastes are assumed to be constant and treated as residuals.

In the recent literature, it is being increasingly realized that some economic variables, for example consumer's past consumption experiences with commodities, do, indeed, influence tastes.[1] It seems important to explore how tastes are formed and what changes them.

For this purpose for this research a broad hypothesis was advanced that the relative commodity prices induce tastes. The consumer is viewed to possess potentially quite general and similar taste preferences. Specific tastes are developed and acquired through consumption experiences. The consumer in

---

[1] For example, a theoretical development is seen in C. C. von Weizsacker, "Notes on Endogeneous Changes of Tastes," Journal of Economic Theory, Vol. 3 (December 1971), pp. 345-372 and an empirical analysis is seen in H. S. Houthakker and L. D. Taylor, Consumer Demand in the United States: Analyses and Projection, 2nd ed., Harvard University Press (1970).

the short-run responds to a price change by substituting a commodity bearing a lower price. As experience with the new consumption mix is intensified over the longer run, so do tastes intensify.

Specifically, the following two hypotheses were investigated:

(1) The commodities which have a comparative advantage in production, consistent with resource endowment and climatic conditions of a country, induce formation of relative taste preferences favorable to them.

(2) When the relative availability of commodities changes, as a result of technical developments in production and marketing or by the opening up of international trade, people change their tastes in response to changes in relative prices.

In order to investigate the first hypothesis, intercountry cross-section data for forty-three countries and twenty-two food commodities was used. The model used was the standard demand model modified by adding a taste variable--representing historical differences in relative prices[1]--as a demand shifter across countries in addition to the usual income and price

---

[1] See Chapter III, pp. 29-40, for development of this and other variables.

variables. The implicit assumption for this model is that taste differences among countries can be described by the same demand function.[1]

For the second hypothesis, that consumer tastes change over time as a result of changes in relative prices consequent upon technical developments in production or trade which change relative availability of commodities, the change is viewed as a sequential process over time. In the short-run a change in relative prices changes the consumption mix via the substitution effect. The persistence of this change in the relative price over the longer time period enables the consumer to gain experience for consuming the new (changed) mix of commodities and thus leads to a change in tastes. This is the process of inducement of tastes as a result of the cumulated stock of experience with the new mix. Again to test this hypothesis, we used the standard demand model by introducing cumulated quantities of past consumption levels of the concerned commodity and that of its substitute commodity as the taste variables, in addition to the usual price and income variables. Three sets of time-series data from the United States and Japan for a few

---

[1] See Chapter III for a detailed discussion of the model.

selected food commodities were employed to carry out this test. We limited our investigation of taste formation and taste changes to the case of food commodities only.

Major Findings

Major findings of the cross-section analysis of Chapter IV are as follows:

(1) The estimated coefficients for the taste variable in all equations are positive and, except for sugar and oilseeds, they are also statistically significantly different from zero at the 95 per cent level. This variable is represented by a ratio of the production of a commodity to the total food production in the country in the period of 1934-38 and reflects the influence of country-specific factor endowments and climatic conditions. In other words, it reflects the historical differences in the relative price of the commodity among countries. Significant coefficients for this variable, thus, indirectly support the hypothesis that tastes are induced by relative prices.

(2) Both the size of the coefficients and t-values are larger in the case of individual commodities than when commodities are grouped. Also in the case of commodity groups there is little improvement in the fits of the equation for commodity groups when we add the taste variable. These results imply that

taste preferences across countries are largely similar for broad commodity groups and the country specific tastes are induced for individual commodities within a group of related commodities by production patterns in each country.

(3) Income coefficients with the taste variable in the equation appear to be quite reasonable in comparison with the estimates of several other studies.[1] Since in our study consumption was measured in the food balance sheet methodology, these estimates should be considered as superior for making food demand projections in the framework of a national accounting scheme.

From the results of the intercountry analysis we found that the effects on demand of tastes differences among countries are more pronounced in the case of individual commodities than in the case of commodity groups. In the time-series analysis, therefore, only individual commodities were used. The commodities selected were those for which the prices showed significant changes during the period under investigation, depending

---

[1] The comparison is made with the following three studies: (1) L. M. Goreux, "Income and Food Consumption," Monthly Bulletin of Agricultural Economics and Statistics, Vol. 9 (October 1960), pp. 1-13; (2) M. Gilbert and Associates, Comparative National Products and Price Levels, OEEC (1958); and (3) P. S. George and G. A. King, Consumer Demand for Food Commodities in the United States with Projection to 1980, Giannini Foundation Monograph No. 26, University of California, Davis (1971).

upon the availability of data. These were poultry versus meats in the United States during the period 1948 to 1970; and rice versus other cereals, and fish versus meats in Japan for both the pre- and postwar periods, 1911-38 and 1950-69, respectively.

Cumulated quantities of the past consumption of the commodity concerned and the substitutable commodity, which constitute the two "state" variables (representing the taste variable), were introduced in the demand function.

Major findings that emerge from the time-series analysis of Chapter V are as follows:

(1) Statistical evidence presented in Chapter V seems to support our hypothesis that consumption experience with a particular commodity intensifies a taste for it. This is the inference drawn from the generally correct signs of both "state" variables (the commodity concerned and the substitute commodity), in spite of high intercorrelation between them which probably is the cause for the weak statistical significance of the coefficients.

(2) Equations for poultry consumption in the United States and fish consumption in prewar Japan are strong statistical evidence supporting our hypothesis. The prices of poultry and fish declined relative to the substitute commodities during the

respective periods under investigation. The results indicate a shift in the consumption pattern toward poultry in the United States and fish in Japan.

(3) Addition of state (taste) variables in demand equations seems to yield better estimates of price and income coefficients in the sense that the elasticities measure pure income and price effects. Their magnitudes are similar to the estimates obtained from demand equations, estimated by including time as a trend variable instead of the state variables. But the use of state variables rather than time provides an economic explanation for the unexplainable "trend."

(4) In the case of Japan no conclusive evidence is provided by our results in the case of rice for the pre- and postwar periods, and for fish for the postwar period. The estimated coefficients of "taste" variables have relatively large standard errors. But in these cases, we also do not find any strong trends in the price ratios. Since rice and fish are important food commodities in Japan (in the sense of their relatively large production shares in the total food production), one should not expect tastes to diminish unless there is a sharp rise in their prices relative to the prices of substitute commodities.

In brief, it should be emphasized that from the time-series analysis strong evidence of taste changes (or shifts) is indicated only in the case of those commodities for which the relative prices decline (or rise) sharply. Thus, even though we have not carried out a direct test of the hypothesis that tastes are induced by relative price changes, the results clearly indicate the importance of price changes for shifts in taste preferences. In order to carry out a direct test of this hypothesis one is confronted with problems of both a conceptual and empirical nature. In the last section of this chapter these problems are discussed at some length and a tentative conceptual framework is developed to comprehend the nature of the problems. In the process we find justification for our having used the production share of a commodity in the country's total food production as a surrogate variable for prices.

Implications

The first important implication of our analysis is that if consumption experiences induce consumer tastes, then empirical estimates of demand with and without consideration of this relationship have different meanings.

For example, if we study budget survey data from a cross-section of households at a point in time, which have faced the same price movements of the past, there should be no taste differences and the estimated Engel functions will reflect the "pure" income effect. But if we estimate the demand function with only prices and income (excluding the taste variable) as explanatory variables and the data come from a regional cross-section where past price movements have been different, the estimated coefficients would be biased.

This point is also important for time-series analysis. The yearly variations of consumption are affected not only by prices and income of the year but also by the cumulated past consumption experiences. A proper specification of the demand function, therefore, must include changes in past consumption experiences as a variable.

Another point that emerges from our analysis is related to the recognition that price changes do, indeed, influence tastes and that the relative strength of the price change is important. Policy actions which institutionally determine prices have to take into account their influence on taste changes and consequent repercussions of demand shifts. Since the speed with which tastes change could be different for different commodities, the point is important if one is interested in planning for a commodity. These policy actions are also likely to influence the welfare gains (or losses) since tastes can change simultaneously or perhaps because of them.

Another policy implication emerging from this study relates to the recognition that tastes are developed through consumption experiences; that is, tastes can be learned. The shorter the learning process the greater the welfare gains for consumers. The process of learning can be influenced by various policies. For example, to shift consumer tastes in favor of wheat, so that consumers can take advantage of the rapidly advanced technology in wheat production efficiently, can be achieved more rapidly through school lunch programs or other policies which increase wheat consumption directly. Education policies for consumers on the technical knowledge of wheat can also effectively be utilized to shorten the learning process of tastes, thereby increasing the elasticity of substitution of wheat or other commodities in a shorter period.

A Hypothesis

In order to carry out a direct test of the hypothesis that changes in prices induce change in tastes, an attempt was made to develop a conceptual framework. The theoretical problem with this approach is: (1) to distinguish the effects due to changes in taste from the substitution effects, both resulting from a price change, and (2) to explain why a fall in the relative price of a commodity induces taste for it.

The research reported in this thesis adopted an indirect approach to tackle these problems. The basic hypothesis that prices induce tastes was modified by postulating that the commodities which have a comparative advantage in production induce formation of relative taste preferences favorable to them. It was argued that people are born with rather general tastes and the specific tastes are developed through consumption experiences. Evidence from the intercountry cross-section analysis supported the point that country specific tastes are induced by relative prices. But the theoretical problems pointed out in the first paragraph still remain unanswered. Also we have not been able to understand the mechanism which regulates the speed and direction of taste changes. The discussion which follows is to clarify these issues.

In recent years, economists have increasingly recognized the consumer household as a firm which maximizes its objective functions under given resource constraints, and consumption has been recognized as equivalent to a production activity.[1] This enables us to employ the Hicksian hypothesis of induced innovation theory in production to provide a possible (or suggested)

---

[1] For instance, K. J. Lancaster, "Change and Innovation in the Technology of Consumption," American Economic Review, Vol. 56 (May 1966), pp. 14-23, and G. S. Becker, "A Theory of the Allocation of Time," Journal of Economics, Vol. 75 (September 1965), pp. 493-517.

explanation of the mechanism by which tastes are developed and changed through an interaction with changes in the supply situation. Hicks[1] argued that a fall in the price of capital relative to labor would induce technical change of a labor-saving type.

Recently the concept of meta-production function[2] has been developed to explain how a change in the relative price of factors could influence the nature of invention. It is assumed that there exists a stable meta-production function, which is defined as an envelope of all potentially existing production surfaces, each corresponding to a certain technology. Ahmad[3] calls an isoquant of the meta-production function a "historical innovation possibility curve," and states as follows: "This is simply an envelope of all the alternative iso-quants . . . which the businessman expects to develop with the use of the available amount of innovating skill and time . . . ." (p. 347).

According to the theory of induced innovation, under a given factor-price ratio, technology economically favorable to

---

[1] J. R. Hicks, The Theory of Wages, Macmillan (1953).

[2] For the concept of meta-production function, see Y. Hayami and V. W. Ruttan, Agricultural Development: An International Perspective, Johns Hopkins Press (1971), pp. 82-83.

[3] S. Ahmad, "On the Theory of Induced Innovation," Economic Journal, Vol. 76 (June 1966), pp. 344-357.

that particular price ratio will be invented from the potentially existing technologies.

A change in price of a commodity relative to others can be assumed to affect the change in tastes in the same way as the factor-price changes affect the nature of technical changes.[1] A fall in the price of a commodity will increase demand for the commodity, substituting it for other similar commodities. This change in demand will increase the familiarity of consumers for the commodity; in Houthakker and Taylor terms, it will increase the psychological stock of the consumers. As a result, while the fall in price is influencing the demand, tastes are also affected. It can be assumed that tastes continue to change, becoming more favorable to the commodity for which the price falls, until the tastes and the new set of prices attain an equilibrium.

Let us assume that all people have common preferences and that there exists a relatively stable ordinal meta-utility function which is a counterpart of the meta-production function in production theory. The meta-utility function represents the fundamental physical and psychological factors that condition changes in tastes over time and is conceived as an envelope of the country specific taste preferences.

---

[1] For a one to one correspondence (isomorphism) between technical change in the theory of production and taste change in the theory of consumer demand see also, F. M. Fisher and K. Shell, <u>The Economic Theory of Price Indices</u>, Academic Press (1972).

The general hypothesis that tastes are induced by relative prices can now be stated as follows: since every economy has different resource endowments and climatic conditions, the commodities which have a comparative advantage in production would be produced more cheaply. The taste preferences induced by relative prices would be consistent with production patterns. If the relative availability of commodities changes as a result of technological developments in production or international trade, resulting in a change in relative prices, consumer tastes would change in response to this change in prices. Tastes become more favorable to those commodities which have become relatively less expensive and easily obtainable. It is assumed that this change will continue until tastes and the new set of prices attain an equilibrium along the meta-utility function. This is the position of an optimum in the sense of the general envelope theorem.[1]

In Figure 6.1, an attempt is made to illustrate this point diagramatically in the case of two commodities and two economies. It is assumed that two closed countries, I and II, produce two commodities, Q_1 and Q_2. The analysis is carried out for a representative individual for each country. Resource endowments

---

[1] See, P. A. Samuelson, Foundations of Economic Analysis, Harvard University Press (1947), p. 32.

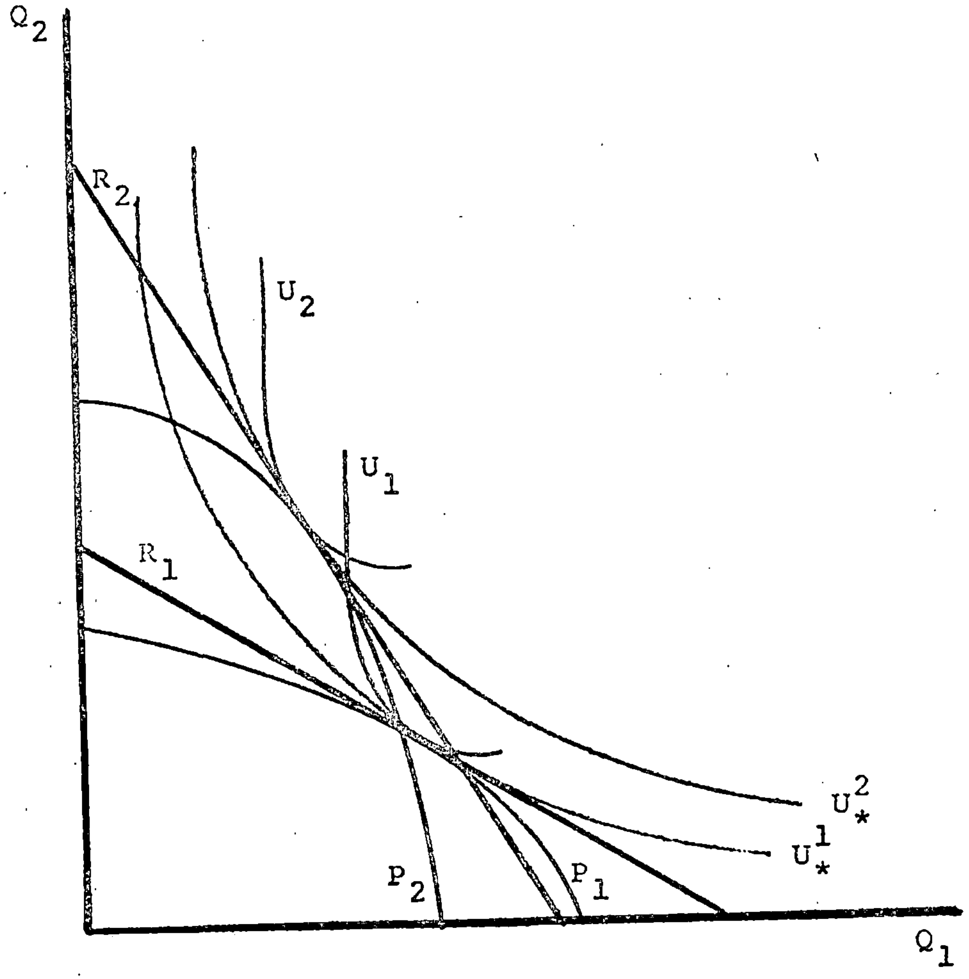


FIGURE 6.1. HYPOTHETICAL EQUILIBRIUM SITUATION OF TASTE PREFERENCES IN TWO CLOSED ECONOMIES.

of Country I are relatively favorable for producing Q_1 and those of Country II for producing Q_2. P_1 and P_2 represent the production frontiers of the respective countries on a per capita basis. U_1 and U_2 are country specific indifference curves of the representative individuals of the two countries, and the shapes represent their tastes. Tastes of Consumer I are more favorable for Q_1 and of Consumer II for Q_2, and it is assumed that they have been determined by the prevailing price ratios, R_1 and R_2, respectively. U_*^1 and U_*^2 are the indifference curves corresponding to the meta-utility function.

Technological improvements in production may shift the production possibility curve upward, and may alter the comparative advantage of production of Q_1 and Q_2. The commodity mix also may change with international trade. These changes in supply disturb the existing relative prices. According to our hypothesis, this leads to a change in taste preferences. Figure 6.2 illustrates this mechanism. Assume P_2^1 is the production possibility curve of Country II during the initial period on a per capita basis.[1] "Initial period" refers to the period before the price change.

---

[1] The economy depicted in Figure 6.2 is the same as Country II in Figure 6.1.

Commodity Q_2 exhibits a comparative advantage in production over Q_1. The indifference curve U_2^1 shows Consumer II to be in equilibrium at A_1. His tastes, that is, the shape of the indifference curve U_2^1, have been determined by the price ratio R_2^1 which prevailed before the price change. In other words, this is a situation of static supply, stable prices, and the so-called traditional consumption pattern.

As a result of technical change and opening up of foreign trade, the slope of the price ratio changes and, also, the line shifts to the right. This shift is shown by R_2^2. In the short-run the consumer attains a new equilibrium at A_2 along U_2^2. But notice that he is no longer in a long-run equilibrium along the meta-indifference curve U_*^2. If the new price ratio (the slope of R_2^2) prevails for an extended period, consumer tastes, that is, the shape of the country specific indifference map, change from U_2^2 to $U_{2'}^2$.[1] Now, in order to be in the long-run equilibrium, the consumer has to move to A_3. The important point to be noted here is that it is the prices which change first and then in order to obtain a long-run equilibrium, force the taste preferences to

---

[1] U_2^1 and U_2^2 are indifference curves of the same utility function, while the indifference curve $U_{2'}^2$ belongs to the changed preference map resulting from the changed price ratio.

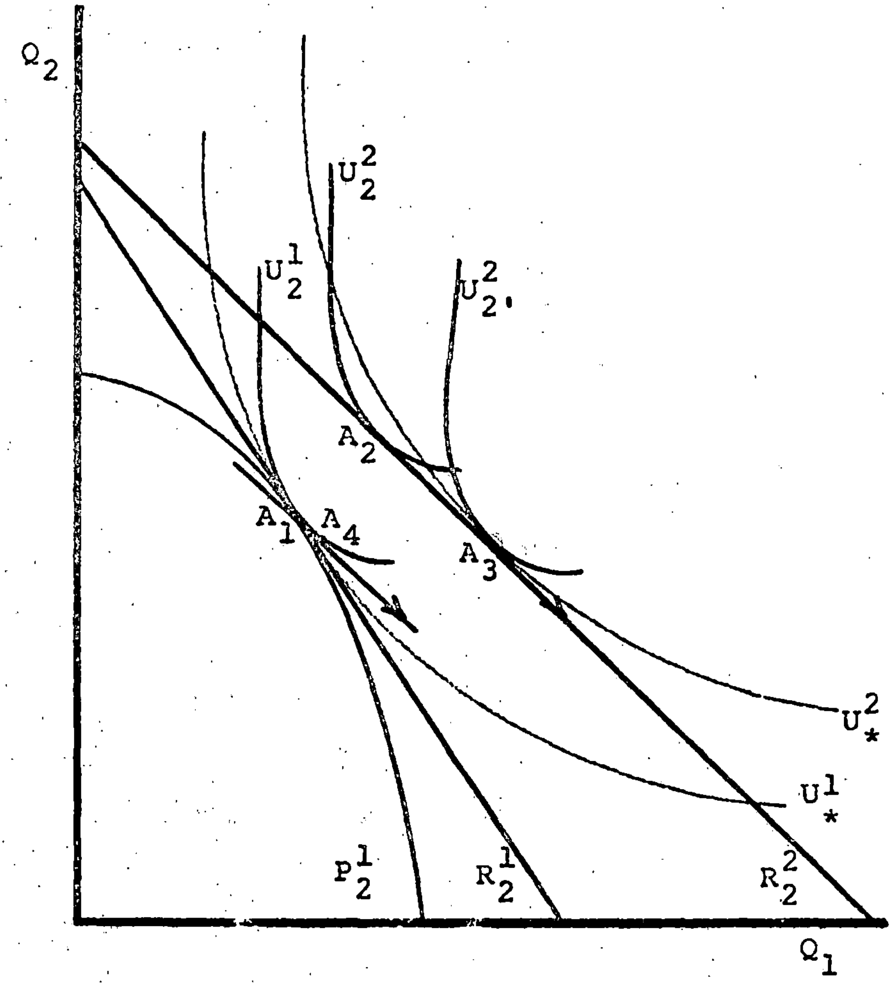


FIGURE 6.2. TASTE CHANGE INDUCED BY PRICE CHANGE.

change. Of course, the result is based on the existence of a long-run meta-utility function which forms the outer envelope of the short-run (or country specific) utility function.

It may also be noted that the usual substitution effect resulting from the price change and the income effect have clearly been accounted for in this framework. Movement from A_1 to A_4 along indifference curve U_2^1 is the substitution effect due to price change. From A_4 to A_2 is the income effect and from A_2 to A_3 is the change due to change in taste.

Evidence from the research reported in this thesis is indirectly suggestive that shifts in relative prices induce taste changes. The discussion presented above enables us to conceptualize the economic basis for this mechanism. It also encourages us to suggest the possibility of constructing a model using relative prices to carry out a direct test of our hypothesis.

BIBLIOGRAPHY

Abramson, A. Victor, "Advertising and Economic Theory: A Criticism," American Economic Review, Vol. 21 (December 1931), pp. 685-690.

Agarwala, A., and J. Drinkwater, "Consumption Functions with Shifting Parameters Due to Socio-Economic Factors," Review of Economics and Statistics, Vol. 54 (February 1972), pp. 89-96.

Ahmad, Syed, "On the Theory of Induced Invention," Economic Journal, Vol. 76 (June 1966), pp. 344-357.

Arrow, Kenneth J., "The Economic Implication of Learning by Doing," Review of Economic Studies, Vol. 39 (June 1962), pp. 155-173.

Arrow, Kenneth J., H. B. Chenery, B. S. Minhas, and Robert M. Solow, "Capital-Labor Substitution and Economic Efficiency," Review of Economics and Statistics, Vol. 45 (August 1961), pp. 225-250.

Basmann, R. L., "A Theory of Demand with Variable Consumer Preferences," Econometrica, Vol. 36 (July-October 1968), pp. 47-59.

Bayton, James A., "Contributions of Psychology to the Microeconomic Analysis of Consumer Demand for Food," Journal of Farm Economics, Vol. 45 (December 1963), pp. 1430-1435.

Becker, Gary S., "A Theory of the Allocation of Time," Journal of Economics, Vol. 75 (September 1965), pp. 493-517.

Berry, Charles H., George K. Brinegar, and Stewart Johnson, "Short Run Effects Following Controlled Price Changes: Skim Milk," Journal of Farm Economics, Vol. 40 (November 1958), pp. 892-902.

Binswanger, Hans P., Induced Innovation: A Critical Review of the Theory and Conclusions from New Evidences, Department of Agricultural and Applied Economics Staff Paper P72-29, University of Minnesota, St. Paul (1972).

Boulding, Kenneth E., "Economics as a Moral Science," American Economic Review, Vol. 59 (March 1969), pp. 1-12.

Brandow, George E., Interrelations Among Demand for Farm Products and Implications for Control of Market Supply, Pennsylvania Agricultural Experiment Station Bulletin 680, University Park (1961).

Brown, Alan, and Angus Deaton, "Surveys in Applied Economics: Models of Consumer Behavior," Economic Journal, Vol. 82 (December 1972), pp. 1145-1236.

Burk, Marguerite C., Consumption Economics: A Multidisciplinary Approach, John Wiley and Sons, New York (1968).

Chamberlin, Edward, The Theory of Monopolistic Competition, Harvard University Press, Cambridge (1938).

Chase, Stuart, The Tragedy of Waste, Macmillan Company, New York (1926).

Clark, J. M., "Toward A Concept of Workable Competition," American Economic Review, Vol. 30 (June 1940), pp. 241-256.

Dudley, Leonard, "Learning and Productivity Change in Metal Products," American Economic Review, Vol. 62 (September 1972), pp. 662-669.

Duesenberry, James S., Income, Saving and the Theory of Consumer Behavior, Harvard University Press, Cambridge (1949).

Farrell, M. J., "Irreversible Demand Functions," Econometrica, Vol. 20 (April 1952), pp. 171-186.

Ferber, Robert, "Research on Household Behavior," American Economic Review, Vol. 52 (March 1962), pp. 19-63.

Fisher, Franklin M., and Karl Shell, The Economic Theory of Price Indices, Academic Press, New York (1972).

Friedman, Milton, A Theory of Consumption Function, Princeton University Press, Princeton, N. J. (1957).

Friedman, Milton, Price Theory, Aldine Publishing Company, Chicago (1962).

Galbraith, John K., The New Industrial States, Houghton Mifflin Company, Boston (1967).

George, P. S., and G. A. King, Consumer Demand for Food Commodities in the United States with Projections for 1980, Giannini Foundation Monograph No. 26, University of California, Davis (March 1971).

Gilbert, Milton, and Associates, Comparative National Products and Price Levels, OEEC, Paris (1958).

Goreux, L. M., "Income and Food Consumption," Monthly Bulletin of Agricultural Economics and Statistics, Vol. 9 (October 1960), pp. 1-13.

Gorman, W. H., "Tastes, Habits, and Choices," International Economic Review, Vol. 8 (June 1967), pp. 218-222.

Griliches, Zvi, "Distributed Lags: A Survey," Econometrica, Vol. 35 (January 1967), pp. 16-49.

Harmston, Floyd K., and Hiroyuki Hino, "An Inter-temporal Analysis of the Nature of Demand for Food Products," American Journal of Agricultural Economics, Vol. 52 (August 1970), pp. 381-394.

Hayami, Yujiro, Barbara B. Miller, William W. Wade, and Sachiko Yamashita, An International Comparison of Agricultural Production and Productivities, Agricultural Experiment Station Technical Bulletin 277, University of Minnesota, St. Paul (1971).

Hayami, Yujiro, and Vernon W. Ruttan, Agricultural Development: An International Perspective, Johns Hopkins Press, Baltimore (1971).

Hicks, J. R., Value and Capital, 2nd ed., Clarendon Press, Oxford (1946).

Hicks, J. R., The Theory of Wages, Macmillan, London (1953).

Hicks, J. R., A Revision of Demand Theory, Clarendon Press, Oxford (1959).

Houthakker, H. S., "An International Comparison of Household Expenditure Patterns, Commemorating the Centenury of Engel's Law," *Econometrica*, Vol. 25, (October 1957), pp. 532-551.

Houthakker, H. S., "The Present State of Consumption Theory: A Survey Article," *Econometrica*, Vol. 29 (October 1961), pp. 706-740.

Houthakker, H. S., "New Evidence on Demand Elasticities," *Econometrica*, Vol. 33 (April 1965), pp. 277-288.

Houthakker, H. S., and Lester D. Taylor, *Consumer Demand in the United States: Analyses and Projections*, 2nd ed., Harvard University Press, Cambridge (1971).

Hoyt, Elizabeth E., "Want Development in Underdeveloped Areas," *Journal of Political Economy*, Vol. 59 (June 1951), pp. 194-202.

Ichimura, S., "A Critical Note on the Definition of Related Goods," *Review of Economic Studies*, Vol. 18 (1950-51) pp. 179-183.

International Labour Office, *International Labour Review*, Vols. 76, 78, 80, 82, 84, 86, and 88, Geneva.

International Labour Office, *Bulletin of Labour Statistics*, issues of Second Quarter for 1965, 1966 and 1970, Geneva.

Japan Department of Agriculture, *Agricultural Statistics*, issues from 1950 to 1970.

Japan Economic Planning Agency, *1970 Annual Report on National Income* (1972).

Japan Office of the Prime Minister, *General Report on the Family Income and Expenditure Survey 1946-1962* (1964).

Japan Office of the Prime Minister, *1969 Annual Report on the Family Income and Expenditure Survey* (1971).

Jureen, L., "Long-Term Trends in Food Consumption: A Multi-Country Study," *Econometrica*, Vol. 24 (January 1956), pp. 1-21.

Kaneda, Hiromitsu, *Urban/Rural Contrast of Consumption Patterns and Consumer Preferences in Postwar Japan*, Economic Growth Center Discussion Paper No. 24, Yale University, New Haven (1967).

Katona, George, *Psychological Analysis of Economic Behavior*, McGraw-Hill, New York (1951).

Katona, George, *The Mass Consumption Society*, McGraw-Hill (1964).

Katona, George, "Consumer Behavior: Theory and Findings on Expectations and Aspirations," *American Economic Review*, Vol. 58 (May 1968), pp. 19-30.

Knight, Frank K., "Ethics and the Economic Interpretation," *Quarterly Journal of Economics*, Vol. 36 (May 1922), pp. 454-481.

Kuznets, Simon, "Quantitative Aspects of the Economic Growth of Nations," *Economic Development and Cultural Change: VII. The Share and Structure of Consumption*, Vol. 10, No. 2, Part II (January 1962).

Lancaster, Kelvin J., "Change and Innovation in the Technology of Consumption," *American Economic Review*, Vol. 56 (May 1966), pp. 14-23.

Lee, Feng-Yao, "Estimation of Dynamic Demand Relations from a Time Series of Family Budget Data," *Journal of American Statistical Association*, Vol. 65 (June 1970), pp. 586-597.

Leibenstein, Harvey, "Bandwagon, Snob, and Veblen Effects in the Theory of Consumers' Demand," *Quarterly Journal of Economics*, Vol. 64 (May 1950), pp. 183-208.

Leser, C. E. V., "Forms of Engel Functions," *Econometrica*, Vol. 31 (October 1963), pp. 694-703.

Machlup, Fritz, "Professor Hicks' Revision of Demand Theory," *American Economic Review*, Vol. 47 (March 1957), pp. 119-135.

Marshall, Alfred, *Principles of Economics*, 8th ed., Macmillan Company, London (1962).

Massell, Benton F., and Judith Heyer, "Household Expenditure in Nairobi: A Statistical Analysis of Consumer Behavior," Economic Development and Cultural Change, Vol. 17 (January 1969), pp. 212-234.

Modigliani, Franco, and Richard Brumberg, "Utility Analysis and the Consumption Function: An Interpretation of Cross Section Data," in Kenneth Kurihara, ed., Post-Keynesian Economics, Rutgers University Press, New Brunswick, N. J. (1954).

Morgenstern, Osker, "Demand Theory Reconsideration," Quarterly Journal of Economics, Vol. 62 (February 1948), pp. 165-201.

Nelson, Richard R., "A Diffusion Model of International Productivity Differences in Manufacturing Industry," American Economic Review, Vol. 58 (December 1968), pp. 1219-1248.

Nerlove, Marc, Distributed Lags and Demand Analysis for Agricultural and Other Commodities, Agricultural Handbook No. 141, U.S.D.A. (1958).

Norris, Ruby T., The Theory of Consumer's Demand, Yale University Press, New Haven (1941).

Paris, Quirino, An Appraisal of "Income" Elasticities for Total Food Consumption in Developing Countries, OECD, Paris (1970).

Perry, G. L., "Consumer Demand in the United States (A Review Article)," American Economic Review, Vol. 57 (September 1967), pp. 832-840.

Peston, Maurice H., "Changing Utility Function," in M. Shubik, ed., Essays in Mathematical Economics in Honor of Osker Morgenstern, Princeton University Press, Princeton, N. J. (1967).

Pollak, Robert A., Habit Formation and Dynamic Demand Functions, Discussion Paper No. 79, Wharton School of Finance and Commerce, Department of Economics, University of Pennsylvania, Philadelphia (1968).

Pollak, Robert A., and Terence J. Wales, "Estimation of the Linear Expenditure System," Econometrica, Vol. 37 (October 1969), pp. 611-628.

Quirk, James P., and Rubin Saposnik, Introduction of General Equilibrium Theory and Welfare Economics, McGraw-Hill, New York (1968).

Prais, S. J., and H. S. Houthakker, The Analysis of Family Budgets, 2nd impression, Cambridge University Press, London (1971).

Samuelson, P. A., Foundations of Economic Analysis, Harvard University Press, Cambridge (1947).

Sinohara, Miyohei, Personal Consumption Expenditures, Vol. 6 of K. Ohkawa, et al., eds., Estimates of Long Term Economic Statistics of Japan Since 1868, Toyokeizai, Tokyo (1967).

Stevens, Robert D., Elasticity of Food Consumption Associated With Changes in Income in Developing Countries, Foreign Agricultural Economic Report No. 23, U.S.D.A. (1965).

Stigler, George J., The Theory of Price, 3rd ed., Macmillan Company, New York (1966).

Theil, Henri, "Value Share Transitions in the Consumer Demand Theory," Econometrica, Vol. 38 (January 1970), pp. 118-127.

Theil, Henri, Principles of Econometrics, John Wiley and Sons, New York (1971).

Tobin, James, "Relative Income, Absolute Income, and Savings," in Money, Trade and Economic Growth, Essays in Honor of John H. Williams, Macmillan Company, New York (1951).

Tolley, G. S., Y. Wang, and R. G. Fletcher, "Reexamination of the Time Series Evidence on Food Demand," Econometrica, Vol. 37 (October 1969), pp. 695-705.

Tsujimura, Kotaro and Tamotsu Sato, "Irreversibility of Consumer Behavior in Terms of Numerical Preference Fields," Review of Economics and Statistics, Vol. 46 (August 1964), pp. 305-319.

United Nations, Food Balance Sheets, issues of 1949, 1950, 1954-56, 1957-59, and 1960-62, FAO, Rome.

United Nations, Yearbook of Fishery Statistics, 1952-53, Vol. 4, Part I, FAO, Rome (1955).

United Nations, Food Supply Time Series, FAO, Rome (1960).

United Nations, Production Yearbook, issues of 1955, 1957, and 1970, FAO, Rome.

United Nations, Trade Yearbook, issues of 1949, 1955, 1957, and 1962, FAO, Rome.

United Nations, Technical Conversion Factors for Agricultural Commodities, FAO, Rome (1960).

United Nations, 1964 Yearbook of National Accounts Statistics, Statistical Office, New York (1965).

U. S. Department of Agriculture, The Vegetable Situation, Economic Research Services TVS-142 (October 1961), and TVS-150 (October 1963).

U. S. Department of Agriculture, Fruits Situation, Economic Research Services FS-151 (June 1964).

U. S. Department of Agriculture, Conversion Factors and Weights and Measures, Statistical Bulletin No. 362 (1965).

U. S. Department of Agriculture, U. S. Food Consumption, Statistical Bulletin No. 364 (1965).

U. S. Department of Agriculture, Food Consumption, Prices and Expenditures, Agricultural Economic Report No. 138 (1968).

U. S. Department of Agriculture, Supplement to Agricultural Economic Report No. 138 for 1970, (1972).

U. S. Department of Commerce, The National Income and Product Accounts of the United States 1929-65, (1967).

U. S. Department of Commerce, Survey of Current Business, (July 1971).

Veblen, Thorstein, The Theory of the Leisure Class, Modern Library Inc., New York (1934).

Watanabe, Tsunehiko, "A Note on an International Comparison of Private Consumption Expenditure," Weltwirtschaftliches Archiv, Bd. 88, Heft 1 (1962), pp. 145-149.

Waugh, Frederick V., Demand and Price Analysis;Some Examples for Agriculture, Technical Bulletin No. 1316, U.S.D.A., (1964).

Weckstin, Richard S., "Welfare Criteria and Changing Tastes," American Economic Review, Vol. 52 (March 1962), pp. 133-153.

Weizsacker, Carl Christian von, "Note on Endogenous Change of Tastes," Journal of Economic Theory, Vol. 3 (December 1971), pp. 345-372.

Wold, H., and L. Jureen, Demand Analysis, John Wiley and Sons, New York (1953).

Yoshihara, Kunio, "Demand Functions: An Application to the Japanese Expenditure Patterns," Econometrica, Vol. 37 (April 1969), pp. 257-274.

APPENDIX

Intercountry Cross-section Data

TABLE A.1. PER CAPITA CONSUMPTION, 1957-62 AVERAGES, IN KILOGRAM INTERNATIONAL WHEAT UNITS.

Country	Grains				Potatoes			Sugar	Pulses	Nuts	Oilseed	Total Pulses Nuts Oilseed
	Wheat	Rice	Other	Total	White	Sweet, Cassava	Total					
Argentina	133.4	9.5	0.0	143.1	27.0	8.1	35.2	44.6	2.8	1.9	34.4	39.4
Australia	111.2	3.5	3.7	118.5	22.1	0.3	22.4	68.2	1.7	5.8	16.7	25.5
Austria	134.2	7.2	5.3	146.9	39.2	0.0	39.2	46.4	1.4	9.9	22.2	35.5
Belgium*	115.2	3.0	3.2	121.6	58.7	0.0	58.7	40.6	3.3	4.0	26.5	34.8
Brazil	34.7	79.8	27.3	143.2	4.1	18.0	22.3	50.8	34.5	1.9	8.2	45.3
Canada	83.3	3.9	5.5	92.9	29.1	0.1	29.2	62.6	3.9	6.7	16.9	28.9
Ceylon	26.7	202.9	3.5	234.1	2.1	6.3	8.5	23.9	10.2	0.0	3.0	15.1
Chile	148.0	16.5	1.4	166.4	3.6	0.0	3.6	41.6	13.3	2.2	12.3	28.4
Colombia	15.4	37.0	29.6	83.0	10.9	26.2	37.8	61.3	8.7	0.0	14.6	23.6
Denmark	58.1	2.7	26.6	87.5	54.2	0.0	54.2	62.3	5.7	3.5	24.6	34.7
Finland	85.1	6.1	34.6	126.1	45.9	0.0	45.9	52.0	2.2	1.2	17.4	21.2
France	130.5	3.8	3.5	137.9	46.0	0.0	46.0	40.8	4.6	14.9	24.4	46.5
Germany**	71.2	3.4	22.5	97.3	61.1	0.0	61.1	39.6	2.3	4.2	35.4	42.9
Greece	183.3	11.1	4.8	199.5	18.4	0.0	18.4	17.2	16.4	26.0	55.5	102.4
Honduras	11.9	15.0	65.1	92.0	0.6	11.8	12.5	28.4	16.6	0.0	2.7	19.8
India	28.4	136.3	34.6	201.3	1.8	2.2	4.0	12.9	31.8	0.0	12.4	44.3
Ireland	144.9	1.6	6.5	153.2	63.3	0.0	63.3	59.3	2.4	1.9	10.2	14.9
Israel	141.7	11.5	2.0	155.5	16.5	0.0	16.5	39.9	5.1	0.0	46.6	51.8
Italy	161.5	12.0	11.4	185.1	22.5	0.0	22.5	27.1	9.1	31.6	38.4	83.6
Japan	33.3	210.6	14.1	259.3	17.8	16.6	34.6	19.0	20.9	0.0	8.9	21.5
Libya	97.5	13.6	26.6	138.4	6.0	0.0	6.0	29.9	4.0	13.6	15.7	35.1
Mexico	35.2	9.6	75.8	121.1	2.8	3.0	5.9	41.0	29.6	0.0	16.3	46.2
Netherlands	94.0	4.8	8.3	107.4	42.3	0.0	42.3	58.8	2.9	4.2	35.7	43.9
New Zealand	103.8	2.6	3.6	110.1	24.7	1.2	25.9	60.1	2.1	18.3	4.7	26.7
Norway	80.8	3.1	13.3	97.4	44.1	0.0	44.1	52.4	3.2	4.5	57.4	66.3

TABLE A.1. (Continued)

Country	Grains				Potatoes			Sugar	Pulses	Nuts	Oilseed	Total Pulses Nuts Oilseed
	Wheat	Rice	Other	Total	White	Sweet, Cassava	Total					
Pakistan	49.1	198.9	8.3	257.9	1.9	0.0	1.9	12.9	9.0	0.0	12.4	21.5
Paraguay	50.5	12.9	27.3	91.1	1.6	64.6	66.3	22.2	19.0	0.0	11.6	31.2
Peru	46.7	41.6	30.5	119.9	41.0	15.1	56.6	29.7	13.8	0.0	12.1	26.0
Philippines	12.7	178.7	21.2	213.9	0.1	17.2	17.3	16.0	2.1	1.4	8.8	12.6
Portugal	77.8	25.6	40.1	144.4	45.2	0.0	45.2	23.4	9.8	37.0	33.6	85.0
South Africa	53.1	6.4	83.7	143.5	6.2	0.8	7.0	54.0	5.0	1.0	8.3	14.6
Spain	134.3	14.8	6.0	155.5	51.4	0.0	51.4	22.3	12.8	50.5	41.9	112.6
Sweden	68.7	2.9	16.1	87.8	40.7	0.0	40.7	56.4	2.3	8.0	26.8	38.7
Switzerland	104.4	6.2	13.0	123.8	31.2	0.0	31.2	54.4	2.3	18.2	32.2	56.0
Syria	141.1	12.3	31.6	185.7	4.2	0.0	4.2	17.3	15.1	3.6	18.3	38.2
Taiwan	28.4	249.9	1.7	280.9	0.2	29.8	29.9	12.2	7.2	0.0	7.1	14.4
Turkey	207.7	7.7	22.5	238.3	17.5	0.0	17.5	18.9	15.2	35.0	13.2	67.7
U. A. R.	99.2	55.6	61.2	217.7	2.6	1.4	4.1	17.8	15.6	0.4	14.3	30.7
U. K.	101.1	2.8	7.7	111.7	43.1	0.0	43.1	67.2	5.8	9.5	33.5	50.8
U. S. A.	74.7	5.2	11.2	91.2	20.0	1.3	21.3	58.9	6.1	11.0	41.3	60.8
Uruguay	124.6	19.9	1.1	145.6	20.3	11.0	31.9	48.5	4.4	0.0	17.3	21.7
Venezuela	37.0	16.0	36.7	90.3	6.0	21.1	27.3	43.6	20.2	0.7	22.6	43.8
Yugoslavia	183.8	4.6	33.0	221.6	30.0	0.0	30.0	19.3	13.5	7.3	8.8	31.2

TABLE A.1. (Continued)

Country	Fruits	Vegetables	Total Fruits Vegetables	Meats				Poultry	Fish	Total Meats Poultry Fish	Milk	Eggs
				Beef	Pork	Mutton, other	Total					
Argentina	93.5	35.4	130.7	685.0	46.9	46.3	780.7	23.6	5.4	809.7	173.4	44.3
Australia	99.8	48.7	149.5	412.6	65.5	304.6	792.4	20.4	9.1	822.0	294.4	65.8
Austria	124.1	48.9	174.0	146.5	228.0	14.0	389.7	13.2	6.4	409.3	302.8	88.5
Belgium*	69.3	55.9	126.3	183.5	169.5	20.1	374.7	31.7	13.9	420.3	322.0	83.0
Brazil	86.0	21.4	108.3	168.2	51.4	4.4	224.6	0.5	3.2	228.3	65.1	19.5
Canada	90.1	59.0	150.5	292.1	164.2	28.3	486.6	60.4	11.2	558.3	442.1	93.2
Ceylon	10.0	32.9	43.2	15.8	0.7	2.4	19.0	8.9	11.3	31.1	20.3	6.1
Chile	56.6	60.7	118.6	165.6	30.7	23.8	221.4	6.7	21.6	249.6	123.7	23.6
Colombia	44.6	9.6	55.1	221.0	32.4	2.4	256.1	6.7	15.9	278.8	96.0	16.6
Denmark	82.9	50.9	134.7	153.7	278.7	9.2	442.8	20.6	29.5	492.9	436.3	60.0
Finland	51.0	13.9	65.3	139.2	100.1	12.9	253.3	5.3	20.3	278.9	578.7	41.6
France	75.3	106.4	183.1	251.2	146.2	50.8	451.0	38.7	16.3	506.0	320.2	64.0
Germany**	120.1	37.1	158.2	162.2	210.4	8.2	381.9	18.8	12.8	413.5	283.0	74.2
Greece	139.7	96.5	238.0	52.8	23.3	65.4	143.2	10.7	19.1	173.2	199.3	36.1
Honduras	219.7	4.0	223.8	52.8	11.3	2.0	66.6	6.9	1.7	75.0	107.4	23.9
India	18.5	2.2	20.7	0.9	0.7	6.5	8.1	0.5	2.7	11.3	51.0	1.2
Ireland	36.2	49.3	86.4	128.6	156.4	101.9	390.6	23.4	5.4	419.5	493.5	92.9
Israel	150.3	88.3	241.6	71.1	13.0	9.8	94.8	101.0	15.0	210.9	328.9	113.8
Italy	107.2	102.6	211.4	116.2	41.2	17.0	175.5	16.7	10.6	202.7	169.8	51.8
Japan	30.7	62.8	94.3	13.6	15.2	3.4	32.4	3.0	43.3	78.7	24.4	28.8
Libya	76.6	31.7	108.3	17.0	0.0	59.6	77.4	1.9	3.5	82.9	63.8	7.9
Mexico	70.7	13.6	85.1	111.1	40.9	6.5	159.0	6.5	4.8	170.3	117.1	34.6
Netherlands	90.9	52.4	144.6	159.7	133.9	12.3	307.0	8.6	13.3	328.8	343.2	69.0
New Zealand	89.1	57.0	147.5	402.8	103.2	271.2	786.3	8.8	12.4	807.6	583.7	91.1
Norway	78.0	26.7	105.3	122.2	108.5	38.5	271.1	4.2	53.9	329.2	387.7	48.6

TABLE A.1. (Continued)

Country	Fruits	Vegetables	Total Fruits Vegetables	Meats				Poultry	Fish	Total Meats Poultry Fish	Milk	Eggs
				Beef	Pork	Mutton, other	Total					
Pakistan	31.8	14.2	46.5	20.0	0.0	9.9	30.2	0.0	4.1	34.3	105.6	1.7
Paraguay	145.7	20.0	168.9	286.1	18.3	13.3	318.5	22.7	0.4	341.7	89.0	3.5
Peru	103.5	63.8	168.9	63.4	25.4	25.2	115.1	4.9	15.3	135.2	49.5	4.7
Philippines	39.6	22.8	64.1	12.3	61.7	7.5	81.8	7.2	30.2	119.3	10.1	18.0
Portugal	98.5	85.4	185.7	49.0	40.5	19.1	109.4	6.3	46.6	162.3	56.4	19.2
South Africa	49.3	28.1	78.0	260.6	22.2	60.3	345.7	6.9	14.6	367.3	134.6	18.3
Spain	106.2	94.1	202.0	51.1	26.8	31.3	110.4	8.1	32.3	150.9	88.9	36.7
Sweden	96.6	21.3	118.4	163.9	175.5	13.6	354.3	7.4	35.4	397.1	370.7	68.7
Switzerland	153.2	58.3	212.7	192.9	170.9	15.7	380.9	17.6	6.3	404.8	403.0	57.6
Syria	174.6	35.4	210.4	7.2	0.0	67.5	75.1	2.8	0.7	78.7	290.4	8.2
Taiwan	24.2	45.4	70.9	3.0	106.8	0.7	110.5	6.7	29.8	147.0	4.1	9.6
Turkey	130.1	70.7	201.9	41.3	0.0	42.2	84.7	5.6	4.7	95.0	158.4	9.9
U. A. R.	87.9	64.9	153.1	35.3	0.0	51.1	87.6	10.7	9.4	107.8	46.6	6.4
U. K.	71.1	45.4	117.3	221.0	66.2	192.8	486.0	28.0	16.3	530.4	356.8	84.7
U. S. A.	118.3	75.5	195.6	309.1	217.0	23.2	551.4	81.3	8.5	641.1	329.1	113.5
Uruguay	63.4	29.3	93.9	669.3	55.0	145.8	870.2	6.9	4.1	880.6	285.1	38.4
Venezuela	92.1	10.1	102.4	145.6	26.4	9.2	181.8	12.5	17.5	211.8	125.6	22.1
Yugoslavia	68.1	40.3	109.0	57.5	80.0	20.1	158.6	15.1	2.5	176.1	165.1	19.2

TABLE A.1. (Continued)

Country	Beverages and Cocoa				Totals		
	Coffee	Tea	Cocoa	Total	Plant foods	Animal foods	All foods
Argentina	13.7	1.6	2.0	17.5	419.2	1044.1	1476.9
Australia	7.8	20.6	7.3	36.9	433.2	1200.2	1645.7
Austria	13.8	1.1	9.6	24.7	477.4	814.5	1298.4
Belgium*	50.5	0.0	8.7	59.2	451.7	840.8	1298.4
Brazil	118.2	0.0	6.5	124.6	495.4	318.5	817.4
Canada	30.8	8.8	5.4	45.9	421.0	1115.9	1543.5
Ceylon	0.9	7.9	0.0	8.9	344.4	58.8	403.7
Chile	6.0	7.5	0.9	14.9	416.9	405.2	828.4
Colombia	73.4	0.0	10.7	84.0	355.1	399.5	760.4
Denmark	77.4	1.7	6.0	85.3	471.1	1007.3	1483.5
Finland	69.7	0.0	1.5	71.3	389.8	915.3	1308.5
France	38.1	0.3	8.9	47.4	515.6	907.4	1432.7
Germany**	31.5	1.0	14.4	47.1	456.9	784.6	1248.7
Greece	7.5	0.0	3.3	10.7	600.0	415.2	1019.4
Honduras	45.8	0.0	0.8	46.5	434.3	210.6	653.0
India	0.7	2.2	0.0	3.0	287.6	64.1	353.8
Ireland	0.0	30.4	12.1	43.8	434.6	1022.2	1460.9
Israel	12.6	3.7	3.2	19.9	535.8	664.9	1206.5
Italy	16.7	0.3	4.2	21.2	565.5	432.8	1003.8
Japan	1.0	5.3	0.8	7.3	452.5	133.7	587.6
Libya	0.0	19.7	0.0	19.7	354.6	156.8	514.4
Mexico	10.1	0.0	2.7	12.9	318.4	328.8	650.8
Netherlands	40.1	6.1	48.9	95.9	505.2	755.4	1265.2
New Zealand	7.5	26.4	8.7	43.9	429.1	1509.2	1946.6
Norway	66.7	0.0	7.6	74.4	450.1	779.6	1233.1

TABLE A.1. (Continued)

Country	Beverages and Cocoa				Totals		
	Coffee	Tea	Cocoa	Total	Plant foods	Animal foods	All foods
Pakistan	0.0	1.7	0.0	1.7	348.0	143.8	494.7
Paraguay	0.0	0.0	0.0	1.0	394.6	442.0	851.0
Peru	5.7	0.7	3.2	9.7	423.3	192.5	622.0
Philippines	8.6	0.0	1.5	10.1	340.8	148.4	490.8
Portugal	10.9	0.0	0.8	11.7	510.3	241.5	757.7
South Africa	6.2	6.9	0.9	14.4	318.9	530.1	857.2
Spain	5.3	0.0	4.5	9.8	570.0	281.0	855.0
Sweden	84.1	1.0	6.4	91.7	443.3	852.5	1300.0
Switzerland	43.1	1.5	16.6	61.3	552.6	882.6	1441.1
Syria	3.9	3.4	0.0	7.6	473.7	380.7	859.3
Taiwan	0.0	2.2	0.0	2.2	423.9	161.1	586.5
Turkey	0.3	2.6	3.7	6.8	565.1	267.7	835.5
U. A. R.	1.4	6.3	0.0	7.9	444.0	163.3	612.4
U. K.	8.8	35.5	12.0	58.1	463.1	988.2	1457.2
U. S. A.	64.0	2.2	9.4	75.9	517.2	1103.6	1631.0
Uruguay	10.7	0.0	2.1	12.8	362.1	1228.4	1601.2
Venezuela	30.6	0.0	2.7	33.4	352.2	367.7	725.2
Yugoslavia	3.3	0.0	1.9	5.2	424.8	366.9	795.4

* and Luxembourg.

** Federal Republic.

Data sources: United Nations, *Food Balance Sheets*, issues of 1957-59 and 1960-62, FAO. For the procedure used for aggregation of commodities and the concept of international wheat units, see pp.   , Chapter III. All commodities are converted into the same form as which the international wheat units are based on. Data sources of conversion factors are: *ibid.*, and ________, *Technical Conversion Factors for Agricultural Commodities*, FAO (1960).

TABLE A.2. UNITED NATIONAS PURCHASING POWER PARITY RATES FOR U.S. DOLLAR AND PER CAPITA ANNUAL INCOME IN U.S. DOLLARS, AVERAGE OF 1958 and 1962.

Country	Domestic Currency	Parity Rate in Domestic Currency for one U. S. Dollar	Income[a] in U. S. Dollars
Argentina	peso	68.45	463
Australia	pence	93.12	1628
Austria	shilling	24.8	792
Belgium-Luxembourg	franc	49.25	1149
Brazil	cruzeiro	172.5	162
Canada	cent	101.5	1789
Ceylon	rupee	4.615	129
Chile	peso	1346.	413
Colombia	peso	6.33	265
Denmark	krone	6.08	1334
Finland	mark	426.	673
France	franc	4.23	1303
Germany (Fed. Rep.)	mark	3.62	1281
Greece	drackma	31.4	335
Honduras	lempira	2.125	185
India	rupee	4.7	71
Ireland	pence	71.76	665
Israel	agorot	185.	1068
Italy	lira	456.5	803
Japan	yen	316.	444
Libya	0.01 pound	33.1	168
Mexico	peso	11.75	341
Netherlands	guilder	2.855	1144
New Zealand	pence	69.12	1737
Norway	krone	5.735	1460
Pakistan	paise	470.	69
Paraguay	guarani	147.	91
Peru	sol	25.55	162
Philippines	peso	3.61	119
Portugal	escudo	22.95	311
South Africa	cent	55.9	525
Spain	peseta	50.215	422
Sweden	krona	4.65	1672
Switzerland	franc	3.855	1730
Syria	piastre	429.5	119

TABLE A.2. (Continued)

Country	Domestic Currency	Parity Rate in Domestic Currency for one U. S. Dollar	Income in U. S. Dollars
Taiwan	dollar	41.45	109
Turkey	piastre	615.	263
U. A. R.	piastre	34.8	156
U. K.	pence	73.68	1354
U. S.	cent	100.00	2508
Uruguay	peso	8.20	459
Venezuela	bolivar	4.81	675
Yugoslavia	dinar	525.	314

a/ U. S. dollars adjusted by the United Nations Purchasing Power Parity Rates.

Data Source:
United Nations, 1964 Yearbook of National Accounts Statistics (1965).

TABLE A.3-a. PRICE OF COMMODITY PER KILOGRAM IN DOMESTIC CURRENCY, 1960 PRICES.

Country	City a/	Period	Currency	Grains		White Potatoes	Sugar	Pulses	
				Wheat Flour	Rice			Beans	Peas
Argentina	Buenos Aires	1957-62	peso	7.85	18.19	5.85	18.49	20.71	45.33
Australia	Sydney	1957-62	pence	20.82	28.54	14.50	24.48	68.61	66.43
Austria	Vienna	1957-62	shilling	4.35	6.22	1.39	6.12	8.25	9.54
Belgium*	Brussels	1957-62	franc	15.68	17.62	2.63	13.94	16.10	15.70
Brazil	--	1958,66	cruzeiro	33.28	52.42	26.83	27.04	39.52	14.56
Canada	33 cities	1957-62	cent	19.23	40.81	9.28	21.97	35.86	n.a.
Ceylon	Colombo	1957-62	rupee	.54	.34	.70	1.36	n.a.	3.81
Chile	Santiago	1957,61,62	peso	146.38	271.60	129.57	213.33	342.22	338.28
Colombia	Bogota	1959,60,62	peso	1.71	1.89	.43	.99	4.65	n.a.
Denmark	Copenhagen	1957-62	krone	1.43	2.16	.49	1.20	3.48	2.21
Finland	Helsinki	1957-62	mark	88.50	146.74	21.58	117.99	n.a.	96.59
France	Paris	1957-62	franc	1.12	1.78	.29	1.14	2.10	1.68
Germany**	--	1957-62	mark	.86	1.02	.24	1.28	n.a.	1.35
Greece	Athens	1957-62	drackma	6.15	6.82	2.70	10.92	11.42	n.a.
Honduras	Tegucigalpa	1958,61,62	lempira	.57	.54	.43	.42	.42	n.a.
India	Delhi	1957-62	rupee	.44	.78	.55	1.11	1.02	n.a.
Ireland	Dublin	1957-62	pence	14.77	22.91	4.94	16.68	31.01	n.a.
Israel	--	1957,58,60-62	agorot	29.78	60.54	25.90	48.68	53.07	n.a.
Italy	Rome	1957-62	lira	135.18	191.74	53.76	235.27	213.42	n.a.
Japan	Tokyo	1957-62	yen	54.48	92.82	26.30	142.08	165.02	n.a.
Libya	Tripoli	1970	0.01 pound	2.97	3.47	5.70	2.48	8.92	7.93
Mexico	Mexico City	1957,60,63	peso	1.83	3.15	1.54	1.54	3.27	5.27
Netherlands	--	1957-62	guilder	.48	1.00	.22	.97	1.15	.67
New Zealand	Wellington	1957-62	pence	7.13	22.92	13.86	18.13	n.a.	52.22
Norway	Oslo	1957-62	krone	1.06	2.74	.47	1.32	2.91	2.42

TABLE A.3-a. PRICE OF COMMODITY PER KILOGRAM IN DOMESTIC CURRENCY, 1960 PRICES. (Continued)

Country	City a/	Period	Currency	Grains		White Potatoes	Sugar	Pulses	
				Wheat Flour	Rice			Beans	Peas
Pakistan	b/	1957-61	paise	48.98	58.91	93.44	146.81	50.24	n.a.
Paraguay	Asuncion	1957-62	guarani	10.77	13.92	9.68	11.77	14.03	18.41
Peru	Lima & Callac	1956,62,63	sol	3.41	2.74	1.38	1.71	4.76	4.97
Philippines	Manila	1959-62	peso	.61	.47	.71	.45	1.36	1.45
Portugal	Lisbon	1957-62	escudo	6.22	5.33	1.57	5.58	7.96	n.a.
South Africa	Capetown	1957-62	cent	10.32	26.10	12.90	10.99	36.75	n.a.
Spain	Madrid	1958-61	peseta	9.97	10.64	2.77	13.18	15.20	n.a.
Sweden	Stockholm	1957-62	krona	1.00	1.80	.62	1.41	2.42	1.53
Switzerland	Zurich	1957-62	franc	.75	1.21	.42	.85	1.23	1.30
Syria	Damascus	1960,62,64	piastre	30.03	65.32	32.51	100.97	100.71	75.16
Taiwan	Taichung	1957-62	dollar	6.58	5.48	1.71	8.30	11.37	14.70
Turkey	Istanbul	1957-62	piastre	124.45	294.83	88.18	306.38	n.a.	390.64
U.A.R.	Cairo	1957,59-62	piastre	3.62	3.22	3.62	7.42	8.78	8.49
U.K.	7 cities	1957-62	pence	15.33	26.74	7.12	16.82	32.26	34.24
U.S.A.	46 cities	1957-62	cent	24.53	41.09	12.80	25.61	38.00	n.a.
Uruguay	Montevideo	1962,63,64	peso	.88	1.41	1.14	2.26	3.74	2.33
Venezuela	5 cities	1959,62,65	bolivar	.94	1.44	.69	.91	1.44	1.38
Yugoslavia	20 cities	1959,60,65	dinar	77.63	192.60	33.00	155.81	95.93	146.44

TABLE A.3-a. (Continued)

			Fruits		Vegetables	
Country	Currency	Oil	Apple	Orange	Cabbage	Onions
Argentina	peso	31.06	15.01	11.32	6.67	8.89
Australia	pence	126.37	36.95	36.95	19.37	14.78
Austria	shilling	13.68	6.72	4.56	2.92	2.74
Belgium *	franc	31.31	13.28	22.79	9.77	6.43
Brazil	cruzeiro	116.50	270.40	57.60	30.60	39.50
Canada	cent	66.87	28.38	36.34	15.20	21.39
Ceylon	rupee	1.25	2.42	2.16	1.13	.62
Chile	peso	365.68	51.91	72.78	67.35	75.76
Colombia	peso	5.94	n.a.	.37	.48	1.04
Denmark	krone	2.29	2.26	2.45	.48	1.18
Finland	mark	429.00	138.00	159.00	43.00	107.00
France	franc	2.77	1.83	2.13	.60	.79
Germany **	mark	2.07	1.24	1.55	.45	.62
Greece	drachma	19.13	4.59	4.99	2.16	2.30
Honduras	lempira	2.17	3.01	.31	.32	1.07
India	rupee	2.23	1.15	1.15	n.a.	.36
Ireland	pence	22.22	33.86	29.17	5.64	16.57
Israel	agorot	106.85	187.08	24.03	51.63	30.23
Italy	lira	445.93	134.21	134.21	n.a.	73.97
Japan	yen	191.26	69.71	107.47	32.18	38.29
Libya	.01 pound	41.02	20.51	19.23	12.05	13.46
Mexico	peso	5.61	5.00	1.05	1.31	1.27
Netherlands	guilder	1.93	.77	1.37	.32	.33
New Zealand	pence	93.80	26.58	28.27	23.00	20.23
Norway	krone	5.77	2.92	2.62	.62	1.57
Pakistan	paise	458.00	169.00	169.00	186.00	186.00
Paraguay	guarani	70.51	45.55	15.22	15.90	10.78
Peru	sol	8.37	3.75	3.11	n.a.	1.28
Philippines	peso	1.89	1.99	1.72	.88	1.21
Portugal	escudo	14.18	12.53	14.64	2.00	2.03
South Africa	cent	57.54	25.89	10.15	5.91	14.71
Spain	peseta	24.33	8.90	9.41	2.99	3.13
Sweden	krona	7.72	2.10	1.92	.65	1.51
Switzerland	franc	2.54	.81	1.72	.52	.71
Syria	piastre	184.32	70.46	58.56	15.23	21.80
Taiwan	dollar	16.97	47.18	11.91	6.36	13.96
Turkey	piastre	637.44	424.40	207.72	98.88	89.69
U.A.R.	piastre	54.14	n.a.	2.60	n.a.	1.76
U.K.	pence	22.81	29.15	27.82	9.91	13.03
U.S.A.	cent	65.88	28.88	51.67	17.84	19.91
Uruguay	peso	4.65	2.32	1.44	.95	2.73
Venezuela	bolivar	3.77	3.90	.67	.64	.93
Yugoslavia	dinar	255.00	73.00	223.00	22.00	43.00

TABLE A.3-a. (Continued)

				Beverages and Cocoa		
Country	Currency	Milk	Eggs	Coffee	Tea	Cocoa
Argentina	peso	7.29	34.73	118.39	192.57	92.38
Australia	pence	21.35	100.45	292.66	178.64	184.13
Austria	shilling	2.24	21.97	86.55	119.73	45.42
Belgium *	franc	7.12	47.20	115.95	n.a.	95.33
Brazil	cruzeiro	21.63	119.05	136.66	249.60	141.44
Canada	cent	20.62	97.07	174.92	261.24	161.27
Ceylon	rupee	1.07	4.41	13.96	5.20	10.44
Chile	peso	111.16	763.10	2064.93	2064.84	1016.87
Colombia	peso	.78	8.53	2.96	n.a.	6.53
Denmark	krone	.75	6.19	18.98	29.72	15.56
Finland	mark	40.85	313.50	1022.10	n.a.	821.65
France	franc	.56	5.02	10.51	30.28	8.90
Germany **	mark	.44	4.11	18.10	30.41	9.69
Greece	drachma	5.24	30.69	76.85	n.a.	60.43
Honduras	lempira	.39	1.73	1.77	n.a.	1.64
India	rupee	.76	4.06	5.78	5.78	n.a.
Ireland	pence	10.73	110.09	n.a.	154.29	114.88
Israel	agorot	37.90	163.85	631.17	695.87	501.43
Italy	lira	92.75	639.77	2444.58	3117.12	1541.81
Japan	yen	81.88	242.37	523.26	525.23	683.44
Libya	.01 pound	3.96	18.74	47.57	29.73	24.78
Mexico	peso	1.57	10.57	15.48	n.a.	14.30
Netherlands	guilder	.39	3.09	6.55	8.53	6.15
New Zealand	pence	8.42	77.60	219.43	179.54	148.39
Norway	krone	.76	8.11	14.05	n.a.	11.43
Pakistan	paise	80.71	296.69	n.a.	830.35	n.a.
Paraguay	guarani	11.45	53.14	n.a.	n.a.	115.45
Peru	sol	2.90	12.44	13.06	39.22	23.04
Philippines	peso	1.21	2.26	5.56	n.a.	6.47
Portugal	escudo	3.55	22.09	61.51	n.a.	56.34
South Africa	cent	11.38	50.11	188.79	202.85	119.42
Spain	peseta	5.36	49.65	139.75	n.a.	93.47
Sweden	krona	.80	5.88	11.19	24.23	8.93
Switzerland	franc	.58	5.91	9.24	15.48	7.42
Syria	piastre	59.86	227.58	487.15	626.51	n.a.
Taiwan	dollar	16.12	39.01	n.a.	59.74	n.a.
Turkey	piastre	174.70	541.52	6029.34	3825.94	3832.85
U.A.R.	piastre	7.05	15.93	76.60	116.69	n.a.
U.K.	pence	14.09	71.67	197.26	173.30	117.81
U.S.A.	cent	27.10	95.96	177.03	352.80	157.05
Uruguay	peso	.97	4.63	9.03	17.72	5.75
Venezuela	bolivar	1.01	3.98	15.49	n.a.	10.31
Yugoslavia	dinar	51.85	472.48	1637.23	n.a.	953.75

TABLE A.3-a (Continued)

		Meats			
Country	Currency	Beef	Pork	Mutton	Fish
Argentina	peso	28.81	52.75	34.38	22.06
Australia	pence	171.77	144.84	57.17	90.51
Austria	shilling	48.95	34.76	17.49	21.55
Belgium *	franc	126.39	92.42	90.87	63.91
Brazil	cruzeiro	115.65	114.40	145.60	96.30
Canada	cent	220.43	163.33	168.24	61.65
Ceylon	rupee	5.29	3.13	5.09	6.30
Chile	peso	1448.13	1129.82	1068.82	271.54
Colombia	peso	5.77	5.95	5.84	6.24
Denmark	krone	10.45	9.21	8.56	2.35
Finland	mark	506.92	523.03	401.28	131.00
France	franc	11.16	6.39	12.91	2.38
Germany **	mark	5.90	6.56	4.70	1.87
Greece	drachma	27.27	24.44	26.40	13.83
Honduras	lempira	1.50	2.25	2.25	2.07
India	rupee	2.17	2.17	2.17	3.98
Ireland	pence	141.35	99.78	87.12	24.86
Israel	agorot	652.40	585.80	495.78	206.00
Italy	lira	1420.17	1239.65	1060.07	545.10
Japan	yen	554.30	530.87	270.93	109.06
Libya	0.01 pound	39.64	n.a.	45.10	14.45
Mexico	peso	13.59	14.84	14.69	12.40
Netherlands	guilder	5.00	4.79	4.00	1.29
New Zealand	pence	89.60	93.50	73.40	69.50
Norway	krone	17.01	12.43	9.83	2.90
Pakistan	paise	161.10	n.a.	275.42	354.00
Paraguay	guarani	32.86	31.08	25.19	43.21
Peru	sol	14.34	12.80	9.77	4.78
Philippines	peso	4.02	2.47	8.86	1.57
Portugal	escudo	30.34	30.88	20.51	16.15
South Africa	cent	71.57	79.88	76.42	21.97
Spain	peseta	69.22	72.71	51.41	32.43
Sweden	krona	13.77	9.05	8.86	2.87
Switzerland	franc	10.12	9.90	8.09	4.73
Syria	piastre	356.67	n.a.	392.46	259.27
Taiwan	dollar	28.17	43.54	41.70	34.84
Turkey	piastre	644.01	n.a.	684.91	510.01
U.A.R.	piastre	24.17	n.a.	28.01	18.04
U.K.	pence	143.44	119.34	92.08	68.19
U.S.A.	cent	307.43	199.45	162.65	72.98
Uruguay	peso	1.96	18.90	3.59	1.84
Venezuela	bolivar	5.37	5.59	3.25	3.86
Yugoslavia	dinar	472.37	408.21	330.38	291.00

TABLE A. 3-b. PRICE INDEX OF COMMODITY, GEOMETRIC MEAN OF U.S., JAPAN AND INDIA WEIGHTS.

Country	Grains	Pulses Oilseed	Fruits Vegetables	Coffee Tea Cocoa	Meats	Meats Fish	Plant Foods	Animal Foods	Total Foods
Argentina	84.6	110.1	70.5	139.7	45.9	45.7	94.6	50.9	75.0
Australia	125.7	217.6	147.6	152.5	104.4	124.4	150.5	125.1	135.9
Austria	100.6	98.8	79.0	251.6	107.0	118.3	103.0	86.2	95.9
Belgium	163.3	99.2	97.1	147.0	169.3	178.0	127.5	127.3	127.4
Brazil	116.1	73.0	136.9	70.0	58.4	67.7	112.2	68.0	90.5
Canada	133.2	105.8	115.0	134.6	146.5	116.6	124.0	110.0	118.4
Ceylon	47.2	141.6	158.3	126.8	78.4	128.0	108.8	128.0	109.5
Chile	71.2	60.5	23.6	92.4	73.0	49.9	63.2	47.3	58.0
Colombia	137.5	187.5	35.8	31.0	74.9	103.9	102.9	92.0	100.2
Denmark	138.5	101.4	117.0	248.4	125.2	88.9	128.4	79.1	108.3
Finland	128.3	107.4	112.0	150.0	90.6	66.5	120.4	60.0	94.5
France	160.0	120.7	151.7	278.9	191.0	134.0	150.0	101.8	130.5
Germany**	124.6	102.8	123.7	404.2	127.9	100.4	133.4	85.5	111.5
Greece	99.8	103.9	57.4	146.9	67.1	65.0	96.8	77.5	86.0
Honduras	128.3	103.0	79.5	64.8	76.1	102.8	109.4	101.1	101.8
India	59.9	70.2	84.7	73.7	37.4	71.9	76.5	83.1	74.9
Ireland	122.9	92.2	125.5	133.8	122.9	84.8	118.0	88.1	106.3
Israel	110.6	89.0	78.3	223.7	252.7	197.4	114.2	151.5	129.9
Italy	169.3	147.6	122.2	372.3	219.6	196.1	169.7	153.0	160.6
Japan	108.0	128.5	86.0	109.7	113.9	80.6	114.5	102.7	109.2
Libya	46.9	127.8	253.7	60.2	105.8	83.5	114.6	71.5	91.6
Mexico	98.1	93.9	52.8	83.1	99.0	122.1	87.5	98.6	91.5

TABLE A.3-b. Continued

Country	Grains	Pulses Oilseed	Fruits Vegetables	Coffee Tea Cocoa	Meats	Meats Fish	Plant Foods	Animal Foods	Total Foods
Netherlands	116.6	101.3	101.6	162.2	130.2	96.5	117.9	86.3	105.0
New Zealand	91.8	222.6	182.0	177.5	100.1	120.6	156.0	97.1	127.7
Norway	144.8	149.2	147.4	155.5	183.6	125.6	147.3	102.4	132.2
Pakistan	55.1	82.3	202.3	112.9	33.5	62.9	112.6	78.6	90.9
Paraguay	40.1	51.7	47.5	50.1	16.3	27.6	45.9	35.4	39.3
Peru	59.5	55.0	45.7	63.9	38.9	32.9	51.4	45.1	47.8
Philippines	74.3	101.5	192.7	96.0	105.9	83.8	113.0	112.6	106.8
Portugal	123.9	101.8	162.6	171.1	95.7	98.7	126.2	92.5	108.3
South Africa	143.0	182.4	77.0	215.0	110.1	82.2	145.3	91.5	123.1
Spain	99.5	84.8	62.6	171.1	103.7	98.5	91.4	80.9	86.1
Sweden	138.7	186.7	146.1	226.8	183.2	134.8	153.1	114.5	136.8
Switzerland	118.2	101.8	92.6	202.4	196.7	186.7	113.7	136.9	123.5
Syria	49.8	64.8	45.0	82.4	69.4	76.9	60.0	74.0	63.3
Taiwan	71.7	80.9	118.0	92.4	73.8	93.6	84.8	140.4	100.5
Turkey	151.1	177.7	128.8	484.5	86.5	100.8	187.5	121.2	151.6
U. A. R.	48.3	146.8	33.7	175.5	59.0	65.6	71.4	80.9	70.5
U. K.	131.9	93.1	135.6	153.3	129.4	131.9	129.0	117.0	122.2
U. S. A.	152.2	110.2	125.4	162.1	179.1	142.3	137.8	138.5	138.4
Uruguay	65.0	101.8	78.3	100.5	78.2	53.6	85.5	58.6	73.8
Venezuela	115.7	104.6	73.1	195.1	79.0	96.8	111.1	104.0	104.4
Yugoslavia	113.3	73.1	47.6	189.8	62.1	70.6	100.3	65.5	85.0

Footnotes for Tables A.3-a and A.3-b.

*and Luxembourg

**Federal Republic

[a] In case city is not listed, prices are measured as national averages.

[b] Arithmetic means of Dacca and Karachi.

n.a. = not available.

Principle data sources: International Labour Office, International Labour Review, Vols. 5, 76, 78, 80, 82, 84, 86, and 88, and ________, Bulletin of Labour Statistics, issues of Second Quarter of 1965, 1966, and 1970.

Prices are measured in the month of October. Prices are deflated by the CPI for food for 1960=100. Data for Libya are available only for 1970. The CPI for food in 1960 is estimated from those in the period of 1964-1970 using least squares in semi-logarithms.

The following two procedures are most frequently used to estimate price of a country where price data is not available but the country has a positive consumption. Procedure I: the price for country A is estimated by assuming it to be the same as that of its neighboring country B and is described as A(B). United Nations' Purchasing Power Parity Rates (UNPPPR)--presented in Table A.2 are used to convert the price into the domestic currency. Procedure II: price is estimated from 1950 price ratio to the U. S. price (M. Gilbert and associates, Comparative National Products and Price Levels, OECD (1958)). UNPPPR is used to convert the estimate into domestic currency. For the procedure used to construct prices for aggregated commodities, see p. 36, Chapter III. In case a zero consumption is observed for a commodity in a particular country, the commodity is dropped for the aggregation for the country.

Rice

Canada (U.S.) by Procedure I.

Pulses

The price used in estimating equation (3.5)--per capita cross-country demand function-- is the arithmetic mean of prices of beans and peas. The prices for the following countries are estimated by Procedure I: Denmark (Sweden); U. K. (Ireland).

Oil

Mainly the prices of peanut oil and olive oil, whichever is lower.

Fruits

The prices for the following countries located in the Southern Hemisphere are adjusted by using the U. S. seasonal index of the October/April ratio: Argentina, Australia, Brazil, New Zealand, Paraguay, Peru, South Africa, Uruguay (U. S. Department of Agriculture, Fruits Situation, Economic Research Service F S -151 (June 1964)). The price used in estimating equation (3.5) is the prices of oranges and apples, whichever is lower. For the following countries Procedure I is applied to estimate price: Australia (New Zealand), Pakistan (India). Price for Italy is estimated by Procedure II.

Vegetables

The prices in these countries located in the Southern Hemisphere are adjusted by the U. S. seasonal index as for fruits. (U. S. Department of Agriculture, The Vegetable Situation, Economic Research Service TVS-142 (October 1961) and TVS-150 (October 1963)). The price used in estimating equation (3.5) is the price of cabbages and onions, whichever is lower.

Beef

Price of sirloin without bone is used. If it is not available in the above form, the price is estimated by U. S. price ratios of sirloin to brisket and/or adjusted by appropriate conversion factors (U. S. Department of Agriculture, Conversion Factors and Weights and Measures for Agricultural Commodities, Statistical Bulletin No. 362 (1965).

Pork

Price of loin with bone is used. The adjustment procedure used for the prices other than the above form is the same as that of beef. Since the U. S. price ratios of loin to shoulder is not available, the Canadian price ratio is used.

Mutton

Price of leg with bone is used. The adjustment procedure used for the prices other than the above form is the same as that of beef. For the following countries the price of veal with bone is substituted for mutton price: Belgium-Luxembourg, Denmark, Finland, and Netherlands.

Fish

Price of fresh fish is used, mainly. However, in case the price is more than twice as high as the price of salted fish, the latter is used, instead. India price is that in Calcutta.

Eggs

Price for one egg is available. The price for one kilogram is estimated by multiplying the price for one egg by 18.

Coffee

For some countries the price of green coffee is listed. The price at the retail level is estimated by multiplying the price of green coffee by 2.5 (U. S. Department of Agriculture, U. S. Food Consumption, Statistical Bulletin No. 364 (1965), and United Nations, 1963 Trade Yearbook, FAO (1964).

Cocoa

The same conversion factor (2.5) is used to estimate the price at the retail level from the green cocoa price. In case price of cocoa with sugar is listed, the price without sugar is estimated from that with sugar by assuming the sugar content is 38 per cent and using the retail sugar price of the country.

TABLE A.4. ANNUAL FOOD PRODUCTION IN 1,000 METRIC TON INTERNATIONAL WHEAT UNITS.

		Grains				Potatoes							Total
Country	Period	Wheat	Rice	Other	Total	White	Sweet Cassava	Total	Sugar	Pulses	Nuts	Oilseed	Pulses Nuts Oilseed
Argentina	1934-38	6,634	68	6,715	13,432	296	184	485	779	60	0	604	644
Australia	1934-38	4,200	57	508	4,769	153	7	160	674	32	43	17	99
Austria	1934-38	417	0	1,016	1,434	1,271	0	1,271	187	17	16	3	39
Belgium*	1934-38	508	0	835	1,344	1,507	0	1,507	237	83	0	0	83
Brazil	1934-38	144	1,825	506	2,498	155	1,559	1,724	2,193	1,259	238	1,167	2,769
Canada	1934-38	7,169	0	5,470	12,651	856	0	856	90	104	0	20	127
Ceylon	1934-38	0	455	14	469	0	83	83	0	2	0	232	234
Chile	1934-38	851	15	207	1,075	194	0	194	1	192	0	2	194
Colombia	1934-38	106	132	371	609	108	259	369	529	100	0	9	110
Denmark	1934-38	383	0	2,228	2,614	603	0	603	242	12	0	0	12
Finland	1934-38	142	0	817	960	494	0	494	17	26	0	0	26
France	1934-38	8,142	0	4,866	13,018	7,667	0	7,667	1,432	358	1,084	55	159
Germany**	1934-38	2,522	0	5,594	8,126	8,945	0	8,945	677	112	0	54	175
Greece	1934-38	756	5	470	1,230	66	0	66	7	109	65	111	415
Honduras	1948-52	1	23	181	205	1	2	3	156	33	0	27	65
India	1948-52	6,087	44,636	12,224	63,580	691	728	1,428	6,939	8,365	11	10,985	19,431
Ireland	1934-38	178	0	488	666	1,154	0	1,154	84	5	0	0	5
Israel	1948-52	23	0	42	66	16	0	16	1	2	0	8	9
Italy	1936-39	7,551	1,028	2,736	11,362	1,214	0	1,214	537	1,311	3,256	1,736	6,699
Japan	1934-38	1,288	15,378	1,623	18,374	725	1,436	2,173	74	407	125	623	1,218
Libya	1948-52	11	0	64	76	3	0	3	0	6	81	7	98
Mexico	1934-38	374	101	1,243	1,724	30	17	47	1,363	266	0	258	536
Netherlands	1934-38	430	0	663	1,095	1,262	0	1,262	266	222	0	7	231
New Zealand	1934-38	183	0	56	239	54	0	54	4	17	0	0	16
Norway	1934-38	56	0	230	286	399	0	399	0	3	0	0	3

TABLE A.4. (Continued)

Country	Period	Grains				Potatoes			Sugar	Pulses	Nuts	Oilseed	Total Pulses Nuts Oilseed
		Wheat	Rice	Other	Total	White	Sweet Casava	Total					
Pakistan	1948-52	3,685	16,579	817	21,209	62	141	204	1,301	1,317	0	879	2,263
Paraguay	1948-52	1	20	81	103	1	223	225	44	30	0	54	86
Peru	1934-38	76	115	414	605	366	121	487	417	159	0	112	277
Philippines	1934-38	0	2,914	302	3,231	0	114	114	1,064	17	27	643	669
Portugal	1934-38	477	88	375	944	248	0	248	1	141	98	506	766
South Africa	1934-38	427	0	1,619	2,047	76	13	88	486	30	0	33	64
Spain	1931-35	4,392	392	3,180	7,994	2,239	29	2,269	422	777	1,609	2,480	5,143
Sweden	1934-38	696	0	1,663	2,360	825	0	825	306	56	0	0	56
Switzerland	1934-38	196	0	56	252	329	0	329	15	0	0	0	16
Syria	1948-52	761	17	316	1,098	15	0	15	4	119	16	137	279
Taiwan	1935-39	1	2,196	8	2,204	1	624	625	951	14	0	114	128
Turkey	1934-38	3,510	146	2,356	6,033	77	0	77	70	320	656	465	1,542
U.A.R.	1934-38	1,184	814	1,619	3,646	21	10	31	191	455	0	666	1,141
U.K.	1934-38	1,743	0	2,008	3,755	2,239	0	2,239	519	193	22	0	221
U.S.A.	1934-38	19,476	1,278	51,948	72,798	4,479	832	5,331	3,144	1,126	591	6,665	8,577
Uruguay	1934-38	365	22	140	527	5	19	24	138	8	0	8	17
Venezuela	1948-52	5	55	214	276	13	64	77	83	83	0	41	128
Yugoslavia	1934-38	2,467	5	4,048	6,520	729	0	729	2	222	163	85	500

TABLE A.4. (Continued)

Country	Fruits	Vege- tables	Total fruits, vege- tables	Red meats Beef	Pork	Mutton, other	Total	Poultry	Fish	Total Meats, Poultry, Fish	Milk	Eggs
Argentina	2,413	280	2,700	13,880	958	1,267	16,170	245	73	16,488	3,182	606
Australia	1,226	382	1,619	4,598	627	2,187	7,493	107	44	7,644	6,006	547
Austria	786	347	1,138	809	1,106	82	2,004	19	3	2,025	2,709	233
Belgium*	345	501	850	1,209	1,290	109	2,618	65	55	2,737	3,481	443
Brazil	3,812	594	4,477	8,260	2,417	450	11,162	250	137	11,549	4,286	594
Canada	513	543	1,062	3,193	2,001	259	5,475	415	1,005	6,895	7,349	931
Ceylon	25	221	246	213	7	136	361	4	70	435	47	16
Chile	787	185	967	920	127	293	1,352	32	40	1,424	378	47
Colombia	535	98	647	1,533	148	13	1,696	20	6	1,722	1,015	175
Denmark	149	166	318	1,396	2,318	61	3,786	124	118	4,028	5,678	652
Finland	64	49	114	536	331	68	940	6	59	1,005	2,773	111
France	13,481	5,390	18,956	7,536	4,158	1,772	13,556	1,042	612	15,211	16,410	2,241
Germany**	2,377	1,736	4,138	5,799	7,188	538	13,574	236	945	14,755	16,848	1,618
Greece	1,637	721	2,396	128	120	436	691	60	48	800	823	163
Honduras	471	15	487	136	35	7	180	5	3	183	107	40
India	7,166	1,088	8,346	1,456	176	1,894	3,526	210	910	4,700	18,182	276
Ireland	15	2,277	2,293	1,541	712	204	2,470	111	16	2,597	2,489	384
Israel	454	111	572	9	7	1	16	29	7	52	119	96
Italy	10,424	2,518	13,006	2,742	1,571	749	5,099	299	231	5,630	7,003	1,846
Japan	2,032	4,328	6,427	519	409	102	1,036	97	4,711	5,844	311	1,153
Libya	79	69	148	9	0	7	16	0	3	19	24	9
Mexico	1,290	259	1,507	1,234	409	106	1,768	270	23	2,062	1,668	562
Netherlands	335	807	1,149	1,158	1,219	116	2,503	36	338	2,877	5,518	699
New Zealand	121	79	201	1,414	338	1[illegible]3	3,479	13	33	3,525	4,990	[illegible]124

New Zealand

TABLE A.4. (Continued)

Country	Fruits	Vege-tables	Total Fruits, vege-tables	Red meats Beef	Pork	Mutton, Other	Total	Poultry	Fish	Total Meats, Poultry, Fish	Milk	Eggs
Norway	107	54	162	358	289	102	754	9	1,345	2,108	1,500	126
Pakistan	1,593	1,009	2,760	1,541	0	450	2,214	0	101	2,315	5,095	102
Paraguay	384	48	438	775	106	7	889	0	1	889	77	34
Peru	342	410	760	460	268	279	1,017	28	6	1,052	206	31
Philippines	814	370	1,265	281	874	402	1,570	134	1,072	2,778	54	239
Portugal	1,491	591	2,098	238	247	136	627	56	288	970	191	134
South Africa	754	209	970	1,856	211	729	2,825	46	70	2,942	985	110
Spain	7,686	2,625	10,398	1,311	1,036	1,056	3,443	306	513	4,262	2,071	543
Sweden	278	130	390	1,115	1,057	89	2,269	38	164	2,472	4,952	326
Switzerland	987	193	1,183	843	606	41	1,495	18	3	1,515	2,861	137
Syria	584	159	747	43	0	34	78	8	2	87	226	34
Taiwan	394	306	723	43	641	0	684	51	118	854	2	76
Turkey	2,886	578	3,482	869	0	675	1,563	93	101	1,757	2,485	300
U.A.R.	1,389	1,107	2.508	1,107	7	354	1,482	111	50	1,644	1,185	210
U.K.	636	2,098	2,748	5,075	2,960	804	8,887	373	1,452	10,712	8,992	2,294
U.S.A.	17,089	9,235	26,577	30,799	23,452	2,691	57,166	5,536	2,552	65,255	51,305	13,212
Uruguay	56	15	72	2,274	120	436	2,849	23	5	2,877	397	105
Venezuela	729	75	824	571	113	7	691	13	29	732	400	20
Yugoslavia	1,718	772	2,504	834	923	640	2,421	148	9	2,442	3,233	256

TABLE A.4. (Continued)

	Beverages and Cocoa				Totals		
Country	Coffee	Tea	Cocoa	Total	Plant foods	Animal foods	All foods
Argentina	0	0	0	0	18,211	20,581	39,362
Australia	0	0	0	0	7,273	14,483	21,935
Austria	0	0	0	0	4,153	5,058	9,259
Belgium*	0	0	0	0	4,114	6,805	10,974
Brazil	12,815	2	849	13,665	27,962	16,751	44,919
Canada	0	0	0	0	14,914	15,491	30,575
Ceylon	0	813	25	843	2,039	505	2,583
Chile	0	0	0	0	2,484	1,877	4,420
Colombia	2,226	0	72	2,298	4,646	2,984	7,651
Denmark	0	0	0	0	3,859	10,543	14,465
Finland	0	0	0	0	1,644	3,938	5,598
France	0	0	0	0	43,485	34,427	78,486
Germany**	0	0	0	0	22,543	33,859	56,704
Greece	0	0	0	0	4,196	1,812	6,053
Honduras	136	0	1	136	976	335	1,321
India	183	2,138	0	2,344	103,532	23,443	127,696
Ireland	0	0	0	0	4,286	5,586	10,037
Israel	0	0	0	0	667	270	944
Italy	0	0	0	0	33,620	14,716	48,455
Japan	0	386	0	386	29,736	7,356	37,230
Libya	0	0	0	0	348	52	401
Mexico	561	0	57	618	4,868	4,339	9,268
Netherlands	0	0	0	0	4,117	9,250	13,414

TABLE A.4. (Continued)

	Beverages and Cocoa				Totals		
	Coffee	Tea	Cocoa	Total	Plant foods	Animal foods	All foods
New Zealand	0	0	0	0	524	8,779	9,317
Norway	0	0	0	0	869	3,807	4,701
Pakistan	0	175	0	175	28,098	7,661	35,935
Paraguay	2	0	0	2	942	1,009	2,014
Peru	27	2	13	41	2,680	1,309	4,116
Philippines	18	0	5	24	6,713	3,092	9,903
Portugal	0	0	0	0	4,120	1,269	5,461
South Africa	0	3	0	3	3,712	4,105	7,928
Spain	0	0	0	0	26,474	6,983	33,615
Sweden	0	0	0	0	4,006	7,889	11,932
Switzerland	0	0	0	0	1,815	4,599	6,455
Syria	0	0	0	0	2,176	352	2,534
Taiwan	0	91	0	91	4,910	933	5,852
Turkey	0	2	0	2	11,433	4,622	16,124
U. A. R.	0	0	0	0	7,695	3,104	10,876
U. K.	0	0	0	0	9,728	22,405	32,351
U. S. A.	38	0	0	38	117,828	132,283	251,976
Uruguay	0	0	0	0	646	3,418	4,094
Venezuela	390	0	120	514	2,005	1,182	3,210
Yugoslavia	0	0	0	0	10,486	6,168	16,756

Footnotes for Table A.4.

Data sources: United Nations, Production Yearbook, issues of 1955, 1957, and 1969, FAO, with supplements of ________, Yearbook of Fishery Statistics, 1952-53, Vol. 4, Part I, FAO (1955); ________, Food Balance Sheets, issues of 1949, 1950, and 1957-59, FAO; and ________, Food Supply Time Series, FAO (1960). Production is measured as gross output, including seeds and feeds. For the procedure used in aggregating commodities and the concepts of international wheat units, see p. 36, Chapter III. All commodities are converted on the same basis used for the international wheat units (United Nations, Technical Conversion Factors for Agricultural Commodities, FAO (1960)).

Fruits

The Production Yearbook covers selected fruits. First, we aggregated quantitatively all fruits covered in the Production Yearbook. Second, we aggregated quantitatively all fruits including processed fruits (using conversion factors: dried x4= fresh; canned x1.2=fresh; juice x1.6=fresh) in the Food Balance Sheets. Then for those countries where the Food Balance Sheets total exceeds the total reported in the Production Yearbook the difference is considered as unspecified fruits. Finally the aggregation is made from the Production Yearbook and the unspecified fruits obtained by the procedure mentioned above using the international wheat units.

Vegetables

The Production Yearbook listed only a few selected vegetables. The principle data sources for vegetables are the Food Balance Sheets and the Food Supply Time Series. For some countries data are not available for the period in which other commodities are measured. Estimation is made by assuming that per capita production of vegetables are the same between the two periods, that is, the period in which the earliest data are available and the period in which other commodities are measured. The countries for which this estimating procedure is applied are as follows (the period in which the earliest data are available are presented in parentheses): Finland (1945-50), Colombia (1957-60), India (1961-60), Libya (1959), Mexico (1957-59), Peru (1957-59), Paraguay (1957-59), Philippines (1960-62), Spain (1957-59), Syria (1957-59), U. A. R. (1954-55), Venezuela (1957-59), Yugoslavia (1957-59).

Nuts

Since data is not available in the Production Yearbook, the data sources are the Food Balance Sheets and the Food Supply Time Series. For the following countries, nut production is measured for the period in parentheses: Greece (1948-53), Libya (1957-59), Philippines (1957-59), Spain (1957-59), Syria (1957-59), Yugoslavia (1957-59).

Oilseeds

Oilseeds include copra, cottonseeds, groundnuts, olives, palm kernels, rapeseeds, sesame seed, soybeans, and sunflower seed.

TABLE A.5. ANNUAL NET IMPORTS IN 1,000 METRIC TON INTERNATIONAL WHEAT UNITS.

Country	Period	Grains Wheat	Grains Rice	Grains Other	Grains Total	Potatoes	Sugar	Pulses	Nuts	Oilseed	Total Pulses Nuts Oilseed
Argentina	1934-38	-3341	66	-5232	-8314	31.1	-2	3.0	0	100	102
Australia	1934-38	-2787	-21	-58	-2868	-0.8	-502	1.5	0	40	44
Austria	1934-38	244	62	393	691	6.9	3	9.1	22	158	195
Belgium*	1934-38	1069	105	991	2149	18.0	24	65.0	0	306	374
Brazil	1934-38	990	-111	-31	839	1.1	-49	-0.6	-175	-64	-256
Canada	1934-38	-4722	45	-87	-4781	-24.0	506	-7.6	33	518	548
Ceylon	1934-38	25	1090	3	1151	5.5	9	33.3	0	-176	-115
Chile	1934-38	-11	31	-82	-59	-2.2	143	-93.7	0	58	-21
Colombia	1934-38	15	27	0	43	0.1	13	6.0	0	12	19
Denmark	1934-38	268	14	320	593	-11.2	-3	25.7	0	370	398
Finland	1934-38	103	27	89	218	1.5	107	0.1	0	44	43
France	1934-38	148	1253	664	2096	29.2	132	176.8	-49	2564	2688
Germany**	1934-38	1330	202	1109	2629	548.3	79	107.3	0	2926	3042
Greece	1934-38	447	60	41	549	1.4	93	30.2	-11	-64	-44
Honduras	1948-52	11	1	-2	9	-0.1	-25	-2.3	0	0	-5
India	1948-52	2160	1598	486	4303	3.6	-28	46.9	0	-416	-368
Ireland	1934-38	4266	6	267	4529	-14.6	49	3.0	5	28	39
Israel	1948-52	171	8	48	227	7.7	38	7.6	0	66	74
Italy	1936-39	492	-302	224	385	-20.9	4	52.9	-711	780	122
Japan	1934-38	-97	3563	178	3743	-18.1	881	163.3	0	1096	1269
Libya	1948-52	15	4	-9	10	1.2	15	0.1	0	-8	-7
Mexico	1934-38	19	-27	22	12	0.5	2	-5.9	0	48	38
Netherlands	1934-38	587	64	924	1550	-138.0	84	-76.5	0	600	519
New Zealand	1934-38	39	8	8	56	-2.8	92	-10.1	0	12	1
Norway	1934-38	219	10	200	426	-0.3	104	9.1	0	166	176

TABLE A.5. (Continued)

Country	Period	Grains				Potatoes	Sugar	Pulses	Nuts	Oilseed	Total
		Wheat	Rice	Other	Total						Pulses Nuts Oilseed
Pakistan	1948-52	36	-125	<1	-91	1.5	148	-0.3	0	38	38
Paraguay	1948-52	42	<1	-1	41	0.2	<1	0.8	0	-4	-5
Peru	1934-38	128	41	2	173	0.1	-355	0.0	0	-18	-18
Philippines	1934-38	107	68	0	178	5.0	-1010	10.6	0	-576	-558
Portugal	1934-38	13	31	30	75	3.4	80	1.5	-60	162	84
South Africa	1934-38	10	119	-233	-80	-1.4	-229	-1.5	0	128	126
Spain	1931-35	57	-68	73	57	-26.8	14	9.1	0	-288	-278
Sweden	1934-38	-14	23	75	82	2.2	10	4.4	0	262	312
Switzerland	1934-38	460	33	306	799	18.7	189	-21.9	33	92	109
Syria	1948-52	-108	21	-62	-148	1.9	20	0.0	0	4	4
Taiwan	1935-39	47	-1387	0	-1379	0.0	-1064	6.5	0	40	46
Turkey	1934-38	-80	<1	53	-14	-0.1	50	-66.5	-150	-34	-267
U. A. R.	1934-38	6	-202	17	-185	8.2	32	9.1	11	-218	-203
U. K.	1934-38	5456	237	3048	8666	68.3	2125	216.2	443	2184	2481
U. S. A.	1934-38	-537	-64	120	-348	-7.6	3122	-18.1	482	2138	2714
Uruguay	1934-38	-72	<-1	3	-69	10.6	64	0.5	2	50	54
Venezuela	1948-52	152	35	14	202	16.7	54	15.1	0	32	47
Yugoslavia	1934-38	-238	33	-347	-536	-0.1	1	-45.4	-5	10	-37

TABLE A.5. (Continued)

Country	Fruits	Vege-tables	Total Fruits, vege-tables	Meats Beef	Meats Pork	Meats Mutton, other	Meats Total	Poultry	Fish	Total Meats, Poultry Fish	Milk	Eggs
Argentina	194	0	194	-5245	-155	-348	-5765	0	13	-5752	-139	-23
Australia	-290	-1	-291	-1047	-113	-613	-1794	-74	32	-1837	-1645	-46
Austria	228	23	252	102	233	34	371	18	12	401	-63	30
Belgium*	260	39	302	85	7	7	99	0	62	162	336	-64
Brazil	-337	0	-337	-911	-21	-3	-935	0	34	-901	5	-1
Canada	304	-10	293	-43	-550	41	-550	-9	-132	-692	-396	-6
Ceylon	4	24	28	0	2	7	9	0	45	54	11	0
Chile	-4	-8	-11	9	0	-68	-59	0	0	-59	-2	-2
Colombia	-141	0	-141	35	-4	1	32	0	1	61	2	0
Denmark	202	0	202	-392	-1480	2	-1872	0	-82	-1954	-2419	-480
Finland	124	0	124	-3	-21	-2	-26	0	-4	-30	-259	-50
France	831	77	926	94	-7	95	184	0	53	238	-12	69
Germany**	648	154	809	119	782	-20	881	69	-75	875	292	180
Greece	-650	1	-650	102	1	102	209	<1	36	245	14	7
Honduras	-409	0	-409	-68	-35	1	-102	0	<1	-102	-58	1
India	131	-32	97	0	0	0	0	0	-30	-30	106	0
Ireland	55	7	63	-1159	-275	-68	-1506	-32	-12	-1534	-372	-116
Israel	-204	2	-202	77	1	7	85	0	-26	59	93	17
Italy	-644	-285	-944	358	-35	20	343	19	131	493	-213	58
Japan	15	-24	-9	111	0	1	112	0	44	157	20	-5
Libya	-2	0	-2	6	0	5	12	0	0	12	7	-1
Mexico	-219	<1	-218	-115	3	1	111	0	-130	-242	8	3
Netherlands	406	-212	170	94	-289	-27	-222	0	-81	-305	-1915	-413
New Zealand	57	1	58	-630	-190	-1[illegible]	-2175	0	-3	-2178	-31[illegible]	-12
Norway	76	5	81	3	3	[illegible]	12	0	-619	-606	-31	-6

TABLE A.5. (Continued)

				Meats								
Country	Fruits	Vegetables	Total Fruits, vegetables	Beef	Pork	Mutton, other	Total	Poultry	Fish	Total Meats, Poultry Fish	Milk	Eggs
Pakistan	41	6	47	0	0	0	0	0	-9	-9	9	0
Paraguay	-9	0	-9	-93	0	-1	-95	0	1	-95	4	0
Peru	14	<1	14	9	3	1	12	0	1	13	11	1
Philippines	10	14	24	26	7	7	40	0	20	60	56	7
Portugal	-4	-5	-7	1	-3	-136	-138	0	-26	-166	2	-3
South Africa	-206	0	-206	-51	7	-1	-45	0	7	-39	-77	-12
Spain	-1180	-77	-1264	10	-1	4	13	0	34	47	9	203
Sweden	78	5	83	-9	-106	14	-100	5	17	-78	-338	-23
Switzerland	110	46	158	34	35	20	91	0	5	96	-183	82
Syria	22	0	22	-26	0	4	-20	0	0	-20	-24	-6
Taiwan	-242	0	-242	0	0	0	0	0	83	83	24	0
Turkey	-484	0	-484	-60	0	-61	-123	0	-19	-141	-12	-33
U. A. R.	84	-103	-20	7	0	2	9	0	9	18	51	-23
U. K.	2797	400	3221	4837	3791	3080	11823	176	-36	11964	9181	1211
U. S. A.	567	48	649	579	-303	7	262	0	325	592	225	64
Uruguay	19	<1	20	-1192	-7	-61	-1263	0	0	-1263	-2	-16
Venezuela	21	<1	21	26	21	61	109	9	1	120	201	51
Yugoslavia	-136	-5	-141	-68	-113	-7	-188	-60	-4	-252	-23	-70

TABLE A.5. (Continued)

Country	Beverages and Cocoa				Totals		
	Coffee	Tea	Cocoa	Total	Plant foods	Animal foods	All foods
Argentina	202	15	34	252	-7708	-5931	-13905
Australia	17	23	44	86	-3546	-3599	-7204
Austria	51	3	44	99	1257	363	1640
Belgium*	437	2	67	507	3402	444	3854
Brazil	-7752	1	-778	-8528	-8358	-897	-9294
Canada	152	139	79	383	-3029	-1111	-4164
Ceylon	12	-780	-25	-795	234	66	300
Chile	28	15	5	50	77	-64	-33
Colombia	-2036	0	20	-2016	-2099	36	-2061
Denmark	247	5	29	282	1468	-4931	-3427
Finland	182	1	1	184	686	-341	328
France	1636	10	294	1942	7878	296	8152
Germany**	837	22	335	1197	8374	1364	9763
Greece	56	2	10	68	17	267	286
Honduras	-57	0	0	-57	-490	-164	-661
India	-16	-1488	0	-1506	1844	72	1943
Ireland	3	81	11	96	4777	-2056	2587
Israel	10	3	6	19	166	174	341
Italy	329	1	62	392	-62	299	237
Japan	43	-135	11	-64	5787	172	5962
Libya	2	16	0	18	36	18	55
Mexico	-323	0	5	-318	-507	-229	-741
Netherlands	319	82	425	836	3010	-2655	365
New Zealand	2	351	11	396	606	-5384	-4847
Norway	157	2	21	18[illegible]	975	-647	1[illegible]

TABLE A.5. (Continued)

	Beverages and Cocoa				Totals		
Country	Coffee	Tea	Cocoa	Total	Plant foods	Animal foods	All foods
Pakistan	0	-66	0	-66	76	1	77
Paraguay	3	0	0	3	29	-91	-61
Peru	-27	5	2	-19	-196	26	-168
Philippines	31	2	10	43	-1504	125	-1363
Portugal	46	2	3	51	290	-167	93
South Africa	125	49	8	186	-161	-131	-331
Spain	231	1	75	307	-1213	261	-939
Sweden	426	3	39	469	964	-444	512
Switzerland	138	6	53	198	1487	34	1480
Syria	11	0	0	11	-91	-52	-143
Taiwan	0	-82	0	-82	-2758	111	-2644
Turkey	44	7	1	53	-689	-188	-886
U. A. R.	68	56	2	130	-295	47	-243
U. K.	125	1515	670	2386	19817	22744	42767
U. S. A.	2540	295	1709	4579	11111	905	12036
Uruguay	19	2	4	25	110	-1287	-1175
Venezuela	-222	1	-105	-325	16	376	401
Yugoslavia	58	2	7	67	-651	-348	-1012

Data Sources: United Nations, Trade Yearbook, issues of 1957 and 1962, FAO, and _____, Food Balance Sheets, issues of 1949 and 1955, FAO. For the procedure used in aggregating commodities and the concepts of international wheat units, see pp. , Chapter III. All commodities are converted on the same basis used for the international wheat units (United Nations, Technical Conversion Factors for Agricultural Commodities, FAO (1960), and U. S. Department of Agriculture, Conversion Factors and Weights and Measures, Statistical Bulletin No. 362 (1965).

Vegetables

For the following countries only net imports of onions are available: Finland, Denmark; Mexico; Spain.