AN ANALYSIS OF CONSUMPTION AND IMPORTS OF BREAD GRAINS IN SEVERAL EUROPEAN COUNTRIES

by

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ABSTRACT

The object of this study has been to carry out an analysis of demand for bread grains in twelve Western European countries, to project the demand to 1966 and to match it against possible increases in production. The demand for bread grains was separated into two components, that entering directly into human consumption as flour and that consumed indirectly in all other forms. Direct consumption was projected on the basis of anticipated changes in population and income, it being assumed that tastes and relative prices would exert a negligible influence on quantities consumed. The quantity of bread grain disappearance for purposes other than direct consumption in 1966 was estimated from the trend in the percentage milled into flour to total bread grain consumption.

The level of domestic production in 1966 was obtained by calculating the average annual production during 1955-59, and supposing that production would increase during the period of the study by the same percentage amounts as those by which per capita income growth rates were projected. Thus, the import requirement estimates for 1966 were obtained as the difference between the predicted levels of total consumption and domestic production.

The results of the study indicated income elasticity coefficients in the European Economic Community which ranged from zero in Belgium-Luxembourg and Western Germany to -0.32 in the Netherlands; the coefficient for Austria was estimated at -0.20 amd the elasticity

coefficients for the other five countries of the study were in the range of -0.85 for Switzerland to -1.84 for Denmark. Comparison of direct consumption estimates using the coefficients calculated in this study with those calculated by using a United Nations-Food and Agriculture Organization average coefficient of -0.42 gave quite similar results for the nations as a group, but considerable variation in estimates for individual countries. The study indicated that direct consumption of bread grains will decline by 1966 for the area as a whole. The amount of bread grains used for purposes other than human consumption was forecast to increase. However net increases in consumption appeared to be easily offset by possible increases in production so the most likely estimates for 1966 indicated a decreased import requirement for the study countries as a group.

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INTRODUCTION

This study is concerned with analyzing the market for bread grains in twelve Western European countries including Austria, Belgium, Denmark, France, Western Germany, Italy, Luxembourg, the Netherlands, Norway, Sweden, Switzerland and the United Kingdom. During the five year period 1955-59, all of these nations with the exception of France, Italy and Sweden were net importers of wheat and rye.[1]

This group of nations comprises a large part of the Canadian wheat market. Total Canadian wheat and rye exports in the five year period 1956/57-1960/61 were 41,946,500 metric tons; of this amount these nations purchased 24,262,200 metric tons, or 57.8 per cent of the total.

Economic integration is now taking place within the area with the formation of the European Economic Community.[2] New agricultural policies are emerging from this integration. It has recently been decided that a common market for all agricultural produce will be in existence by December 31, 1969 within the Community.

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1. Net exports of the latter two have been small. See Table 3 p. 58

2. These countries, also known as the "Common Market" countries, are Belgium, France, Western Germany, Italy, Luxembourg and the Netherlands.

The basic concept of EEC agricultural policy as it affects grain imports is that a guaranteed domestic price will be set for each kind of grain and imports to the area may not be sold for less than the domestic price within the Common Market. The difference between import and domestic prices will become part of a fund, which will be used to assist adjustment in the farm community, to stabilize prices and to subsidize exports.

Western Europe - particularly the Common Market area - has been experiencing rapid economic growth and development. Income and population have been rising rapidly and the index of gross agricultural production has increased from 93 in 1952/53 to 113 in 1959/60. The index of food production per capita in Western Europe increased from 95 to 109 in the 1952/53-1959/60 period (1952/53-1956/57 = 100).[1]

This study, which includes wheat and rye together as bread grains, is designed to evaluate the effects of the most important factors on bread grain consumption and to measure expected European domestic production, with the object of estimating the gap which will have to be filled by imports in 1966.

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1. Food and Agriculture Organization, The State of Food and Agriculture 1961, Rome, 1961, 143-4. The 1959/60 figures are preliminary.

CONCEPT OF DEMAND

> Demand for a good is defined as the various quantities of it which consumers will take off the market at all possible alternative prices, other things being equal. The quantity which consumers will take will be affected by a number of circumstances, the most important ones being (1) the price of the good, (2) consumer's tastes and preferences, (3) the number of consumers under consideration, (4) consumer's incomes, (5) the prices of related goods..... [1]

Accordingly, demand is distinguished from desire for a good. Effective demand may be described as the functional relationship between price and the quantity removed from the market, to distinguish it from the more nebulous "desire", which need not include the necessary purchasing power.

Leftwich thus tells what demand is, and what are the factors responsible for its change in the long run. He does not tell why goods are demanded. Although he indicates the factors which can influence demand, he does not indicate in this quotation the basic reasons for changes in quantity demanded from time to time. Before discussing such reasons, it is necessary to introduce two elementary facets of demand theory: First is the concept of a demand schedule, and second is the distinction between changes in quantity demanded and changes in demand.

> There is one general law of demand:-The greater the amount to be sold, the smaller must be the

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1. Richard H. Leftwich, The Price System and Resource Allocation, Revised Edition, New York, Holt, Rinehart and Winston, 1955, 27.

> price at which it is offered in order that it may find purchasers ..... The demand prices on our list are those at which various quantities of a thing can be sold in a market during a given time under given conditions.[1]

A demand schedule is thus a relationship between all possible prices and all possible quantities, given the period of time and given the neutral effect on demand of all other variables. In a geometrical representation, with price on the vertical axis and quantity on the horizontal axis, such a demand schedule slopes downward from left to right. This assumption is the usual one in respect of the shape of demand curves. Several logical reasons are apparent for believing such a slope to be the probable one. When, for example, price falls, people who were previously unable to buy will enter the market. If price falls, some people will buy the good in preference to other goods which they previously bought but which, as a result of the price fall, have become relatively more expensive. Then, too, some people, who bought the good before its price fell, will buy more of it now that it is relatively cheaper. These common sense observations are guides but are not, however, sufficiently inclusive or basic to provide a sound theory of demand. Such a basis can be provided by a consideration of utility and preference scales.

Utility

"Utility is taken to be correlative to Desire or Want".[2]

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1. Alfred Marshall, Principles of Economics, Eighth Edition, London, Macmillan, 1920, 84.

2. Marshall, 78.

It is thus the capacity of any economic good to satisfy a need or wish. There is, however, a limit to the want-satisfying capacity of any good, even though there is an endless variety of wants. This general principle, now known as the law of diminishing marginal utility, may be expressed as follows: The total utility of a good to its possessor increases with increases in quantity. There comes a point, however, beyond which the increments of utility from each unit of the good will be less than the increment of utility from the previous unit.

The law of diminishing marginal utility is the basis for the conventional slope of the demand schedule. It can be used to explain why a price fall induces some persons, who had not previously purchased a good, to enter the market. Entry occurs when the marginal utility of a good in terms of money exceeds that of the money necessary to acquire it. As price declines, the money price eventually falls below the marginal utility of the good in terms of money, at which point the individual enters the market. This phenomenon, the purchase of a good only when its marginal utility in terms of money exceeds its money price, may also be used to explain a shift in consumption toward the good whose price has fallen, and to explain the tendency of those who are in the market to purchase more following the price fall.

The marginal utility of money, like that of any other good, tends to diminish with increases in the size of an individual's stock. When the price of a good falls, other things being equal, there is a rise in the real incomes of persons who have been buying

the good. For those persons, the marginal utility of money can be expected to fall. The decrease in the marginal utility of money tends to affect the consumption of all goods[1] - the one whose price fell included. There are, thus, two effects of a decrease in price. One is a substitution effect, which tends to increase consumption of the good whose price has fallen, and the other is an income effect, the result of which varies with the magnitude and direction of any response of quantity to income change. The combined income and substitution effect of a price change is known as the price effect.

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1. J.R. Hicks, A Revision of Demand Theory, Oxford, Clarendon Press, 1956, 19-21 and Chapter IV.

It is necessary, at this point, to make reference to Hicksian "strong ordering" and "weak ordering".

> If a set of items is strongly ordered, it is such that each item has a place of its own in the order; it could, in principle, be given a number, and to each number there would be one item, and only one item, which would correspond..... Weak ordering, on the other hand, allows for the possibility that some items may be incapable of being arranged in front of one another.

Hicks thinks of weak ordering as dividing goods into groups, which are not ordered within. Each group, however, is strongly ordered with respect to other groups.

It is apparent in the real world that the income effect of a price fall does not normally increase the quantity consumed of each good which displays a positive income elasticity and which was included in the budget before the price fall. Neglecting indivisibility, this is, nevertheless, the conclusion to which one is drawn if strong ordering is assumed. Thus, it is useful (with Hicks) to assume only a system of weak ordering, for this makes it possible to explain the situation in which a price fall leads to expansion of consumption of one or several goods, with quantities of other goods remaining unchanged.

Marshall deduced the downward slope of the demand curve from the law of diminishing marginal utility. He assumed, however, a constant marginal utility of money, thereby circumventing the income effect of a change in price. Hicks points out that by this, Marshall really meant that the demand for such a commodity is independent of income. Marshall had "quite good reasons for [generally neglecting the income side, and] ..... the constancy of the marginal utility of money is in fact an ingenious simplification, which is quite harmless for most of the applications Marshall gave it himself".[1] The assumption of constantcy is harmless when the proportion of income spent on a commodity is so small that changes in its price exert a negligible effect on total income, and in turn, a negligible effect on the marginal utility of money.

Utility and Preference

Marshallian demand theory assumes that individuals attempt to maximize total utility. Thus, it also assumes that the consumer is always aware of - and is able to evaluate - the possibilities open to him.

> The concept of utility and its maximization are void of any sensuous connotation. The assertion that a consumer derives more satisfaction or utility from an automobile than from a suit of clothes means that if he were presented with the alternative of

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1. J.R. Hicks, Value and Capital, Second Edition, Oxford, Clarendon Press, 1946, 27.

> receiving as a gift either an automobile or a suit of clothes, he would choose the former.[1]

Such a concept of utility is thus equivalent only to a postulate of rationality.

Marshall, however, considered utility to be measurable; that is "the consumer.... was assumed to be capable of assigning to every commodity or combination of commodities a number representing the amount or degree of utility associated with it."[2] A postulate of rationality assumes only an ordinal utility measure. The consumer need only be able to rank commodities in order of preference. As long as the consumer's order of preference is consistent (i.e., if he prefers X to Y and Y to Z, he also prefers X to Z), the assumption of ranking of preferences (ordinal utility) is sufficient.

The ideal consumer thus has a definite scale of preferences. Since he is affected by nothing other than current market conditions, he

> .....chooses that alternative, out of the various alternatives open to him, which he prefers, or ranks most highly..... The choices he makes always express the same ordering, and must therefore be consistent with one another... [Any] apparently inconsistent behaviour must be capable of explanation in terms of the ways in which the actual consumer differs from an ideal consumer; that is to say, it must be explicable in terms of changes in other variables than

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1. James M. Henderson and Richard E. Quandt, Microeconomic Theory, New York, McGraw-Hill, 1958, 6.

2. Henderson and Quandt, 6.

current prices (or incomes).[1]

Hicks[2] shows how the preference concept can be developed in terms of indifference curves, which necessitate only the ordinal assumption.

Indifference Curves

A given level of utility can be obtained by using goods in many different combinations. This is shown graphically by Hicks[3] in the case of two goods by an indifference curve which is the locus of all combinations of the two goods which yield the consumer the same amount of satisfaction. Indifference curves correspond to higher levels of satisfaction, the farther one moves upward and to the right. The manner in which one is able to show the effect on consumption of a change in one of the variables influencing demand is demonstrated in, for example, Stonier and Hague.[4] However, the effects of such a variable will differ depending on the way in which the goods are related to each other.

Complementarity and Competitiveness

A suitable manner in which to describe complementarity

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1. Hicks, A Revision of Demand Theory, 18.

2. Hicks, Value and Capital, Chapter I.

3. Hicks, Value and Capital, 15 (Figures 1 and 2).

4. Alfred W. Stonier and Douglas C. Hague, A Textbook of Economic Theory, London, Longmans, Green and Company, 1953, 49-70.

is one in which only three goods, X, Y and Z, are initially being consumed. Assume a fall in the price of X, and a "compensating variation" in income just sufficient to offset the fall. Though he is neither better nor worse off at the new equilibrium, the consumer may be purchasing more X, less Z and more Y. If such is the case, Y is complementary with X against Z. It is impossible, however, for both Y and Z - at the same time - to be complementary with X. Whenever there is a given number of goods, at least one of these goods must be competitive with the one whose price fell.

A competitive good can be described by discussing a situation in which a consumer, at equilibrium, is again buying various amounts of X, Y and Z. Assume a fall in the price of X, the the prices of Y and Z remaining constant and a compensating variation in income. Because of the substitution effect, the consumer then buys more of X. In the normal case, he also buys less of Y and Z. When such a situation occurs, "Y is competitive with X against Z, and Z is competitive with X against Y."[1]

Price Elasticity of Demand

"The elasticity (or responsiveness) of demand in a market is great or small according as the amount demanded increases much or little for a given fall in price, and diminishes much or little for a given rise in price".[2] Marshall defined elasticity of

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1. Stonier and Hague, 80. The discussion of competitive and complementary goods follows closely that of Stonier and Hague, 80-4.

2. Marshall, 86.

demand as the percentage change in quantity divided by the percentage change in price - the line of causation being from price to quantity.

Except in special circumstances,[1] the demand curve does not maintain the same elasticity throughout its length. Accordingly, the elasticity coefficient may be determined for a point on a demand function or as an average for a segment of a function. A measure of price elasticity at a point on the demand function is known as a measure of point price elasticity of demand, to contrast it with a coefficient of arc price elasticity of demand which is measured over a range on the function. The arc elasticity of demand is more generally used in practical work because it is possible to take the averages of the beginning and end quantities and prices and to use these data in determining the elasticity coefficients.[2] This precludes the problem of differing coefficients due to different reference points of price and quantity, which arises when such averages are not used in the calculation of arc elasticities.

The coefficient of price elasticity of demand is negative because any change in price is associated with a change in quantity

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1. These circumstances are (i) a perfectly inelastic demand function, e = 0, (ii) a perfectly elastic demand function, e = -infinity, and (iii) a demand function in the form of a hyperbola with rectangular coordinates, e = -1.

2. $e_p = \frac{dQ}{Q_1+Q_2} \times \frac{P_1 + P_2}{dP}$

where e_p = coefficient of price elasticity of demand.
Q = quantity
1,2 = first and second observations
p = price
d = difference

in the opposite direction. When elasticity is equal to minus one, changes in price and quantity occur at the same rate and total revenue (price times quantity) is constant along that segment of the function. When the coefficient of price elasticity is less than minus one, demand is said to be elastic, in which case the relative change in quantity is larger than the relative change in price. Demand is inelastic when the coefficient of price elasticity is between zero and minus one.

Income Elasticity of Demand

The coefficient of income elasticity of demand is a measure of the responsiveness of consumer purchases to changes in income, and is defined as the percentage change in purchases of a good divided by the percentage change in income responsible for the change in purchases. It "has the important advantage of being a non-dimensional number, independent of units of measurement and consequently directly comparable between products and between countries."[1]

The income elasticity coefficient may be either negative or positive. It is important, however to stress the significance of several possible values of the coefficient. A coefficient of zero indicates that purchases of the good are independent of the income level. A good exhibiting a negative income elasticity coefficient is called an inferior good, since purchases of it decrease with increases in income. Within the range of positive elasticity

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1. United Nations and Food and Agricultural Organization co-operating, European Agriculture in 1965, ST/ECE/AGRI/4, Geneva, 1961, 36.

coefficients, which indicate increased purchases with increased income, a coefficient of one means that the proportion increases with increasing income when the coefficient is greater than one and decreases with increasing incomes when the elasticity coefficient is less than one.

> It seems reasonable to think that a good with an income-elasticity greater than one..... is in some sense a luxury; and a good with an income-elasticity of less than one.... is in some sense a necessity.... One cannot... give a precise definition of necessities and luxuries in terms of income-elasticities of demand, but the notion that goods with income-elasticities greater and less than one are in a general sense luxuries and necessities respectively seems a useful one.[1]

In determining the coefficient of income elasticity, purchases of a good may be defined in either of two ways. Purchases may be expressed in terms of physical quantities, thereby providing an income elasticity of quantity of consumption. Alternatively, an income elasticity of expenditure may be determined, relating percentage change in expenditure on a good to percentage change in income. The question then arises of the relevant considerations in choosing one or the other of these elasticity coefficients. Wold discusses the two in the light of " (a) the material available for the alternative methods, (b) general relations between the variant elasticities, (c) differences in the interpretation and application of the elasticity variants."[2]

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1. Stonier and Hague, 72.

2. Herman Wold with Lars Jureen, Demand Analysis, New York, Wiley, 1953, 219.

To secure quantity data, it is necessary that the good be capable of precise definition regarding quality and variety. Different goods, which cannot be aggregated on a physical basis, must be dealt with in value terms.

Wold indicates factors which may make the quantity elasticity smaller than the expenditure elasticity. Particularly relevant is that when

> ....a commodity is available in different varieties... an increase of income... will induce the consumers to shift toward more expensive qualities, with the result that demand variations will be smaller if measured by quantities than by expenditures.[1]

Schultz also deals with the difference between these coefficients in an analysis designed to reconcile results of quantity and expenditure studies of income elasticity.[2] He indicates that a processed good tends to display a higher income elasticity coefficient than the raw product. This arises because the elasticity coefficients for the services added in processing are usually higher than the coefficient for the raw product. The conclusion is thus similar to that of Wold, namely that expenditure coefficients tend to be higher than quantity coefficients for processed goods.

Both the expenditure and quantity elasticities show the relation between demand and income. "The expenditure elasticity measures the demand from the standpoint of purchasing power... The

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1. Wold and Jureen, 219.

2. Theodore W. Schultz, The Economic Organization of Agriculture, New York, McGraw-Hill, 1953, 55-63.

quantity elasticity refers rather to the physical satisfaction of demand....."[1] The former is more suited to applications to the marginal propensity to consume out of income. The latter refers to the physical consumption of a good, and is accordingly applicable to studies concerned with the standard of living and the claims that may be made on agricultural resources due to changed incomes. Therefore, the use to be made of the coefficients must be considered since, as is indicated, "the two variants answer somewhat different questions."[2]

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1. Wold and Jureen, 220.

2. Wold and Jureen, 220.

PRINCIPLES OF MEASUREMENT

An analysis of demand involves first of all an examination of the basic relationship between the forces which constitute the basis for demand; this aspect of the analysis relies largely on economic theory, and is exemplified in the above discussion of the concept of demand. The second aspect is the determination of the specific quantitative relationships between the variables; that is, to calculate numerical values of the parameters by which the variables are related. This process involves selecting a quantitative method which is applicable. In the matter of the selection of a quantitative technique, the important decisions centre around the choices between single and simultaneous equations and between cross-sectional and time-series data.

Simultaneous versus Single Equation Techniques

The single equation technique of measurement is one which expresses the dependent variable as a function of one or several independent variables. When demand is stated as a linear function of one or several variables, the equation is of the form $Y = a + b_1X_1 + \ldots + b_nX_n$ where Y is the number of units of the dependent variable such as consumption, X_i is the number of units of an independent variable such as income or price, a is a constant and b_i indicates the change in Y for a given one unit change in X_i.[1]

It is possible, however, that a linear demand function

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1. $i = 1, 2, \ldots n$.

may not describe the functional relationships, which may be more closely approximated by other mathematical functions such as the exponential type, which is linear in the logarithms.

The multiple equations technique, which assumes the simultaneous determination of a set of economic variables, may also be used. The philosophical basis of such a technique has been summarized as follows:

> In scientific research - in the field of economics as well as in other fields - our search for "explanations" consists of digging down to more fundamental relations than those that appear before us when we merely "stand and look". Each of these fundamental relations we conceive of as invariant with respect to a much wider class of variations than those particular ones that are displayed before us in the natural course of events. Now, if the real phenomena we observe day by day are really ruled by the simultaneous action of a whole set of fundamental laws, we see only very little of the whole class of hypothetical variations for which each of the fundamental variations might be assumed to hold..... For the variations we observe, it is possible to establish an infinity of relationships, simply by combining two or more of the fundamental relations in various ways. In particular, it might be possible to write one economic variable as a function of a set of other variables in a great variety of ways.[1]

The multiple equations method takes into account the fact that economic variables such as quantity of consumption may be determined jointly and simultaneously by a system of relationships. Single equation analysis of the relationships between economic variables which cannot be clearly defined as independent and dependent gives a wider spectrum of possible results than those which

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1. Trygve Haavelmo, The Probability Approach in Econometrics, Econometrica, XII, Supplement (July, 1944), 38-9.

actually exist. In addition, the attempt to approximate such systems of equations by single equation methods results, Haavelmo contends, in biased parameters: But he also says that

> .... modern economists have stressed very much the necessity of operating with relations of the mutual-dependence type, rather than relations of the cause-effect type. However, both types of relationships have their place in economic theory; and, moreover, they are not necessarity opposed to each other.[1]

This quotation is consistent with Wold's justification of the single equation technique on the basis of a recursive model of economic relationships, in which events are unilaterally and casually determined by prior events. In cases where relationships are of the cause-effect rather than the mutual-dependence type, use of the single equations technique in demand analysis is entirely satisfactory.

"The main statistical method used for the estimation of demand functions is least-squares regression analysis".[2] The fact that the single equation technique of demand analysis is so closely bound up with least-squares regression makes it necessary to discuss both the applicability of least-squares regression and the philosophical basis of the single equation technique. Wold's discussion of least-squares analysis emphasizes the features of efficiency and accuracy inherent in the method.

In respect of accuracy, he notes that ".....least-squares regression will under general conditions be unbiased when applied

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1. Haavelmo, Econometrica, XII, Supplement, 22.

2. Wold and Jureen, 16.

to a single relation."[1] The necessary condition which makes this statement true is that the residuals not be correlated with the independent variables.

> It is a general property of the residuals of least-squares regression that they are uncorrelated with the regressors, but not with the regressand. In recursive systems the assumed noncorrelation between the disturbance .... and the explanatory variables... will therefore assure that least-squares regression is applicable without bias.[2]

Essentially neglecting the philosophical argument of whether relations are unidirectionally or simultaneously determined, Fox[3] shows that the results obtained by simultaneous and single equation approaches are very similar. He points out that "..... there are certain cases, particularly in the analysis of demand for farm and food products, where simultaneity is of limited importance."[4] He indicates elsewhere,[5] for example, that the extent to which consumer income is affected by changes in price or quantity of a particular agricultural product is negligible. Thus, the introduction of such income change in a separate simultaneously determined equation is unnecessary.

The fact of the several end-uses for a product is a factor favoring use of the simultaneous equations approach. Again Fox points out, specifically in relation to price elasticity, that

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1. Wold and Jureen, 49.

2. Wold and Jureen, 51.

3. Karl A. Fox, Econometric Models of the United States, Journal of Political Economy, LXIV, No. 2 (April, 1956).

4. Fox, Econometric Analysis for Public Policy, Ames, Iowa State College Press, 1958, 12.

5. Fox, The Analysis of Demand for Farm Products, United States Department of Agriculture, Technical Bulletin, 1081, 1953, 2.

such various end-uses need not preclude single equation methods: "For major commodities having two or more major end uses.... valid single-equation measurements may sometimes be obtained by deriving a statistical relation for each of the separate outlets".[1]

Klein indicates that, in single equation measurement, least-squares bias can be avoided if cases are selected ".... in which the causation pattern is likely to be one-way from the explanatory or independent variables to the dependent variables."[2] Only when this condition is not fulfilled, and when such nonfulfillment results in significant bias, is the multiple equations system more suitable than the single equation method.

Wold's concept of recursive economic relations, which are causally determined by prior events, permits him to state that ".... the least-squares regression coefficient b is that unbiased linear estimate which is of optimal efficiency; i.e., its standard error is the smallest possible."[3] The least-squares method thus has the advantages of

> ..... being highly flexible as regards the underlying assumptions and very simple as regards the numerical computations.....The final conclusion must be.... that the regression analysis as traditionally applied is essentially sound. In demand analysis, at least, it can still be safely recommended.[4]

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1. Fox, The Analysis of Demand for Farm Products, 2.

2. Lawrence R. Klein, An Introduction to Econometrics, Englewood Cliffs, New Jersey, Prentice-Hall, 1962, 67-8.

3. Wold and Jureen, 54.

4. Wold and Jureen, 59.

Cross-Sectional versus Time-Series Data

There are two basic sources of data on which a demand analysis can be built. One source is time-series data of market statistics. With such data, the parameters are estimated on the basis of variations in economic quantities over time. "We could equally well base our estimates on a different type of variation, namely, spatial, instead of time, variation arising from inter-individual differences at a given point of time."[1] The latter method makes use of cross-sectional or family budget data.

Cross-Sectional Data

Economic time-series analysis assumes that different time periods "..... are homogenous, except for differences in the explicit variables of the system we measure..... In the analysis of cross-section data, we assume that different people are homogeneous....."[2]

Family budget data are dealt with as if they had come from a controlled experiment, in which consumer income was the independent variable and expenditure on various commodities was the dependent variable. Thus, the information relates to how families at different income levels respond rather than the response of the same family at different income levels. However, this is no

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1. Klein, 53.
2. Klein, 55.

more serious an obstacle to interpretation than that of other studies where the data is obtained by sampling and the results are interpreted within confidence intervals.

"What is recorded in family budget data is usually the expenditures on the specified items of the budget. In some cases, however, supplementary information is given about the quantities purchased of the various items."[1] Thus with cross-sectional data - as with time series - two separate elasticity coefficients can be calculated. One is the income elasticity coefficient of quantity of consumption, which expresses the percentage change in quantity of consumption associated with a one percent change in income. The other is an income elasticity coefficient of expenditure, which expresses the percentage change in expenditure on a good associated with a one percent change in income.[2] Choice between the two coefficients rests on considerations of the data available and on the way in which the coefficients are to be applied.

A significant feature of cross-sectional samples for a single time period is that the price variable is held constant. Although the choices and the prices paid by individuals may vary as a result of quality differences and product differentiation, all consumers are faced with the same set of market alternatives during the period.

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1. Wold and Jureen, 219.

2. T.W.Schultz, 69. These terms correspond, respectively, to Schultz' elasticity of physical consumption and elasticity of value of consumption.

Two considerations are important in evaluating budget data for demand analysis. First, the consumer units must be such as to accurately reflect consumer habits within each stratum. It is important to note, therefore, that

> ..... we cannot determine with complete exactness the weights that should be attached to the average quantities when summing the various strata, a source of error that might well result in considerable deviation, since there are large differences in consumption habits of different social classes.[1]

In spite of these shortcomings, Wold points out that results from budget data have not been notably different from those obtained by the use of market statistics. For this reason, he concludes that either method is valid in demand analysis.[2]

Time-Series Data

Whether calculated from budget or time series data, the income elasticity coefficients which are of primary concern to demand analysis are long term elasticities. The difference between long and short term coefficients arises from the fact that it normally takes a period of time for consumers to accustom themselves to changes in income. Consumers tend to have a different pattern of consumption immediately following a change in income than that which they exhibit once they become accustomed to the new income level.

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1. Wold and Jureen, 255.

2. Wold and Jureen, 257.

Income elasticity coefficients derived from budget data tend to be of the long term type because consumer incomes for a large group are not likely to increase or decrease sharply. Thus, income changes may generally be regarded as small in relation to existing income differences between families. One can therefore assume that families have largely accustomed themselves to the income level at which they are recorded.

In time series analysis, the elasticity coefficient is closely related to the problem of using trend-free data. Trends may be removed by regression analysis relating the raw data with time, and recalculating the trend-free data as deviations from the line of regression. Wold[1] points out that the use of trend-free data results in short term coefficients, while data including trends provide a compromise between short and long term coefficients, since they include both the trends and short run deviations from the trends. Therefore, removal of trends prior to estimation of long term elasticity coefficients is not desirable, even though a strict estimation of such coefficients necessitates disregarding short term fluctuations in the variable under analysis. If used in demand analysis, methods such as first differences and link relatives, which provide coefficients closely comparable to those obtained by trend removal, "... have the character of emergency measures that may be used as a last resort if the regressand is affected by trend factors other than those of the regressors."[2]

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1. Wold and Jureen, 240-2.

2. Wold and Jureen, 242.

Nominal coefficients of price and income elasticities are, by definition, those calculated from actually observed data of prices and incomes. Real elasticity coefficients are those calculated from nominal values divided by a consumer price index. Although conversion to real values of price and income is obviated by the nature of the family budget method, it is customary in time-series demand analysis to work with the real values. Deflation is carried out because the theory of demand assumes that measurement in monetary units provides a well defined scale and consistent use of real values of price and income serves to eliminate changes in the value of the monetary unit.

METHODOLOGY

The single equation, least-squares method has been used in the analysis. The assurance that simultaneity is of little significance in demand analysis of farm products[1] was one reason for the choice. Wold's preference of the single equation over the multiple equations technique because of the accuracy and efficiency of the former was an added reason.[2] However, bread grains are used for animal feed, seed and industrial purposes as well as for bread; since the demand functions for each of the uses are likely to be quite different, the two uses were separated for purposes of analysis. A linear trend relationship over the period for the percentage consumed in each form was established. Having separated out consumption in forms other than flour, a single equation was used to determine income elasticity coefficients for flour consumption in each of the various countries. The choice of time series over cross-sectional data was based on the requirement for this study of an income elasticity coefficient of quantity of consumption, the availability of quantitative time series consumption data and the suitability of time series data to demand analysis and projection.

Bread grains Consumed Directly as Flour

Schultz states that the assumptions underlying time

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1. Above, 19.

2. Above, 18-20.

series analysis of market statistics are the following:

> .... (1) that there exists a routine in the demand behavior of human beings; (2) that the statistical data of consumption and prices are such as to reflect this routine of demand; and (3) that the unknown theoretical demand function can be approximated by various empirical curves.[1]

These assumptions, particularly with respect to regularity in demand behavior, form basic tenets of demand analysis, and provide a basis for the empirical calculations. It is important to note that the variables affecting quantity consumed are of two types. One type includes factors which shift the curve as a whole, such as changes in population, tastes and income. The other type is a change in the amount purchased when there is a change in the price of bread grains relative to the price of all other goods available to the consumer. Factors which shift the demand curve are called changes in demand in contrast with a change in relative prices, which leads to a change in quantity demanded, and consists of a movement along a given demand curve.

Population

Schultz indicates the desirability of limiting the analysis to the effect of two or three variables, then continues with this statement: "Accordingly I have preferred to reduce the number of variables by dividing the total consumption series by the

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1. Henry Schultz, The Theory and Measurement of Demand, Chicago, University of Chicago Press, 1938, 133.

figures for population.... before submitting them to mathematical treatment."[1] Consequently, this study has used per capita data of bread grains consumed as flour.[2] These data were calculated as "net food supplies per person per year - cereals as flour (in terms of flour and milled rice)" in kilograms. The inclusion of grains other than wheat and rye is not serious since the consumption per capita of milled rice and other cereals in Western Europe is quite small.[3]

A demographic study[4] of the area has been used to provide an estimate of population in 1966. For most of the nations of the Organization for European Economic Cooperation (OEEC), the publication presents three population projections corresponding to "average", "pessimistic" and "optimistic" expectations of the rate of population change. In the case of several of the countries (Western Germany, Italy, the Netherlands and the United Kingdom), a fourth estimate, including the effect of projected migration, has also been made .

Since the estimates of population growth were published in 1956, it is now possible to make an assessment of the accuracy of these projections in the light of actual population changes. The most accurate projection, based on a comparison with actual 1959

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1. H. Schultz, 150.

2. Food and Agriculture Organization, Production Yearbook, Annual.

3. See, for example, Organization for European Economic Cooperation, Food Consumption in the OEEC Countries, Part I, Paris, November 1960 (Restricted).

4. Organization for European Economic Cooperation, Demographic Trends in Western Europe 1951-1971, Paris, 1956.

data projected from 1959 to 1966 at the 1953-59 rate of population growth, has been selected. In all countries in which an OEEC estimate of population in 1966 was not used as presented by the indicated publication, 1966 population was calculated as an average of the "most accurate" projection by OEEC and the population level obtained by projecting the 1959 population datum to 1966 at the 1953-59 rate of increase. Such a method has the advantage of giving recognition both to the considerations embodied in the specialized demographic study and to factors which have manifested themselves more recently in a change in the rate of growth.

The quantity of bread grain consumption was assumed, in this study, to vary directly with the level of population. Although abstracting from changes in the age, geographical and occupational distribution of the population, the usefulness of the results is not likely thereby to be impaired within a time period equivalent to that considered in this study.[1]

Tastes

"For staple agricultural commodities .... tastes are not likely to change rapidly."[2] For this reason, and because there are no satisfactory means of empirically identifying taste changes, they were not taken into account in this study.

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1. Fox, Econometric Analysis for Public Policy, 136-9

2. H. Schultz, 143..

Relative Prices

Movement along a demand function, as distinguished from movement of the function, occurs when the price of bread grains changes relative to the prices of competing goods. These price changes are of two kinds; (1) changes in the price of bread grains relative to the price of other food, and (2) changes in the price of food relative to nonfood goods and services. In order to deal with the first of these, bread grains have been defined to include wheat and rye. This grouping avoids the problem of substitutability which results in consumption shifts between the two cereals when their relative prices change. Such a grouping also tends to lower the price elasticity of demand for both goods since the ".... price elasticity of demand is lower for a large group of products than for one component of the group because of the possibilities of substitution within the group."[1] The more inelastic is the demand for bread grains, the less their consumption will be affected by price changes relative to other foods. Working stated that the ".... elasticity of demand for wheat for actual consumption is so small that even after years of effort devoted to refining the data, no trustworthy measurement has been obtainable."[2] Henry Schultz derived a price elasticity of demand of -0.08

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1. United Nations and Food and Agriculture Organization cooperating, European Agriculture in 1965, 44.

2. H. Working, The Elasticities of Demand for Wheat, read before the meeting of the Econometric Society held in Chicago, Illinois, December 28-30, 1936, and summarized in Econometrica, V, no. 2 (1937), 185.

for wheat in all uses.[1] Demand was shown to be more elastic for rye, but the calculated coefficients included demand for uses such as feed and seed in addition to human consumption.[2]

In respect of the second relationship, the evidence is that relative price changes have not occurred during the period. This conclusion has been reached by a comparison of the index of retail food prices with the price index of all consumer goods. The comparison was concerned with differences arising between the indices, rather than an examination of the index of retail food prices in itself, since the price of any good is only meaningful in relation to the prices of other goods.

One of the greatest divergences between these two indices (1953=100) occurred in Western Germany, where, in 1954, the index of retail food prices rose two index points above the index of all consumer goods prices. However, from that point until 1959 (the last year for which these data are available), the indices exhibited no further net divergence, the food price index being two points above the consumer goods price index in 1959 as well. Therefore, since relative prices have been nearly constant, the changes in the amount consumed have been assumed to be determined solely by the growth of population and income.

Incomes

Certain commodities tend to stay fairly constant in their physical composition

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1. H. Schultz, 390.
2. H. Schultz, 495-501.

> as farm products, but may change substantially in value at the point at which consumers buy them, reflecting the amount and kind of nonfarm services added in processing, handling, delivering, and serving these products as food.[1]

A measure of the income elasticity of quantity rather than value consumption was calculated because this study is concerned with the demand for bread grains without the processing and other marketing services. The elasticity coefficient was calculated by relating per capita flour consumption to per capita real income. The consumption data (dependent variable), as "net food supplies per person per year - cereals as flour (in terms of flour and milled rice)" were those calculated by the Food and Agriculture Organization: The income statistics were in the form of estimated real national income per capita per year in domestic currencies, derived as follows: From estimates of national income, mid-year population and consumer price index numbers, the real level of national income in each year was calculated by dividing total national income by the consumer price index. The real national income figures were, in turn, divided by mid-year population data, to give an estimate of real national income per capita per year in domestic currency.

Any of a number of functions could have been used to measure the income elasticity coefficients. Two functions frequently used in demand analysis[2] are the linear function, $Y=a + bX$ and

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1. T. W. Schultz, 68.

2. United Nations and Food and Agriculture Organization cooperating, European Agriculture in 1965, Annex I, Table 36. Five functions and the formulae for deriving elasticity coefficients from each are shown. In addition to the above, the indicated functions are the semi-logarithmic, log-inverse and log-log-inverse functions.

the logarithmic function, log Y = a + b log X. The former has the advantage that it is easy to work with in an analysis. It was rejected, however, because the linearity assumption is "... only a convenience and must at times be sacrificed in favor of reality".[1] The logarithmic function is better in several ways. First, it assumes a constant percentage change in consumption associated with a given percentage change in real income, while the linear function assumes a constant absolute change in consumption associated with a given absolute change in income; of the two, the former seems more realistic. Furthermore, scatter diagrams of consumption and income showed that, in several countries, a logarithmic function would describe the data better than a linear function.

The logarithmic function was chosen over other nonlinear functions because it gives a constant elasticity coefficient over the range of available data, which extended over a time period of eleven or twelve years. During this period, per capita real incomes increased by amounts ranging from 12.0 to 56.9 percent.[2] Thus, the income range was not great enough to presuppose anything other than constant income elasticity coefficients. The logarithmic function was therefore fully as useful as any other nonlinear function, and more suitable than a linear relationship.

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1. Klein, 22.

2. The percentage increase in real per capita income during the eleven or twelve year period, based on the level in the final year of the period, is as follows for each country of the study: Austria 45.1; Belgium-Luxembourg 26.3; Denmark 12.8; France 34.4; Western Germany 56.9; Netherlands 28.5; Norway 12.0; Sweden 16.5; Switzerland 24.3; United Kingdom 12.3.

The standard error of estimate of the regression coefficient (s_b) was calculated to obtain a measure of the influence of factors other than income, and from the s_b value the confidence intervals about b were calculated. For each country, therefore, three regression coefficients, at b and at 95 percent confidence intervals above and below b, were determined.[1] All three estimates of income elasticity were included in the calculations of flour consumption. Such a method provided a prediction of direct bread grain consumption over a range which took into account the confidence limits in the income elasticity coefficient. In addition a fourth estimate of the income elasticity coefficient, the average for the European area, was used. The coefficient, which is -0.42 for all countries of the study, ".... corresponds to a combination of typical analyses of time series carried out separately for different countries".[2] Use of this coefficient, a quantity elasticity, enabled a comparison of consumption and import estimates when coefficients relative to each country were used and when an average elasticity coefficient was used for all countries.

In addition, for each income elasticity coefficient, three estimates of consumption were calculated corresponding to low, medium and high rates[3] of future income growth. Thereby, twelve

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1. This excepts the two countries whose coefficients did not differ significantly from zero.

2. United Nations and Food and Agriculture Organization co-operating, European Agriculture in 1965, 41.

3. 1.5, 3.0 and 4.5 percent per capita per year, respectively.

estimates of the level of flour consumption in 1966 were computed for all those countries for which three income elasticity coefficients had been calculated. These estimates arose because three rates of growth of income were applied to each of the three calculated elasticity coefficients and to the UN-FAO elasticity coefficient.

Indirectly Consumed Bread Grains

Disappearance of wheat and rye in any form other than as flour was termed indirect consumption and was measured in percentage terms as follows:[1] The total quantity of cereals consumed as flour, in each year from which data were obtained, was calculated by applying population estimates to the per capita data of bread grains consumed as flour. Statistics on gross supplies of wheat and rye entering consumption in all forms were also available.[2] From those two quantities the proportion of total bread grain consumption as flour in each year was calculated. In all countries except three[3], a linear trend line[4] relating time to the percentage of

1. United Nations, Economic Bulletin for Asia and the Far East, XI, No. 1 (1960), 12-4. The Japanese study reported here calculated the quantities of bread grains required for seed and wastage as a percentage of total requirements, and made no attempt to relate indirect consumption to any of the demand variables. A coefficient of income elasticity for wheat of -0.1 was used in the 1969 projections made therein.

2. Food and Agriculture Organization, Production Yearbook.

3. The countries were Belgium-Luxembourg, Denmark and Western Germany, in each of which a trend was not applicable. For these countries, the average nonflour consumption for the most recent five year period was used to project 1966 indirect consumption.

4. $Y = a + bX$, where X = time in years and Y = percentage of total bread grain consumption as flour.

total wheat and rye disappearance as flour was projected to 1966. For the countries for which such a trend was calculated, the percentages at the appropriate t value times the standard error of estimate above and below the projected percentage were determined to give the 95 percent confidence limits, as a basis for judging the accuracy of the calculated figures.

Total consumption of wheat and rye was thus calculated by dividing total flour consumption in 1966 by the percentage of bread grain consumption as flour in 1966. This method furnished a maximum of thirty six estimates of total bread grain disappearance for 1966. The maximum number of estimates were made for those countries for which the study calculated three estimates of indirect consumption, utilized four income elasticities, and applied to each of the latter the three projected rates of income growth.

Projected Import Requirements

In order to predict 1966 import requirements of wheat and rye, an estimate of quantities domestically produced was necessary. Such an estimate was made by projecting from 1959 to 1966 the average 1955-59 production in each country. In accordance with the three assumptions of 1.5, 3.0 and 4.5 percent annual increases in real per capita incomes, it was assumed that domestic bread grain production would increase at the same rates over the period 1959-66. The import requirements were then determined by subtracting from each estimate of total requirement the relevant estimate of domestic production.

Import requirements for the individual countries were also aggregated, to obtain the 1966 import requirement for the entire area. The table showing 1966 import requirements[1] and the several other tables presented in the thesis provide a means of explaining the results of the study, and of comparing them with the conclusions arrived at by other studies of a similar nature.

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1. See Table 3, page 58.

RESULTS

The results are presented in two parts. The first is a discussion of the significant features of the variables which were used to determine the 1966 import requirement for each country.[1] The discussion also includes an assessment of the implications of these variables and of the agricultural situation on agricultural imports. Following this, an assessment of the results for the group of countries and a comparison of the results with those of a United Nations-Food and Agriculture Organization study of European agriculture[2] were made.

Results for Individual Countries

Austria[3]

Direct Consumption

Austria has shown, in the period 1953-59, the slowest rate of population growth of any of the twelve countries considered. Nevertheless, the increase which has occurred since 1951 has exceeded the highest projection made by the Organization for European Economic Cooperation.[4] The growth of population used in this study

1. A detailed description of the method of calculating the 1966 import requirement is included in the Appendix; see page 76.

2. United Nations and Food and Agriculture cooperating, European Agriculture in 1965.

3. See Table 9, page 76.

4. Organization for European Economic Cooperation, Demographic Trends in Western Europe, 1951-71.

was 0.5 percent for the period 1959-66. The 1966 population figure was an average of the highest Organization for European Economic Cooperation estimate of population growth and the estimate obtained by projecting the 1959 population datum to 1966 at the annual rate of growth, 1953-59, of 0.2 percent.

The effect of projected changes in per capita income was estimated by using four income elasticity coefficients of demand for bread grains for human consumption in Europe. These coefficients were the one calculated in this study and at 95 percent confidence intervals above and below that figure, and the United Nations-Food and Agriculture Organization calculated coefficient of -0.42. In this study the income elasticity coefficient for Austria was calculated to be -0.20. For all of the twelve estimates of direct consumption the negative elasticity coefficients applied to the assumed rates of income growth influenced the forecast of direct consumption more than enough to offset the effect of population growth. The result is that 1966 direct consumption may be expected to decrease between 0.4 and 14.7 percent from 1959 to 1966.[1]

Indirect Consumption

The projection of trends in consumption gave an estimate of direct consumption in 1966 as 54.4 percent of total disappearance.[2]

1. The level of direct consumption in 1959 has been estimated by the average of the 1957-59 period. In later references to 1959 direct consumption levels, the reference is also to the 1957-59 average.

2. The standard error of estimate was 3.6 percentage points which gave a range of 62.4 to 46.4 percent at 95 percent confidence limits.

Import Requirements

Austria has moved toward greater self-sufficiency in wheat production as compared to pre-World War II levels, and self-sufficiency continues to be encouraged by government policy.[1] Attempts to increase further the production of hard wheat have been made, since the Austrian need is chiefly for high quality bread grains. Assuming the medium import requirement and the 3.0 percent annual rate of income and production growth, the net deficit of wheat and rye is expected to decrease by 1966.

Belgium-Luxembourg[2]

Direct Consumption

Population estimates for Belgium-Luxembourg in 1966 were calculated separately for each country, then aggregated. One calculation for Luxembourg was derived from the Organization for European Economic Cooperation estimate which had been made for 1971 only. The 1966 estimate was obtained by interpolating between the 1951 population figure and the highest 1971 estimate by assuming a constant percentage rate of growth. The Organization for European Cooperation highest estimate of 1966 population in Belgium was added to the estimate for Luxembourg obtained as above to give a projected total for Belgium-Luxembourg in 1966.

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1. Canada Department of Agriculture, Economics Division, Agriculture Abroad, XIV, No. 5 (October, 1959), 6.

2. See Table 9, page 76.

Another estimate of the 1966 population level was obtained by projecting 1959 levels of population in Belgium and Luxembourg to 1966 by their respective 1953-59 growth rates of 0.6 and 1.1 percent annually. The average of the level so obtained and of the estimate derived from the Organization for European. Economic Cooperation projections was used as the estimate of 1966 population in Belgium-Luxembourg. The result was a calculated increase in population of 2.4 percent from 1959-66.

In calculating per capita incomes for the two countries, the national incomes expressed in the monetary units of each country were added together.[1] The real national income per capita was then obtained by dividing the total national income by a consumer price index for Belgium (1953=100) and by the population figure.

The correlation between direct consumption and income per capita was not significantly different from zero. Thus, only two income elasticity coefficients were used in the final calculation; the zero coefficient of this study and the -0.42 coefficient from United Nations-Food and Agriculture Organization. On the basis of these coefficients, direct consumption in 1966 could range from a high of 2.4 percent above to a low of 12.7 percent below the 1959 level.

Indirect Consumption

Use of a trend line to relate time and the percentage of

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1. United Nations, Statistical Yearbook, New York, Annual. The two currencies exchanged at par throughout the period from which data were drawn.

total wheat and rye consumed as flour was rejected because of the low correlation and high standard error of estimate. Instead, the average level of indirect consumption[1] of 649,000 metric tons during the 1954-58 period was calculated, and used as the estimate of 1966 indirect consumption.

Import Requirements

The consumption of domestic bread grains is encouraged by the requirement that a minimum of 65 percent of domestic wheat must be used in flour.[2] Such rules could reduce the bread grain deficit in 1966 even further than the reduction forecast by this study.

Denmark[3]

Direct Consumption

The average estimate of population of the Organization for European Economic Cooperation study has closely approximated the actual population as shown by annual population estimates. In addition, a population datum obtained by applying the 1953-59 annual rate of growth to the actual 1959 population was very similar to the 1966 projection by the Organization for European Economic Cooperation. The average estimate by the Organization for European

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1. Gross food supplies of wheat and rye minus cereals directly consumed as flour.

2. Canada Department of Agriculture, Economics Division, Agriculture Abroad, XVI, No. 1 (February, 1961), 4.

3. See Table 9, page 76.

Economic Cooperation, which was therefore used as presented, provided an estimate of 1959-66 population growth of 4.8 percent.

The calculated income elasticity coefficient of -1.84 was the lowest of any of the study countries. With the assumed rates of income and population growth, the four elasticity coefficients provided estimates of 1966 direct consumption which differed from the 1959 level by +0.2 to -95.1 percent.

Indirect Consumption

The trend line relating time and percentage of wheat and rye consumed as flour was rejected because of low correlation and high standard error of estimate. The level of indirect consumption of 493,000 metric tons annually during 1954-58 was used as the estimate of 1966 indirect consumption.

Import Requirements

Danish production policy is designed to "exploit the productive capacity of agriculture to the fullest possible extent...[1] In keeping with this policy the obligatory milling percentage for domestic wheat and rye for human consumption is 100 percent; thus the results of this study and Danish agricultural policy both point to a decreased import requirement of wheat and rye.

France [2]

Direct Consumption

The 1966 population estimate has been based on the average

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1. Organization for European Economic Cooperation, Agricultural Policies in Europe and North America, Paris, 1956, 43.

2. See Table 9, page 76.

of a projection from 1959 population to 1966 at the 0.9 percent annual growth rate of 1953-59 and the highest population estimate by the Organization for European Economic Cooperation for 1966. The result was a predicted increase in population from 1959-66 of 3.9 percent.

The effect on direct consumption of the income elasticity coefficient of -0.25 and the assumed rates of income growth could be considerably offset by the effect of population growth. The four income elasticity coefficients provided estimates of 1966 direct consumption differing from the level of 1959 by +2.5 to -11.2 per cent.

Indirect Consumption

The trend indicates that direct consumption will account for 44.0 percent of total bread grain disappearance in 1966.[1] The resulting estimates of total consumption indicate that it will increase during the 1959-66 period.

Import Requirements

There is evidence that French exports of bread grains will not be encouraged by domestic agricultural policy.[2] Nevertheless,

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1. The standard error of estimate of 1.3 percentage points indicated a confidence interval of 47.0 to 41.0 percent for the trend line relating time and percentage of cereals consumed as flour.

2. P. Lamartine Yates, Food, Land and Manpower in Western Europe, London, Macmillan, 1960, 249-50.

Lamartine Yates suggests that it would be excessively expensive to maintain subsidized exports on a large scale, and that no further increases in wheat production are anticipated. See, however, United Nations and Food and Agriculture Organization Cooperating, European Agriculture in 1965, 78, which indicates the ease with which France's wheat production can be expanded.

calculations of this study indicate that, at any rate of income and production growth other than the lowest, the export surplus will not be reduced by 1966, and may increase.

Western Germany [1]

Direct Consumption

The estimate of 1966 population has been calculated as an average of a projection from the 1959 population level to 1966 at the 1953-59 annual rate of population growth of 1.2 percent and the highest estimate by the Organization for European Economic Cooperation for 1966 adjusted for probably migration. The result is a projected increase in population from 1959-66 of 2.4 percent.

The correlation coefficient between income and flour consumption was not significantly different from zero. Thus, only two elasticity coefficients, zero and -0.42, from this study and the United Nations-Food and Agriculture Organization study respectively, were used in calculating 1966 direct consumption. Applying these coefficients to the projected rates of income growth resulted in 1966 estimates of direct consumption which ranged from an increase over the 1959 level of 2.4 to a decrease of 11.8 percent.

Indirect Consumption

Since Western Germany's agriculture is unlikely to require significant increases in feed grain until further market orientation of agricultural production has occurred, the trend line relating

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1. See Table 9, page 76.

time and percentage of bread grains consumed as flour in Western Germany was rejected. Furthermore, the standard error of estimate of 4.2 percentage points for the trend line was very high. Indirect consumption in 1966 was estimated to be equal to the average annual indirect consumption of 4,754,000 metric tons during 1955-59.

Import Requirements

Western Germany requires that a large amount of domestic wheat be used in flour.[1] This requirement can be regarded as restricting any possibility of increases in demand for higher quality foreign produced bread grains. The study indicates that a decrease in the import requirement for bread grains is probable.

Italy[2]

Direct Consumption

The estimate of 1966 population was calculated by averaging the population level obtained by projecting 1959 population to 1966 at the 0.5 percent annual rate of growth of 1953-59 and the Organization for European Economic Cooperation average estimate of population in 1966, adjusted for probable migration. The result was an anticipated growth of 3.5 percent from 1959-66.

An income elasticity coefficient of -0.20 was calculated

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1. Canada Department of Agriculture, Economics Division, Agriculture Abroad, XV, No. 6, 14. The level was seventy five percent in 1960, despite the poor quality of the crop in that year.

2. See Table 9, page 76.

for Italy. The four elasticity coefficients used in the calculations provided estimates of change in direct consumption from 1959 to 1966 in the ranges +2.1 to -11.7 percent.

Indirect Consumption

Trend line regression indicated that 69.5 percent of total bread grain disappearance in 1966 will be in the form of flour.[1]

Import Requirements

The potential for increased wheat production does exist in Italy.[2] The encouragement of production of hard wheat varieties[3] further reinforces the conclusions of this study, which indicate an increase in the export surplus of bread grains during the 1959-66 period.

Netherlands[4]

Direct Consumption

The projected increase in population of 8.4 percent in the 1959-66 period represents the highest percentage increase of any of the study countries. The 1966 population estimate was calculated by averaging the estimate obtained by projecting the 1959 population

1. The standard error of estimate for the trend line of 1.6 percentage points provided 95 percent confidence limits in the range 73.2 to 65.9 percent.

2. United Nations and Food and Agriculture Organization Cooperating, European Agriculture in 1965, 77.

3. Organization for European Economic Cooperation, Agricultural Policies in Europe and North America, 1957, 155.

4. See Table 9, page 76.

level to 1966 at the 1.3 percent annual rate of growth of 1953-59 and the Organization for European Economic Cooperation average estimate of 1966 population.

The income elasticity of demand for the Netherlands was calculated to be -0.32. This coefficient, together with those at the limits of the 95 percent confidence interval and the United Nations-Food and Agriculture Organization coefficient of -0.42, provided estimates of direct consumption in 1966 ranging from 6.7 percent above to 8.9 percent below the 1959 level.

Indirect Consumption

Trend line regression indicated that 1966 direct consumption will constitute 35.4 percent of total consumption.[1]

Import Requirements

Dutch millers are compelled to incorporate domestically grown soft wheat in their flour; the percentage varies with the size and quality of the crop, but is usually 35 to 40 percent.[2] The possibility of expanding the livestock feeding industry is evidenced by a policy designed to limit wheat production in favor of feed grain production.[3] This study suggests that import requirements will increase by 1966, and that much of the increase will be for purposes other than direct consumption.

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1. The standard error of estimate of 2.4 percentage points indicated a 95 percent confidence interval of 40.6 to 30.2 percent.

2. Canada Department of Agriculture, Economics Division, Agriculture Abroad, XVI, No. 2 (April, 1961), 24.

3. Organization for European Economic Cooperation, Trends in Agricultural Policies Since 1955, Paris, 1959, 231.

Norway[1]

Direct Consumption

The 1966 population level was estimated by averaging the highest Organization for European Economic Cooperation estimate of 1966 population and a projection to 1966 of the 1959 population level at the 1953-59 average annual rate of growth of 0.9 percent. The result was a predicted 6.7 percent increase in population from 1959-66.

The income elasticity coefficient of demand of -1.34 was one of four coefficients used to calculate estimates of direct consumption in 1966. The 1966 direct consumption estimates differed from the 1959 level by amounts varying from +0.7 to -70.5 percent.

Indirect Consumption

The study indicated that 66.0 percent of 1966 total consumption will be in the form of flour.[2]

Import Requirements

Although presently providing only a small amount of the bread grains domestically required, Norway is attempting to "induce an expansion of production toward commodities which are now imported, such as cereals and feeding-stuffs".[3] The policy statement indicates a trend toward decreased wheat and rye imports, such as

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1. See Table 9, page 76.

2. The standard error of estimate of 2.2 percentage points indicated 95 percent confidence limits at 70.8 and 61.2 percent.

3. Organization for European Economic Cooperation, Agricultural Policies in Europe and North America, 1956, 176.

is borne out by the calculations of this study.

Sweden[1]

Direct Consumption

The 1966 estimate of population was calculated by averaging the estimate obtained by projecting the 1959 population level to 1966 at the 0.6 percent annual rate of growth of 1953-59 with the average estimate of population in 1966 calculated by the Organization for European Economic Cooperation. The result was an anticipated increase from 1959 to 1966 of 2.3 percent.

An income elasticity coefficient of demand for Sweden of -0.98 was calculated. The four elasticity coefficients used in the calculation provided estimates of 1966 direct consumption below the 1959 level by amounts ranging from 2.3 to 46.1 percent.

Indirect Consumption

Trend line regression indicated that 38.1 percent of 1966 bread grain disappearance will be as flour.[2]

Import Requirements

The estimated increases in total requirement of bread grains by 1966 indicate that, assuming the medium import requirement, slight increases in requirement may be experienced. However, the low estimates of 1966 import requirement indicate increases in the surplus

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1. See Table 9, page 76.

2. The standard error of estimate of 4.3 percentage points provided 95 percent confidence limits at 47.5 and 28.7 percent.

available for export.

Switzerland[1]

Direct Consumption

The level of population in 1966 has been estimated by an average of the highest estimate of 1966 population by the Organization for European Economic Cooperation and the population level obtained by projecting 1959 population to 1966 at the 1.2 percent annual rate of growth of 1953-59. The resulting estimate of increase in the 1959-66 period was 4.5 percent.

An income elasticity of demand of -0.85 was calculated for Switzerland. The four elasticity coefficients used in the calculation, including the calculated coefficient, indicated that the level of 1966 direct consumption will be below that of 1959 by 0.1 to 37.4 percent.

Indirect Consumption

The trend line relating time and percentage of cereals consumed as flour indicated that 48.1 percent of 1966 consumption will be as flour.[2]

Import Requirements

Agricultural policy objectives of ensuring national food supplies from domestic resources and of maintaining a large farm

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1. See Table 9, page 76.

2. The standard error of estimate of 3.8 percentage points indicated 95 percent confidence limits at 56.5 and 39.7 percent.

population indicate an attempt to decrease agricultural imports.[1] Nevertheless, the predicted increases in indirect consumption, including animal feeding, could maintain or slightly increase the import requirement during the 1959-66 period.

United Kingdom [2]

Direct Consumption

The 1966 population level has been estimated as an average of the highest estimate of 1966 population by the Organization for European Economic Cooperation and the estimate obtained by projecting the 1959 population level to 1966 at the 0.4 percent annual rate of growth of 1953-59. The result is a projected increase in population of 2.5 percent from 1959-66.

An income elasticity coefficient of demand of -1.32 was calculated for the United Kingdom. The four coefficients and three rates of income growth provided twelve estimates of 1966 direct consumption. These estimates were below the 1959 direct consumption level by 2.1 to 58.8 percent.

Indirect Consumption

Trend line regression indicated that direct consumption will constitute 33.1 percent of total 1966 bread grain disappearance.[3]

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1. Organization for European Economic Cooperation, Trends in Agricultural Policies Since 1955, 300.

2. See Table 9, page 76.

3. The standard error of estimate of 2.9 percentage points indicated 95 percent confidence limits at 39.6 and 26.6 percent.

Import Requirements

The medium import requirement indicates the probability of a maintained or increased import requirement during the 1959-66 period. Use of the low estimate of 1966 import requirement, which is more probable,[1] and the two higher rates of income and production growth, gave a decreased import requirement.

Results for Countries as Groups

Table 1 lists the income elasticity coefficients determined by this study, along with their standard errors of estimate. Thorbecke estimated the income elasticity coefficient of demand for bread grains in the Common Market countries at -0.25.[2] The joint United Nations and Food and Agriculture Organization estimate of -0.42 for the elasticity coefficient for cereals in Europe[3] was introduced into the analysis, and its comparability with the coefficients of Table 1 is discussed below.

For the period 1921-39, Wold has estimated that the income elasticity coefficient of demand for wheat and rye flour in Sweden was -0.55[4]. That this coefficient is higher than the one obtained

1. See page 66.

2. Eric Thorbecke, The Pattern of World-Trade in Foodstuffs Past and Present, A paper prepared for the conference on "Optimizing the Use of Food-Producing Resources in Economic Development", sponsored by the Center for Agricultural and Economic Adjustment, Iowa State University, February 19-23, 1962, 11.

3. United Nations and Food and Agriculture Organization co-operating European Agriculture in 1965, Annex I, Table 35.

4. Wold and Jureen, 22.

TABLE 1

CALCULATED COEFFICIENTS OF INCOME ELASTICITY OF DEMAND FOR BREAD GRAINS : BY COUNTRIES, WESTERN EUROPE [a]

Country	Income Elasticity Coefficient	Standard Error Estimate
European Economic Community		
Belgium-Luxembourg	0	-
France	-0.25	0.06
Western Germany	0	-
Italy	-0.20	0.03
Netherlands	-0.32	0.07
Six Other Countries		
Austria	-0.20	0.06
Denmark	-1.84	0.42
Norway	-1.34	0.36
Sweden	-0.98	0.16
Switzerland	-0.85	0.14
United Kingdom	-1.32	0.17

a Calculated from time series market statistics; post World War II period.

for Sweden in the present study may be due to the fact that the coefficient of -0.98 of this study has been calculated from data of the post war period, when income per capita was higher.

Table 2 points out, however, that the United Nations - Food and Agriculture Organization elasticity coefficient of -0.42 and those coefficients for each country calculated in this study provided estimates of direct consumption of bread grains in 1966 which were not greatly different. However, consumption estimates for individual countries showed much greater variability than the totals for all countries. The United Nations - Food and Agriculture Organization study points out that its coefficient applies to Europe as a whole, and not necessarily to any one country.[1]

Table 2 is also relevant to a consideration of prospective import needs of higher quality bread grains. Such bread grains are imported for the purpose of improving the quality of domestic flour. Since the data in the table indicate that total flour consumption will decline, larger imports of higher quality bread grains can only be expected if there is an upward trend in flour quality or a downward trend in the quality of domestic supplies. Compulsory incorporation rates and import quotas make the former trend unlikely. Although year to year variations in the quality of domestic production can be expected, a downward trend in quality is also improbable.

Further support for the comparability of the United -

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1. United Nations and Food and Agriculture Organization, European Agriculture in 1965, 41.

TABLE 2

CONSUMPTION OF BREAD GRAINS AS FLOUR: BY COUNTRIES, WESTERN EUROPE, 1959 AND PROJECTED TO 1966

Country	1959 [a] Flour Consumption	Projected 1966 Flour Consumption b	c	b	e
	000 tons [d]	000 tons	000 tons	000 tons	000 tons
Austria	808	794	775	775	734
Belgium-Luxembourg	875	896	856	896	812
Denmark	362	306	363	226	345
France	4903	4961	4870	4814	4622
Western Germany	4818	4934	4711	4934	4468
Italy	6891	6981	6815	6815	6467
Netherlands	969	1017	1006	979	957
Norway	301	277	307	228	292
Sweden	551	504	538	439	510
Switzerland	478	455	477	406	453
United Kingdom	4365	3843	4274	3151	4054
Totals	25321	24968	24992	23663	23714

a 1957-59 average. Calculated from: Food and Agriculture Organization, Production Yearbook.

b Using income elasticity coefficients calculated in this study.

c Using income elasticity coefficients of -0.42 for all countries.

d Metric tons.

Nations-Food and Agriculture Organization coefficient and the several coefficients of this study is presented in Table 3. For each country, this table presents two import estimates derived from the calculated income elasticity coefficients and two estimates from the United Nations-Food and Agriculture Organization coefficient of income elasticity for cereals in Europe. For each of the elasticity coefficients, the estimates of import requirement corresponding to 1.5 and 3.0 percent annual increases in income and bread grain production are shown. Where applicable, the estimate of import requirement is the one determined from the middle estimated value of total consumption.

Although the United Nations-Food and Agriculture Organization elasticity coefficient provided a 1966 import requirement estimated at 1.4 million tons above that for the calculated coefficients at the 3.0 percent rate of growth of income and production, the estimates differed by less than 0.8 million tons at the 1.5 percent rate. Table 2 provides evidence, however, that the variability in import requirement was not due to the elasticity coefficients, but was a result of differing quantities entering indirect consumption. At the 3.0 percent rate of growth, however, Tables 2 and 3 indicate, respectively, decreased flour consumption and decreased import requirements.

Table 4 is presented in a manner similar to one of the tables of the United Nations-Food and Agriculture Organization study.[1] Past production, disappearance, deficit and net import data

1. United Nations and Food and Agriculture Organization cooperating, European Agriculture in 1965, 78.

TABLE 3

AVERAGE ANNUAL BREAD GRAIN IMPORTS 1955-59 AND 1966 IMPORT REQUIREMENTS : BY COUNTRIES, WESTERN EUROPE.

Country	Average Annual Imports, 1955-59 [a]	Projected 1966 Import Requirement			
		1.5 percent growth rate [e]		3.0 percent growth rate [e]	
		b	c	b	c
	000 tons [d]	000 tons	000 tons	000 tons	000 tons
Austria	284	373	338	220	145
Belgium-Luxembourg	504	500	460	386	302
Denmark	322	173	230	25	144
France	-993	40	-166	-1507	-1943
Western Germany	2062	1356	1133	454	-12
Italy	-32	-55	-294	-1386	-1886
Netherlands	1061	1948	1917	1841	1678
Norway	384	384	429	306	403
Sweden	-7	243	332	44	143
Switzerland	385	564	610	421	519
United Kingdom	5094	8515	9817	6089	8817
Total	9064	14041	14806	6893	8310

a Calculated from: Food and Agriculture Organization, Trade Yearbook, Rome, Annual

b Using income elasticity coefficients calculated in this study.

c Using income elasticity coefficient of -0.42 for all countries.

d Metric tons.

e Refers to rate of growth of domestic production and per capita income.

TABLE 4

PRODUCTION, DISAPPEARANCE, DEFICIT AND NET IMPORTS OF WHEAT AND RYE : BY COUNTRIES, WESTERN EUROPE, 1954-58 AND PROJECTION TO 1966
(million metric tons)

	1954-58				1966 [b]		
	Production [c]	Disappearance [d]	Deficit	Net Imports [e]	Production	Disappearance	Deficit
Common Market [a]	28.8	31.0	2.2	2.8	35.0	34.8	-0.2
Six other Countries	5.7	12.3	6.6	6.2	7.0	14.0	7.1*
	34.5	43.3	8.8	9.1*	42.0	48.8	6.9

* inconsistency due to "rounding off".

a Excluding 1956 data for France.

b The 1966 projections are based on the 3.0 percent annual rate of income and production growth, the calculated income elasticity coefficients and, where applicable, the middle value of total consumption.

c Calculated from: Food and Agriculture Organization, Production Yearbook, Rome, Annual

d Calculated from:United Nations, Statistical Yearbook, New York, Annual.

e Calculated from:Food and Agriculture Organization, Trade Yearbook, Rome, Annual.

relate to the 1954-58 period, thereby assuring comparability between the respective series in the two tables.

The production and disappearance data of Table 4 are quantitively larger than those of the corresponding United Nations-Food and Agriculture Organization table. Table 5 shows that the difference in production between Table 4 and the similar United Nations-Food and Agriculture Organization table is explainable because both rye and wheat are included in the latter. Average 1954-58 wheat production of 23.7 million tons in the Common Market countries, as indicated by Table 5, is the same as that stated by the United Nations-Food and Agriculture Organization.

The United Nations-Food and Agriculture Organization study indicates 5.4 million metric tons as the average wheat production in eight north western European nations which are not within the European Economic Community. Table 5 points out that 5.1 million tons per year of wheat were produced annually during 1954-58 in six of these eight countries.[1] The figure of 5.7 million tons for average wheat and rye production in these six countries is compatible with the 5.4 million tons production datum presented by the United Nations-Food and Agriculture Organization for eight nations for wheat alone.

The 1954-58 disappearance data of Table 4 are less readily compared with similar United Nations-Food and Agriculture Organization data. The data of Table 4 refer to wheat and rye consumption together. Although Food and Agriculture Organization publications

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1. The two countries in question, which have not been included in this study, are Ireland and Finland.

TABLE 5

WHEAT AND RYE, PRODUCTION BY COUNTRIES, WESTERN EUROPE, 1954-58

	Wheat Production [a] Average 1954-58 000 tons [c]	Wheat and Rye Production [a] Average 1954-58 000 tons
European Economic Community Countries		
Belgium-Luxembourg	741	961
France [b]	10,404	10,872
Western Germany	3,459	7,233
Italy	8,753	8,861
Netherlands	370	841
Total	23,727	28,768
Six Other Countries		
Austria	539	942
Denmark	697	547
Norway	35	37
Sweden	799	1,027
Switzerland	303	341
United Kingdom	2,768	2,794
Total	5,141	5,688

a Calculated from editions of: Food and Agriculture Organization, Production Yearbook, Rome, Annual.

b Excluding 1956.

c Metric tons.

present production, import and export data for wheat and rye separately,[1] these data do not include stock changes, and may not provide a close approximation to actual disappearance in any year or short period of years. The disappearance data of Table 4 have been based on a United Nations publication,[2] which does take account of inventory change, but shows disappearance data only for wheat and rye together. However, because the disappearance data of Table 4 exceed those of the similar United Nations-Food and Agriculture Organization table by approximately the same amount as the production data of Table 4 exceed the United Nations-Food and Agriculture Organization production data, evidence is provided that the larger disappearance data of Table 4 are due to the inclusion of rye.

The data of Table 6 point out that net wheat imports to Common Market countries during 1954-58 and 1955-59 were 2.5 million tons and 2.1 million tons, respectively. The net import data of Table 4 are on a 1954-58 basis. The similar United Nations-Food and Agriculture Organization table provides information in terms of 1954/55-1958/59 data. Since the United Nations-Food and Agriculture Organization wheat import datum is more closely approximated by 1955-59 than 1954-58 data, the difference between the 2.8 million tons net imports of Table 4 and the 2.1 million tons of the United Nations-Food and Agriculture Organization table can be ascribed to

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1. Food and Agriculture Organization, Production Yearbook, Rome, Annual; and Food and Agriculture Organization, Trade Yearbook, Rome, Annual.

2. United Nations, Statistical Yearbook, New York, Annual.

TABLE 6

NET WHEAT IMPORTS BY COUNTRIES, WESTERN EUROPE, 1954-58 AND 1955-59

	1954-58[a] Average 000 tons[c]	1955-59[a] Average 000 tons[c]
European Economic Community		
Belgium-Luxembourg	523	434
France[b]	-1,464	-1,287
Western Germany	2,437	2,120
Italy	105	-101
Netherlands	895	952
Totals	2,496	2,118
Six Other Countries		
Austria	270	231
Denmark	358	235
Norway	388	334
Sweden	-133	-45
Switzerland	404	378
United Kingdom	4,921	5,089
Totals	6,208	6,222

a Calculated from: Food and Agriculture Organization, Trade Yearbook, Rome, Annual.

b Excluding 1956.

c Metric tons.

two causes; first, the different period of time dealt with, and second, the fact that the data in Table 4 include both wheat and rye rather than wheat alone.

Table 6 indicates that average annual wheat imports to the six other study countries were 6.2 million tons during either the 1954-58 or 1955-59 periods. This amount is consistent with the 1954/55-1958/59 net import of wheat of 6.8 million tons to eight countries, of which these six are a part.

The wheat production increases calculated by the United Nations-Food and Agriculture Organization from 1954-58 to 1965 are 3.7 million tons for the Common Market countries and 0.5 million tons for the second group of nations, which amount to 15.6 and 9.2 percent, respectively. The 3.0 percent annual rate of growth of production and income, assumed in Table 4, provided estimates of a 23.0 percent rise in production between 1959 and 1966.[1] As indicated above, the rates of growth of income and production in this study were chosen arbitrarily.

The United Nations-Food and Agriculture Organization table indicates an increase in annual wheat utilization in the Common Market countries of 2.9 million tons, or 11.5 percent.[2] This estimate includes an increased amount of 1.5 million tons for livestock

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1. Production levels shown in Table 4 are for the 1954-58 period. The production levels used as a base for calculating the 1966 production estimates were, however, determined from the average of 1955-59.

2. The increase represents the difference between the 1954-58 annual disappearance of 25.3 million tons and the projected disappearance of 28.2 million tons in 1965.

TABLE 7

TOTAL WHEAT AND RYE DISAPPEARANCE BY COUNTRIES, WESTERN EUROPE 1954-58 AND PROJECTED TO 1966

	1954-58 Average[a] 000 tons[c]	1966 Projection 000 tons
European Economic Community		
Belgium-Luxembourg	1,566	1,545
France[b]	9,042	10,933
Western Germany	9,461	9,688
Italy	9,105	9,800
Netherlands	1,828	2,868
Totals	31,002	34,834
Six Other Countries		
Austria	1,254	1,424
Denmark	880	719
Norway	426	345
Sweden	1,016	1,151
Switzerland	760	844
United Kingdom	7,965	9,519
Totals	12,301	14,002

a Calculated from: United Nations, Statistical Yearbook, New York, Annual.

b Excluding 1956.

c Metric tons.

feeding. This study predicted an increased disappearance for these countries of 3.8 million tons of wheat and rye or 12.3 percent. In this study the rate used to project growth in production was somewhat greater than that used by the Food and Agriculture Organization; the result is a net surplus in 1966 of 0.2 million tons as compared to the deficit of 0.8 million tons in 1965 predicted by the United Nations-Food and Agriculture Organization.

For the six other countries of the study, Table 4 predicts an increased disappearance of 1.7 million tons of wheat and rye, or 13.8 percent. The United Nations-Food and Agriculture Organization study calculated a decrease of 0.2 million tons in 1965 wheat disappearance, or 1.7 percent. However, it is important to note the significance of the United Kingdom in the prediction of increased total consumption. Examination of the tabular calculations for the United Kingdom[1] indicates the following. At the 3.0 percent annual rate of growth of income, the calculated elasticity coefficient indicated a 1966 direct consumption estimate of bread grain consumption of 3,151,000 metric tons. The trend line relating time and percentage of bread grains consumed as flour indicated a total consumption level of 9,519,000 metric tons corresponding to this direct consumption estimate, with 95 percent confidence limits at 7,966,000 and 11,823,000 metric tons. In view of British agricultural policy developments, which are currently attempting to emphasize increased use of fodder as a

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1. See Table 9, page 76.

substitute for high grain feeding,[1] the smallest of the three estimates of total consumption is the most likely one. The estimate of 1966 United Kingdom disappearance of 7.97 million metric tons reduces the estimate of 1966 disappearance for the six countries from 14.0 million tons to 12.4 million tons.[2] The lower estimate of United Kingdom disappearance then indicates a decreased wheat and rye deficit of one million tons for these six countries, whereas the United Nations-Food and Agriculture Organization study points to a decreased deficit of 0.7 million tons of wheat for the eight countries.

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1. Canada Department of Agriculture, Economics Division, Agriculture Abroad, XIV, No. 2 (April, 1959), 33.

3. These 1966 disappearance and net import estimates, like those of Table 4, are correct to one decimal place.

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APPENDIX

Population Estimates for 1966

Table 8 presents a comparison between the population levels assumed by this study and by the United Nations-Food and Agriculture study. The population growth indices presented in Table 8 span the period 1957 to 1966, thereby facilitating comparison with the United Nations-Food and Agriculture Organization assumptions of population growth from 1956 to 1965.[1] The table reveals that the population growth assumptions are similar. The two countries which are least similar are Western Germany, in which the United Nations-Food and Agriculture Organization index exceeds that of this study by 5.0 index points, and the Netherlands, in which the index of this study exceeds that of the United Nations-Food and Agriculture Organization by 3.7 index points. That the index of population growth in Western Germany is lower in this study than in that of the United Nations-Food and Agriculture Organization is to an extent a reflection of using a single year rather than a triennial average as a basis for the index. Use of the triennial average population 1956-58 as a base would yield a 1966 index of 106.4, a rise of 1.5 index points above the level indicated by using 1957 alone as the base period. However, recent political and economic developments, which are likely to have the effect of

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1. Organization for European Economic Cooperation, Demographic Trends in Western Europe, 1951-71.

TABLE 8

POPULATION, 1957 AND PROJECTED TO 1966 BY COUNTRIES, WESTERN EUROPE

	1957 Population[a] 000	1966 Population 000	Index 1966 1957=100	UN-FAO Index 1964-66[b] 1955-57=100
Austria	6,997	7,085	101.3	103.6
Belgium-Luxembourg	9,305	9,658	103.8	103.5
Denmark	4,500	4,767	105.9	106.5
France	44,071	46,869	106.3	105.8
Western Germany	53,692	56,316	104.9	109.9
Italy	48,483	50,770	104.7	104.9
Netherlands	11,021	12,303	111.6	107.9
Norway	3,494	3,794	108.6	107.8
Sweden	7,367	7,625	103.5	102.6
Switzerland	5,117	5,474	107.0	108.8
United Kingdom	51,455	53,477	103.9	104.0

a Source: Food and Agriculture Organization Yearbook, XII, Rome, 1958, 13.

b Source: United Nations and Food and Agriculture Organization cooperating, European Agriculture in 1965, Geneva, 1961, Annex I, Table 33. These indices indicate population growth assumed in the United Nations-Food and Agriculture Organization study.

lowering the rate of immigration to Western Germany, support the lower rate.

The population predictions presented by the Organization

for European Economic Cooperation for the Netherlands, to the extent that subsequent data have become available, have been shown to be very accurate. The fact that the population level obtained by projecting the actual 1959 level to 1966 at the 1953-59 annual rate of growth closely approximates the 1966 prediction of the Organization for European Economic Cooperation suggests no reason for downward revision of the estimate. Therefore, the population estimates have not been altered to correspond more closely with the United Nations-Food and Agriculture Organization estimates.

Calculation of 1966 Import Requirement

The calculations necessary to achieve the 1966 import requirement of cereals have been done in the following manner. Each successive step in the calculation is numbered, the numbers corresponding to successive columns in the tabular presentations for each country.[1]

1. The income elasticity coefficient was calculated by fitting the function log Y = a+b log X, with Y representing flour consumption per capita, and X representing real national income per capita in domestic currency deflated to 1953.

2. Three rates of income growth were arbitrarily selected at 1.5, 3.0 and 4.5 percent per annum. For the seven year period

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1. See Table 9, page 76.

1959-66, these rates amounted to increases of 11.0, 23.0 and 36.1 percent, respectively, in real per capita incomes.

3. The effect on consumption of population growth was assumed to be one. Therefore, a (say) one percent growth in population was assumed to increase consumption by one percent.

4. The effect of income change on consumption was calculated by multiplying the relevant percent increase in income for the period (column two) by the income elasticity coefficient of column one.

5. The combined effect of income and population change was obtained by summing the percentage values of columns three and four.

6. Flour consumption in 1959 was calculated as the product of "net food supplies per person - cereals as flour"[1] and the mid-year estimate of population. Flour consumption in 1957, 1958 and 1959 was calculated, and the average used as the estimate of 1959 flour consumption.

7. The column labelled "change" was used to express, in absolute terms, the effect of the percentage change on 1959 direct consumption.

8. Direct consumption in 1966 was obtained by summing direct (flour) consumption in 1959 and the anticipated change.

9. Three columns are presented for the estimates of total consumption. Each column represents a different assumption regarding the level of direct consumption as a percentage of total consumption. The medium value of total consumption was estimated from

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1. This, the Food and Agriculture Organization terminology, is the equivalent of direct consumption of cereals per capita.

a percentage value calculated by trend line regression. The low and high estimates of total consumption were calculated from a percentage value at a 95 percent confidence interval above and below, respectively, the percentage value estimated from the trend line. Thus, three estimates of total consumption were presented for each of the three income elasticity coefficients and for each of the three income growth rates.

In the countries in which a trend line was not used, an estimate of indirect consumption in the most recent five year period was obtained and used as the estimate of 1966 direct consumption. Total consumption was estimated by summing direct and indirect consumption.

10. Domestic production was estimated from the average annual production of wheat and rye in the 1955-59 period. Production levels in 1966 were obtained by assuming that bread grain production would increase at the same rate as per capita incomes in the economies of those countries. The method therefore provided three estimates of domestic production for each country.

11. Import requirements in 1966 were calculated by subtracting domestic production from the estimate of total consumption.

TABLE 9

ESTIMATES OF FLOUR CONSUMPTION, TOTAL CONSUMPTION, DOMESTIC PRODUCTION AND IMPORT REQUIREMENT IN 1966

AUSTRIA

Income Elasticity Coefficient	Income Growth %	Effect on Consumption of Population Change	Effect on Consumption of Income Change	Combined Effect	1959 Flour Consumption (Av.1957/59) 1000 m.t.	Change	1966 Flour Consumption	Total 1966 Consumption Low	Medium	High	1966 Domestic Production	1966 Import Requirement Low	Medium	High
b+2.20 sb														
-0.08	10.98	+0.504%	-0.878%	-0.374%	808	-3	805	1291	1480	1733	1086	205	394	647
-0.08	22.99		-1.839	-1.335		-11	797	1278	1465	1716	1204	74	261	512
-0.08	36.09		-2.887	-2.383		-19	789	1265	1450	1699	1332	-67	118	367
b														
-0.20	10.98		-2.196%	-1.692		-14	794	1273	1459	1709	1086	187	373	623
-0.20	22.99		-4.598	-4.094		-33	775	1243	1424	1669	1204	39	220	465
-0.20	36.09		-7.218	-6.714		-54	754	1209	1386	1623	1332	-123	54	291
b-2.20 sb														
-0.33	10.98		-3.623%	-3.119		-25	783	1256	1439	1686	1086	170	353	600
-0.33	22.99		-7.587	-7.083		-57	751	1204	1380	1617	1204	-	176	413
-0.33	36.09		-11.909	-11.405		-92	716	1148	1316	1542	1332	-184	-16	210
UN-FAO														
-0.42	10.98		-4.611	-4.107		-33	775	1243	1424	1669	1086	157	338	583
-0.42	22.99		-9.656	-9.152		-74	734	1177	1349	1580	1204	-27	145	376
-0.42	36.09		-15.158	-14.654		-118	690	1106	1268	1486	1332	226	-64	154
					FRANCE									
b+ 2.20 sb														
-0.13	10.98	+3.929%	-1.427%	+2.502%	4903	+123	5026	10690	11414	12243	11226	-536	188	1017
-0.13	22.99		-2.989	+0.940		+ 46	4949	10527	11239	12056	12440	-1913	-1201	-384
-0.13	36.09		-4.692	-0.763		- 37	4866	10350	11051	11854	13766	-3416	-2715	-1912
b														
-0.25	10.98		-2.745	+1.184		+ 58	4961	10552	11266	12085	11226	-674	40	859
-0.25	22.99		-5.748	-1.819		- 89	4814	10239	10933	11727	12440	-2201	-1507	-713
-0.25	36.09		-9.022	-5.093		-250	4653	9897	10567	11335	13766	-3869	-3199	-2431
b- 2.20 sb														
-0.38	10.98		-4.172	-0.243		-12	4891	10403	11107	11914	11226	-823	-119	688
-0.38	22.99		-8.736	-4.807		-236	4667	9927	10599	11369	12440	-2513	-1841	-1017
-0.38	36.09		-13.714	-9.785		-480	4423	9408	10045	10774	13766	-4358	-3721	-2992
UN-FAO														
-0.42	10.98		-4.611	-0.682		-33	4870	10358	11060	11863	11226	-868	-166	637
-0.42	22.99		-9.656	-5.727		-281	4622	9831	10497	11259	12440	-2609	-1943	-1181
-0.42	36.09		-15.158	-11.229		-551	4352	9257	9883	10601	13766	-4509	-3883	-3165

ITALY

Income Elasticity Coefficient	Income Growth	Effect on Consumption of Population Change	Effect on Consumption of Income Change	Combined Effect	1959 Flour Consumption (Av.1957/59) 1000 m.t.	Change	1966 Flour Consumption	Total 1966 Consumption Low	Medium	High	1966 Domestic Production	1966 Import Requirement Low	Medium	High
b +2.20 sb														
-0.13	10.98	+3.502%	-1.427%	+2.075%	6891	+143	7034	9608	10115	10678	10094	-486	+21	584
-0.13	22.99		-2.989	+0.513		+ 35	6926	9461	9960	10514	11186	-1725	-1226	-672
-0.13	36.09		-4.672	-1.170		- 81	6810	9302	9793	10338	12377	-3075	-2584	-2039
b														
-0.20	10.98		-2.196	+1.306		+ 90	6981	9536	10039	10597	10094	-558	-55	503
-0.20	22.99		-4.598	-1.096		- 76	6815	9309	9800	10345	11186	-1877	-1386	-841
-0.20	36.09		-7.218	-3.716		-256	6635	9063	9541	10072	12377	-3314	-2836	-2305
b -2.20 sb														
-0.27	10.98		-2.965	+0.537		+ 37	6928	9464	9962	10517	10094	-630	-132	423
-0.27	22.99		-6.207	-2.705		-186	6705	9159	9642	10178	11186	-2027	-1544	-1008
-0.27	36.09		-9.744	-6.242		-430	6461	8826	9291	9808	12377	-3551	-3086	-2569
UN-FAO														
-0.42	10.98		-4.611	-1.109		- 76	6815	9309	9800	10345	10094	-785	-294	251
-0.42	22.99		-9.656	-6.154		-424	6467	8834	9300	9817	11186	-2352	-1886	-1369
-0.42	36.09		-15.158	-11.656		-803	6088	8316	8755	9242	12377	-4061	-3622	-3135

NETHERLANDS

b +2.20 sb														
-0.16	10.98	+8.435%	-1.757%	+6.678%	969	+ 65	1034	2549	2923	3426	927	1622	1996	2509
-0.16	22.99		-3.678	+4.757		+ 46	1015	2502	2869	3363	1027	1475	1842	2336
-0.16	36.09		-5.774	+2.661		+ 26	995	2453	2813	3296	1136	1317	1677	2160
b														
-0.32	10.98		-3.514	+4.921		+ 48	1017	2507	2875	3369	927	1580	1948	2442
-0.32	22.99		-7.357	+1.078		+ 10	979	2413	2868	3243	1027	1386	1841	2216
-0.32	36.09		-11.549	-3.114		- 30	939	2315	2655	3111	1136	1179	1519	1975
b -2.20 sb														
-0.48	10.98		-5.270	3.165		+ 31	1000	2465	2827	3313	927	1538	1900	2386
-0.48	22.99		-11.035	-2.600		- 25	944	2327	2669	3127	1027	1300	1642	2100
-0.48	36.09		-17.323	-8.888		- 86	885	2182	2502	2932	1136	1046	1366	1796
UN-FAO														
-0.42	10.98		-4.611	3.824		+ 37	1006	2480	2844	3333	927	1553	1917	2406
-0.42	22.99		-9.656	-1.221		- 12	957	2359	2705	3171	1027	1332	1678	2144
-0.42	36.09		-15.158	-6.723		- 65	904	2228	2556	2995	1136	1092	1420	1859

NORWAY

Income Elasticity Coefficient	Income Growth	Effect on Consumption of Population Change	Effect on Consumption of Income Change	Effect on Consumption of Combined Effect	1959 Flour Consumption (Av.1957/59) 1000 m.t.	Change	1966 Flour Consumption	Total 1966 Consumption Low	Total 1966 Consumption Medium	Total 1966 Consumption High	1966 Domestic Production	1966 Import Requirement Low	1966 Import Requirement Medium	1966 Import Requirement High
b+2.20 sb														
-0.55	10.98	+6.693%	-6.039%	+0.654%	301	+ 2	303	428	459	495	36	392	423	459
-0.55	22.99		-12.644	-5.951		- 18	283	400	429	462	39	361	390	423
-0.55	36.09		-19.850	-13.157		- 40	261	369	395	426	44	325	351	382
b														
-1.34	10.98		-14.713	-8.020		- 24	277	391	420	452	36	355	384	416
-1.34	22.99		-30.807	-24.114		- 73	228	322	345	372	39	283	306	333
-1.34	36.09		-48.361	-41.668		-125	176	249	267	287	44	205	223	243
b-2.20 sb														
-2.14	10.98		-23.497	-16.804		- 51	250	353	378	408	36	317	342	372
-2.14	22.99		-49.199	-42.506		-128	173	244	262	283	39	205	223	244
-2.14	36.09		-77.233	-70.540		-212	89	126	135	145	44	82	91	101
UN-FAO														
-0.42	10.98		-4.611	+2.082		6	307	434	465	501	36	398	429	465
-0.42	22.99		-9.656	-2.963		-9	292	413	442	477	39	374	403	438
-0.42	36.09		-15.158	-8.465		-25	276	390	418	451	44	346	394	407
					SWEDEN									
b+2.20 sb														
-0.62	10.98	+2.294%	-6.808%	-4.514%	551	- 25	526	1107	1380	1831	1079	28	301	752
-0.62	22.99		-14.254	-11.960		- 66	485	1020	1272	1688	1195	-175	77	493
-0.62	36.09		-22.376	-20.082		-111	440	926	1154	1532	1323	-397	169	209
b														
-0.98	10.98		-10.760	-8.466		- 47	504	1060	1322	1754	1079	-19	243	675
-0.98	22.99		-22.530	-20.236		-112	439	924	1151	1528	1195	-271	44	333
-0.98	36.09		-35.368	-33.074		-182	369	776	968	1284	1323	-547	-355	-39
b-2.20 sb														
-1.34	10.98		-14.713	-12.419		- 68	483	1016	1267	1681	1079	-63	188	602
-1.34	22.99		-30.807	-28.513		-157	394	829	1033	1372	1195	-366	-162	177
-1.34	36.09		-48.361	-46.067		-254	297	625	779	1034	1323	-698	-544	-289
UN-FAO														
-0.42	10.98		-4.611	-2.317		- 13	538	1132	1411	1873	1079	53	332	794
-0.42	22.99		-9.656	-7.362		- 41	510	1073	1338	1775	1195	-122	143	580
-0.42	36.09		-15.158	-12.864		-71	480	1010	1259	1671	1323	-313	-64	348

SWITZERLAND

Income Elasticity Coefficient	Income Growth	Effect on Consumption of: Population Change	Income Change	Combined Effect	Annual Flour Consumption	1966 Flour Change	1966 Flour Consumption	Total 1966 Consumption: Low	Medium	High	1966 Domestic Production	1966 Import Requirement: Low	Medium	High
b+2.20 sb														
-0.53	10.98	+4.466%	-5.819%	-1.353%	478	- 6	472	835	981	1221	382	453	599	839
-0.53	22.99		-12.185	-7.719		-37	441	780	917	1140	423	357	494	717
-0.53	36.09		-19.128	-14.662		-70	408	722	848	1055	468	254	380	587
b														
-0.85	10.98		-9.333	-4.867		-23	455	805	946	1177	382	423	564	795
-0.85	22.99		-19.542	-15.076		-72	406	718	844	1050	423	295	421	627
-0.85	36.09		-30.676	-26.210		-125	353	624	734	913	468	156	266	445
b-2.20 sb														
-1.16	10.98		-12.737	-8.271		-39	439	777	913	1135	382	395	531	753
-1.16	22.99		-26.668	-22.202		-106	372	658	773	962	423	235	350	539
-1.16	36.09		-41.864	-37.398		-179	299	529	622	773	468	61	154	305
UN-FAO														
-0.42	10.98		-4.611	-0.145		- 1	477	844	992	1234	382	462	610	852
-0.42	22.99		-9.656	-5.190		-25	453	801	942	1171	423	378	519	748
-0.42	36.09		-15.158	-10.692		-51	427	755	888	1104	468	287	420	636
UNITED KINGDOM														
b+0.20 sb														
-0.95	10.98	+2.531%	-10.431%	-7.900%	4365	-345	4020	10163	12144	15083	3095	7068	9049	11988
-0.95	22.99		-21.840	-19.309		-843	3522	8904	10640	13215	3430	5474	7210	9785
-0.95	36.09		-34.286	-31.755		-1386	2979	7531	9000	11177	3796	3735	5204	7381
b														
-1.32	10.98		-14.494	-11.963		-522	3843	9715	11610	14419	3095	6620	8515	11324
-1.32	22.99		-30.347	-27.816		-1214	3151	7966	9519	11823	3430	4536	6089	8393
-1.32	36.09		-47.639	-45.108		-1969	2396	6057	7238	8990	3796	2261	3442	5194
b-2.20 sb														
-1.70	10.98		-18.666	-16.135		-704	3661	9255	11060	13736	3095	6160	7965	10641
-1.70	22.99		-39.083	-36.552		-1595	2770	7003	8368	10393	3430	3573	4938	6963
-1.70	36.09		-61.353	-58.822		-2568	1797	4543	5429	6742	3796	747	1633	2946
UN-FAO														
-0.42	10.98		-4.611	-2.080		- 91	4274	10805	12912	16036	3095	7710	9817	12941
-0.42	22.99		-9.656	-7.125		-311	4054	10249	12247	15210	3430	6819	8817	11780
-0.42	36.09		-15.158	-12.627		-551	3814	9642	11522	14310	3796	5846	7726	10514

WESTERN GERMANY

Income Elasticity Coefficient	Income Growth	Effect on Consumption of Population Change	Effect on Consumption of Income Change	Combined Effect	Annual Flour Consumption Av.1957/59	Change	1966 Flour Consumption	1966 Indirect Consumption	1966 Total Consumption	1966 Domestic Production	1966 Import Requirement
b=o											
0	10.98	+2.401%		+2.401%	4818	+116	4934	4754	9688	8332	1356
0	22.99			+2.401		+116	4934			9234	454
0	36.09			+2.401		+116	4934			10218	-530
UN-FAO											
-0.42	10.98	+2.401	-4.611%	-2.210		-107	4711	4754	9465	8332	1133
-0.42	22.99		-9.656	-7.255		-350	4468		9222	9234	-12
-0.42	36.09		-15.158	-11.757		-566	4252		9006	10218	-1212

BELGIUM - LUXEMBOURG

b=o											
0	10.98	+2.440%		+2.440%	875	+ 21	896	649	1545	1045	500
0	22.99			+2.440		+ 21	896		1545	1159	386
0	36.09			+2.440		+ 21	896		1545	1282	263
UN-FAO											
-0.42	10.98	+2.440	-4.611%	-2.171	875	- 19	856	649	1505	1045	460
-0.42	22.99		-9.656	-7.216		- 63	812		1461	1159	302
-0.42	36.09		-15.158	-12.718		-111	764		1413	1282	131

DENMARK

b+2.23 sb											
-0.91	10.98	+4.834%	-9.992%	-5.158%	362	- 19	343	493	836	626	210
-0.91	22.99		-20.921	-16.087		- 58	304		797	694	103
-0.91	36.09		-32.842	-28.008		-101	261		754	768	-14
b											
-1.84	10.98		-20.203	-15.369		- 56	306		799	626	173
-1.84	22.99		-42.302	-37.468		-136	226		719	694	25
-1.84	36.09		-66.406	-61.572		-223	139		632	768	-136
b-2.23 sb											
-2.77	10.98		-30.415	-25.581		- 93	269		762	626	136
-2.77	22.99		-63.682	-58.848		-213	149		642	694	-52
-2.77	36.09		-99.969	-95.135		-344	18		511	768	-257
UN-FAO											
-0.42	10.98		-4.611	+0.223		+ 1	363		856	626	230
-0.42	22.99		-9.656	-4.882		- 17	345		838	694	144
-0.42	36.09		-15.158	-10.324		- 37	325		818	768	50

SAMPLE CALCULATIONS OF INCOME ELASTICITY COEFFICIENT OF DEMAND BY COUNTRIES, WESTERN EUROPE (log Y = a + b log X)

AUSTRIA

	Consumption Y Logarithms of data	Income X Logarithms of data	Y^2 Logarithms of data	X^2 Logarithms of data	XY Logarithms of data
1948	2.1303	3.8619	4.53818	14.91427	8.22701
1949	2.1038	3.9007	4.42597	15.21546	8.20629
1950	2.1038	3.9368	4.42597	15.49839	8.28224
1951	2.0569	3.9602	4.23084	15.68318	8.14574
1952	2.0719	3.9588	4.29277	15.67210	8.20224
1953	2.0682	3.9585	4.27745	15.66972	8.18697
1954	2.0719	3.9956	4.29277	15.96482	8.27848
1955	2.0755	4.0294	4.30770	16.23606	8.36302
1956	2.0719	4.0750	4.29277	16.60562	8.44299
1957	2.0645	4.0992	4.26216	16.80344	8.46280
1958	2.0645	4.1049	4.26216	16.85020	8.47457
1959	2.0531	4.1227	4.21522	16.99666	8.46432
Sums	24.9363	48.0037	51.82396	192.10992	99.73667
Means	2.07802	4.00031			

r = -0.75

sb = 0.058

DENMARK

	Consumption Y Logarithms of data	Income X Logarithms of data	Y^2 Logarithms of data	X^2 Logarithms of data	XY Logarithms of data
1948	2.0334	3.6682	4.13472	12.45569	7.45892
1949	2.0294	3.6819	4.11846	13.55639	7.47205
1950	1.9912	3.6958	3.96488	13.65894	7.35908
1951	1.9912	3.6815	3.96488	13.55344	7.33060
1952	1.9777	3.6838	3.91130	13.57038	7.28545
1953	1.9685	3.7072	3.87499	13.74333	7.29762
1954	1.9685	3.7122	3.87499	13.78042	7.30747
1955	1.9638	3.6966	3.85651	13.66485	7.25938
1956	1.9395	3.7019	3.76166	13.70406	7.17984
1957	1.9191	3.7151	3.68294	13.80197	7.12965
1958	1.8921	3.7277	3.58004	13.89575	7.05318
Sums	21.6744	40.6719	42.72537	150.38522	80.13324
Means	1.97040	3.69744			

r = -0.81

sb = 0.418

NET FOOD SUPPLIES PER PERSON - CEREALS AS FLOUR (IN TERMS OF FLOUR AND MILLED RICE)[a] (Kilograms per year)

	Austria	Belgium-Luxembourg	Denmark	France	Western Germany	Italy	Netherlands	Norway	Sweden	Switzerland	United Kingdom
1948[b]	135	104	108	127	124	155	100	117	86	112	112
1949	127	106	107	120	113	154	94	116	87	120	103
1950	127	106	98	118	101	153	101	116	92	118	100
1951	114	105	98	119	99	154	96	108	88	114	100
1952	118	104	95	120	98	155	95	104	83	108	98
1953	117	104	93	109	96	155	92	99	79	105	92
1954	118	104	93	115	97	148	92	98	78	101	91
1955	119	104	92	109	96	147	92	98	77	101	88
1956	118	101	87	112	95	146	90	103	75	101	87
1957	116	94	83	110	91	142	87	89	74	99	85
1958	116	93	78	113	90	140	87	88	74	95	84
1959	113	91	79	107	85	142	86	79	75	83	84

a Source: Food and Agriculture Organization, Production Yearbook, Rome, Vols. I - XIV.

b Data presented in terms of split years. For example, 1948 indicates 1948/49 data.

ESTIMATED REAL NATIONAL INCOME PER PERSON PER YEAR IN DOMESTIC CURRENCY,[a]

	Austria Schillings	Belgium-Luxembourg Belgium Francs	Denmark Kroner	France New Francs	Western Germany D.M.	Italy lire	Netherlands guilders	Norway Kroner	Sweden Kroner	Switzerland Swiss Francs	United Kingdom £
1948	7277		4658	2181		151184	1687	4799	4977	3988	265
1949	7955	31564	4808	2268	1339	152236	1708	5027	5288	3934	275
1950	8645	35072	4963	2361	1681	173237	1634	4960	4827	3889	261
1951	9124	36727	4803	2386	1877	180673	1653	5164	5045	4037	260
1952	9095	37167	4829	2479	2079	182204	1709	5109	5128	4096	258
1953	9088	37954	5096	2554	2257	196038	1825	5009	5083	4261	268
1954	9901	39123	5155	2767	2417	193735	1957	5129	5320	4499	280
1955	11070	41266	4972	2956	2696	213991	2156	5326	5505	4663	284
1956	11886	42302	5034	3187	2853	217942	2254	5731	5636	4879	290
1957	12563	43063	5189	3417	2913	230988	2292	5849	5806	5007	295
1958	12733	42622	5342	3339	2963	239274	2291	5347	5693	5051	298
1959	13264	42830		3324	3107	251019	2360	5452	5963	5266	302

a Calculated from: United Nations, Statistical Yearbook, New York, Vols. I - XII.

MID YEAR ESTIMATES OF TOTAL POPULATION[a]
(Thousands)

	Austria	Belgium-Luxembourg	Denmark	France	Western Germany	Italy	Netherlands	Norway	Sweden	Switzerland	United Kingdom
1948	6953	8848	4190	41500	46724	45706	9794	3181	6883	4609	50033
1949	7090	8909	4230	41180	47585	46001	9955	3233	6956	4645	50363
1950	6906	8936	4271	41934	47662	46272	10114	3265	7017	4694	50616
1951	6916	8977	4304	42239	48117	46598	10264	3294	7073	4749	50558
1952	6949	9008	4334	42600	48478	46865	10377	3327	7126	4815	50772
1953	6954	9082	4369	42860	48994	47756	10493	3359	7171	4877	50857
1954	6969	9125	4406	43000	49516	47665	10615	3392	7214	4923	51059
1955	6974	9177	4439	43274	49995	48016	10751	3425	7262	4977	51221
1956	6983	9236	4466	43648	50786	48279	10888	3462	7361	5039	51430
1957	6997	9305	4500	44071	53692	48483	11021	3494	7367	5117	51455
1958	7021	9373	4515	44558	54374	48735	11186	3526	7415	5185	51680
1959	7049	9428	4547	45097	54996	49052	11346	3556	7454	5240	52157

a Source: Food and Agriculture Organization, Production Yearbook, Rome, Vols. I - XIV.

FLOUR CONSUMPTION[a]
(Thousand Metric tons)

	Austria	Belgium-Luxembourg	Denmark	France	Western Germany	Italy	Netherlands	Norway	Sweden	Switzerland	United Kingdom
1948	939	920	453	5270	5794	7084	979	372	592	516	5604
1949	900	944	453	4942	5377	7084	936	375	605	557	5187
1950	877	947	419	4948	4814	7080	1022	379	646	554	5062
1951	788	943	422	5026	4764	7176	985	356	622	541	5056
1952	820	937	412	5112	4751	7264	986	346	591	520	4976
1953	814	945	406	4672	4703	7402	965	333	567	512	4679
1954	822	949	410	4945	4803	7054	977	332	563	497	4646
1955	830	954	408	4717	4800	7058	989	336	559	503	4507
1956	824	933	389	4889	4825	7049	980	357	549	509	4474
1957	812	875	374	4848	4886	6885	959	311	545	507	4374
1958	814	872	352	5035	4894	6823	973	310	549	493	4341
1959	797	877	359	4825	4675	6965	976	281	559	435	4381
1957/59 average	808	875	362	4903	4818	6891	969	301	551	478	4365

a Calculated from: Food and Agriculture Organization, Production Yearbook, Rome, Vols. I-XIV.

FLOUR CONSUMPTION AS PERCENT OF TOTAL WHEAT AND RYE DISAPPEARANCE[a]

	Austria	Belgium-Luxembourg	Denmark	France	Western Germany	Italy	Netherlands	Norway	Sweden	Switzerland	United Kingdom
1948	79.7	67.8	72.0	62.6	73.3	82.6	71.9	87.3	68.1	85.1	74.7
1949	74.5	58.2	54.5	61.5	62.3	80.9	61.6	84.5	69.7	79.5	75.7
1950	64.5	54.8	56.7	61.2	55.1	79.8	65.9	84.4	60.3	75.1	72.6
1951	71.0	59.9	69.6	61.9	57.6	80.4	62.1	83.8	69.0	74.2	69.9
1952	72.3	60.3	59.8	60.7	53.8	81.6	60.4	78.5	65.7	72.0	71.0
1953	67.6	52.1	53.5	56.8	52.3	82.9	57.4	77.3	56.2	68.7	66.4
1954	67.2	58.4	37.3	56.1	50.8	78.2	54.3	74.9	52.1	62.9	55.8
1955	63.1	60.9	45.2	53.2	51.2	78.2	56.1	77.8	58.2	70.2	58.0
1956	65.7	58.4	42.5	54.0	51.2	77.9	54.7	79.0	60.0	64.5	55.6
1957	65.1	58.0	48.6	53.5	51.0	76.0	52.0	76.6	55.6	70.6	55.8
1958	66.3	57.1	45.7	54.4	51.7	72.9	50.1	77.9	48.1	62.5	55.3
1959					46.8		48.1	72.2	50.8		

a Calculated from: Food and Agriculture Organization, Production Yearbook, Rome, Vols. I - XIV.

GROSS FOOD SUPPLIES OF WHEAT AND RYE[a] TOTAL SUPPLY IN THOUSANDS OF METRIC TONS.

	Austria	Belgium-Luxembourg	Denmark	France	Western Germany	Italy	Netherlands	Norway	Sweden	Switzerland	United Kingdom
1948[d]	1178	1356	629	8418	7906	8580	1361	426	869	606	7498
1949	1208	1622	831	8038	8625	8755	1519	444	868	701	6854
1950	1359	1727	739	8084	8740	8874	1551	449	1071	738	6977
1951	1110	1574	606	8120	8269	8929	1585	425	902	729	7233
1952	1134	1555	689	8419	8838	8902	1631	441	899	722	7007
1953	1205	1815	759	8224	8992	8924	1681	431	1009	745	7050
1954	1224	1626	1098	8808	9452	9024	1799	443	1080	790	8331
1955	1315	1567	903	8871	9378	9029	1764	432	960	717	7764
1956	1254	1597	916	9059[b]	9429	9048	1793	452	916	789	8047
1957	1247	1510	770	9241	9581	9063	1843	406	980	717	7831
1958	1228	1528	711	9246	9466	9361	1941	398	1142[c]	789	7852
1959					9994		2029	389	1101		

a Source: United Nations, Statistical Yearbook, New York, Vols. I - XII.

b Estimated from production, import and export data; 1956 and 1957.

c Estimated from available 1957/59 data of Gross Food Supplies of Wheat and Rye:See United Nations, Statistical Yearbook, XII, 308.

d Data presented in terms of split years: For example, 1948 indicates 1948/49 data.

WHEAT AND RYE PRODUCTION, IMPORTS, EXPORTS AND AVAILABIE FOR CONSUMPTION: BY COUNTRIES, WESTERN EUROPE, 1947 - 59[a]

NORWAY

	Wheat production 000 tons[b]	Rye production 000 tons	Wheat Imports[c]	Rye Imports	Wheat Exports	Rye Exports	Wheat & Rye Available
1947	46	2	196.2	83.9	0.1		
1948	76	3	324.4	82.6	-	-	486
1949	67	2	258.2	96.0	-	-	423
1950	66	2	283.4	134.4	-	-	485
1951	40	1	375.0	87.5	-	-	504
1952	39	1	299.0	43.5	-	-	383
1953	39	1	325.1	92.4	0.6	-	456
1954	41	2	334.2	50.5	1.8	-	425
1955	32	1	376.1	38.1	1.7	-	445
1956	56	2	371.7	55.5	1.6	-	484
1957	30	1	281.7	55.9	0.9	-	368
1958	17	1	322.4	59.4	0.2	-	399
1959	20	2	320.6	45.8	0.1	-	389
1959							

SWEDEN

	Wheat Production 000 tons[b]	Rye production 000 tons	Wheat Imports[c]	Rye Imports	Wheat Exports	Rye Exports	Wheat & Rye Available
1947	399	143	93.1	4.6	16.8	3.6	
1948	702	322	135.8	34.9	13.5	0.2	1181
1949	698	277	1.7	8.8	3.5	0.1	982
1950	739	244	76.0	0.2	168.6	66.4	824
1951	477	175	209.5	19.9	19.9	17.7	844
1952	774	277	334.9	50.6	62.1	-	1375
1953	996	305	59.0	-	263.3	12.6	1084
1954	1021	301	5.0	4.4	380.4	113.8	839
1955	716	170	41.5	36.6	161.5	15.4	788
1956	951	267	45.5	45.9	146.7	4.4	1159
1957	711	230	110.2	46.2	200.9	47.2	849
1958	598	170	154.8	76.0	145.3	14.7	839
1959	836	211	164.9	67.9	86.2	2.2	1192

SWITZERLAND

1947	187	25	288.4	20.4	0.3	-	
1948	195	27	425.2	16.1	0.1	-	663
1949	254	30	443.0	2.8	-	-	730
1950	228	38	360.5	5.8		-	633
1951	234	37	383.8	0.2	-	-	655
1952	279	39	360.5	0.5	-	-	678
1953	245	37	350.9	1.8	-	-	635
1954	346	45	383.7	7.0	-	-	782
1955	321	41	314.1	0.8	-	-	677
1956	207	35	465.3	10.2	-	-	717
1957	305	30	436.8	1.1	9.0	-	764
1958	337	40	407.1	1.6	0.1	-	786
1959	366	38	277.9	17.7	0.3	-	700

UNITED KINGDOM

1947	1694	22	5472.0	6.7	13.6	-	
1948	2399	48	5397.2	-	13.1	-	7831
1949	2239	55	5659.0	2.6	12.6	-	7943
1950	2648	58	3895.6	-	13.3	-	6589
1951	2353	48	4814.8	2.0	14.8	-	7203
1952	2344	51	4681.1	1.5	15.0	-	7063
1953	2707	67	4764.8	1.6	13.5	-	7527
1954	2828	40	4027.6	0.8	15.6	-	6881
1955	2641	19	5049.4	-	16.7	-	7692
1956	2891	25	5366.8	6.8	5.3	-	8285
1957	2726	24	5080.1	5.6	6.3	-	7830
1958	2755	21	5114.3	4.5	6.8	-	7887
1959	2830	13	4878.3	7.9	7.3	-	7722

BELGIUM - LUXEMBOURG

	Belgium Wheat Production 000 tons[b]	Belgium Rye Production 000 tons	Luxembourg Wheat Production 000 tons	Luxembourg Rye Production 000 tons
1947	122	162	8	7
1948	344	184	25	13
1949	596	258	29	13
1950	547	240	35	12
1951	514	204	35	11
1952	579	221	37	9
1953	574	213	38	10
1954	589	245	41	11
1955	731	220	41	8
1956	603	196	36	9
1957	766	190	48	9
1958	797	200	53	10
1959	813	195	50	9

BELGIUM - LUXEMBOURG

	Belgium - Luxembourg Wheat Imports[c]	Belgium - Luxembourg Rye Imports	Belgium - Luxembourg Wheat Exports	Belgium - Luxembourg Rye Exports	Wheat & Rye Available
1947	797.2	73.7	21.6	2.1	
1948	802.5	133.0	9.8	82.2	1409
1949	644.8	118.8	4.4	0.5	1656
1950	636.6	100.5	10.7	3.0	1557
1951	960.1	43.2	26.5	12.4	1729
1952	807.7	10.0	21.6	4.2	1638
1953	618.5	113.3	14.0	3.4	1549
1954	778.8	197.6	20.2	12.3	1831
1955	486.2	107.7	9.8	0.7	1583
1956	565.5	87.2	20.3	0.8	1476
1957	413.9	69.5	10.2	0.3	1487
1958	507.4	43.2	77.6	0.1	1532
1959	458.4	42.6	141.8	0.1	1426

WHEAT AND RYE PRODUCTION, IMPORTS, EXPORTS AND AVAILABLE FOR CONSUMPTION: BY COUNTRIES, WESTERN EUROPE, 1947-59[a]

	Wheat Production 000 tons[b]	Rye Production 000 tons	Wheat Imports[c]	Rye Imports	Wheat Exports	Rye Exports	Wheat & Rye Available
AUSTRIA							
1947	206	260	n.a.	0.3	-	-	
1948	261	289	332.6		-	-	883
1949	350	365	509.5	109.5	-	-	1335
1950	384	388	377.9	1.3	-	-	1151
1951	342	334	462.2	130.7	-	-	1269
1952	401	340	324.0	159.7	-	-	1225
1953	499	421	310.2	23.3	-	0.1	1253
1954	452	370	177.2	62.3	-	-	1061
1955	549	416	331.5	66.2	-	-	1363
1956	570	434	206.9	51.1	0.1	-	1262
1957	574	400	178.7	45.9	0.2	-	1199
1958	549	397	177.6	53.9	-	-	1178
1959	589	417	259.1	63.9	0.1	2.8	1326
FRANCE							
1947	3266	384	690.2	44.3	123.2	-	
1948	7634	638	1154.8	43.1	98.5	-	9372
1949	8082	650	641.0	61.8	362.9	-	9072
1950	7701	606	223.4	4.3	884.2	55.2	7631
1951	7116	490	279.3	-	819.4	10.2	7056
1952	8421	482	774.8	-	396.4	0.5	9282
1953	8981	467	255.5	16.8	511.7	-	9362
1954	10566	514	403.1	2.7	1706.7	0.2	9779
1955	10365	440	375.1	-	2961.7	1.2	8219
1956	5683	471	1650.4	19.1	1432.2	-	6391
1957	11082	481	828.0	-	1378.3	37.5	10975
1958	9601	440	438.0	-	1855.0	18.6	8605
1959	11544	470	643.2	4.9	1235.9	2.0	11424
ITALY							
1947	4679	97	1706.4	79.4	3.0	-	
1948	6136	112	2371.5	122.1	1.7	-	8740
1949	7072	125	2040.2	0.2	6.4	-	9231
1950	7773	131	1147.4	19.6	23.8	-	9047
1951	6904	122	1636.1	1.2	40.9	-	8622
1952	7876	127	1355.0	2.1	21.5	-	9338
1953	9052	130	1171.4	39.0	2.9	-	10389
1954	7283	115	265.7	195.8	9.4	-	7850
1955	9504	123	762.9	100.1	15.6	-	10474
1956	8684	105	645.2	51.9	161.8	-	9324
1957	8478	92	536.2	66.0	911.4	-	8261
1958	9815	105	174.7	56.4	762.9	-	9388
1959	8466	105	59.2	65.7	829.1	-	7867

	Wheat Production 000 tons[b]	Rye Production 000 tons	Wheat Imports[c]	Rye Imports	Wheat Exports	Rye Exports	Wheat & Rye Available
DENMARK							
1947	54	179	34.0	53.0	3.4	4.9	
1948	252	400	93.8	58.2	4.9	56.3	743
1949	299	469	61.3	13.5	7.7	69.4	765
1950	298	330	36.7	95.6	5.1	-	756
1951	273	270	57.9	50.3	4.3	14.8	632
1952	301	358	94.6	26.5	4.0	29.5	746
1953	283	331	45.3	0.5	77.1	10.6	571
1954	292	276	291.7	162.7	3.2	6.1	1014
1955	254	191	357.5	168.3	7.4	0.3	964
1956	266	291	272.9	136.6	12.2	1.7	953
1957	273	313	212.5	74.7	9.0	1.0	863
1958	274	306	122.4	32.9	2.0	0.1	733
1959	364	289	240.9	27.2	2.9	0.2	918
WESTERN GERMANY							
1947	1225	2009	3347.3		2.9		
1948	1954	2726	3723.5	234.9	0.3		8639
1949	2471	3310	2761.9	769.5	69.5	1.4	9242
1950	2614	3021	1733.5	210.2	0.5	12.4	7567
1951	2949	3034	2972.2	239.2	68.2	0.3	9126
1952	3291	3119	2159.1	329.4	114.5	0.5	8784
1953	3180	3280	1852.2	147.2	64.7	0.3	8394
1954	2893	4098	3359.1	173.3	45.9	13.1	10464
1955	3379	3495	2435.2	132.6	156.4	196.3	9090
1956	3487	3735	2970.4	51.8	425.4	269.0	9550
1957	3843	3816	2902.2	143.4	507.9	45.2	10151
1958	3693	3728	2275.6	72.9	621.9	34.3	9114
1959	4495	3867	2486.3	25.2	756.9	170.6	9945
NETHERLANDS							
1947	194	318	741.3	-	9.4	13.3	
1948	306	382	808.9	56.6	4.8	12.7	1536
1949	425	517	531.1	19.1	34.1	26.1	1432
1950	295	421	725.1	12.7	3.7	0.8	1449
1951	270	458	868.4	94.4	4.1	1.1	1685
1952	327	497	859.0	22.8	28.8	12.9	1664
1953	249	431	974.9	51.7	71.5	46.3	1589
1954	397	512	805.4	202.3	79.1	22.2	1815
1955	350	465	841.2	153.2	66.5	28.8	1714
1956	309	492	936.4	115.6	53.5	29.3	1700
1957	393	458	949.7	140.4	10.3	10.6	1920
1958	402	427	1059.8	97.4	6.8	7.2	1972
1959	494	386	1122.3	120.3	11.5	7.6	2102

a Source: Food and Agriculture Organization, Production Yearbook, Rome, Vols I - XIV. b. Metric tons

c Import of wheat flour is included and expressed in terms of weight of an equivalent amounts of wheat prior to milling.