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EUROPEAN WHEAT PRODUCTION AS AFFECTING IMPORT REQUIREMENTS

THE PROBLEM

The "world market" for wheat is a commonplace of current commercial discussion; yet it is a development which has taken place within the last hundred years. In the third decade of the 19th century wheat prices were 2⅓ times as high in England as in Prussia; in the last decade of that century English prices of wheat were lower than Prussian.[1] A hundred years ago, the financial return of the wheat farmer depended upon the nature of the harvest in a relatively small area; today the wheat growers of America, Argentina, and Australia compete with the European farmer.

Internationalism is so characteristic of the wheat trade that the current method of viewing the wheat situation is from the point of view of international trade. The discussion tends to center around "importers' requirements" and "exportable surpluses," rather than about world demand and supply. In this way, the Australian farmer is conceived to be competing with his English cousin, not directly but indirectly through the medium of "quantity available for export" and "probable imports." An increase in the production of wheat by the Australian farmer tends to swell the exportable surplus of his country; better crops in England tend to diminish requirements from abroad. Since prices rise or fall as the ratio of import requirements to exportable surplus increases or decreases, a better crop in either country tends to depress prices.

At first glance this may appear a needlessly roundabout method of viewing the wheat market. Why not compare the world's supply of wheat directly from one year to the next? The demand for wheat is said to be relatively inelastic, and it might be supposed that the price of wheat would vary inversely with world supplies. If further refinement of calculation should seem necessary, one might compute the trend of wheat consumption and the elasticity of demand for wheat.[2] By substituting the supply for each year in the formulas thus secured, one might expect to reach a figure for world price.

The objections to this method arise principally on the side of demand, for there are marked differences in consumption habits from country to country. By estimating the surplus or deficiency of each country separately, it is possible for a well-informed observer to make allowances for the more obvious of these differences. The estimator in such a case secures as much information as possible on the conditions in each country. By drawing upon his experience he is able to make rough estimates of the effects of these conditions on the consumption of wheat, country by country. From the estimate of probable consumption thus secured it is possible to derive a figure for probable imports or exports by calculating the difference between the consumption figure and

[1] Cf. Louis Perlmann, *Die Bewegung der Weizenpreise und ihre Ursachen* (Schriften des Vereins für Socialpolitik, Vol. 139), Munich and Leipzig, 1914, p. 8.

[2] Cf. R. A. Lehfeldt, "The Elasticity of Demand for Wheat," *Economic Journal*, June 1914, XXIV, 212.

the best available estimate of domestic production.

It is necessary in this procedure to take account of a number of factors influencing consumption (that is to say, all forms of domestic utilization of wheat): the price of wheat; the prices and availability of complementary and substitute foods and feeds, notably rye, potatoes, and maize; government regulation of milling; the quality of domestic wheat; economic and financial conditions, etc.[1] Ordinarily such estimates have not taken into account, specifically, the influence of domestic production upon domestic utilization of wheat; but this factor is too important to neglect.

This paper is not intended as an exhaustive discussion of the problem of estimating wheat consumption. Its purpose is rather to show the bearing of wheat production upon domestic consumption and imports of wheat in a selected group of European wheat-importing countries in the pre-war period, and to examine the estimates of Broomhall and Sir James Wilson in two post-war years to discover how this influence is reflected in the estimates of two experienced observers.

Need for Analysis by Countries

In Table 1 eight leading importing countries of Europe, for which information for a considerable pre-war period is available, are listed in order of pre-war self-sufficiency with regard to wheat. Four of the countries —France, Spain, Italy, and Germany—produced more wheat than they imported; and four—Sweden, Belgium, Great Britain, and the Netherlands—imported more than they produced. When ranked according to production, the first group (hereafter called Group A) contains the first four wheat-producing nations. The average production for Group A is nearly ten times that for Group B. On the other hand, imports of Group B countries, owing largely to the volume of British imports, average nearly twice as much as those of Group A countries.

Table 1.—Average Production, Imports, and Domestic Utilization of Wheat from 1902–03 to 1913–14, for Eight Importing Countries*

(Arranged in order of self-sufficiency)

Country	Production		Imports		Domestic utilization	
	Quantity (*Million bushels*)	Rank	Quantity (*Million bushels*)	Rank	Quantity (*Million bushels*)	Percentage produced
Group A						
France	329	1	23	5	352	93.5
Spain	122	4	9	7	131	93.1
Italy	174	2	45	4	219	79.5
Germany	144	3	69	2	213	67.6
Total	769		146		915	
Group B						
Sweden	7	7	8	8	15	46.7
Belgium	14	6	48	3	62	22.6
United Kingdom	56	5	211	1	267	21.0
Netherlands	4	8	20	6	24	16.7
Total	81		287		368	

* Data from *International Institute of Agriculture.*

In considering the supplies of wheat, Europe is often regarded as a unit, i.e., the wheat crops of the entire continent are expressed as a single quantity. When this is done, the countries of Group A have an importance of nearly ten times that of the countries in Group B. When considered from the point of view of imports—and this is the significant aspect for international trade, and in large measure for wheat prices —the countries of Group A, as a whole, are roughly only half as important as those of Group B. The effect of crop conditions in the latter very important group of importers may thus be entirely obscured by the conditions in the countries which produce much more but import much less.

[1] The following quotation from Sir James Wilson, *The World's Wheat in November 1922*, p. 6, illustrates the method used: "*Germany*—The pre-war averages were: Yield 19.0 m. qrs. [a quarter corresponds to 8 bushels], net import 8.5, consumption 27.5. The area and population of Germany have been much reduced, and for the year ending July 1922, the statistics are as follows: Yield 13.5 m. qrs., net import 8.7, available, besides carryover, 22.2. The yield of this year's poor harvest is now officially estimated at only 8.7; so that if Germany required the same quantity of wheat as she apparently did last year, she would require to import during the current cereal year 13.5 m. qrs. Her crops of rye, barley, and oats are also reported to be much below those of last year; but on the other hand, owing to the phenomenal fall in the value of the mark, the cost of importing wheat from abroad is now ruinously high when measured in local currency, and on the whole, Germany may be estimated as likely to import during the current cereal year about 12 m. qrs."

Aggregate figures of European production, or total world production, are often useful for a broad view, but such figures afford an unsatisfactory basis for estimating the international movement of wheat, or for considering the prospective course of wheat prices. Estimates by individual countries are essential.[1]

Variability of Wheat Consumption

In the forecasts of wheat consumption for individual countries it is often implied that European countries maintain, or attempt to maintain, a constant volume of wheat consumption from year to year. This idea has probably developed from the frequent use of bread as an example of a commodity with an inelastic demand. Marshall, for example, has said:

> These exceptional features of the value of grain were probably always recognized more or less by thoughtful people. But they were first clearly set out about a hundred years ago, when Tooke convinced the Commission on the Depression of Agriculture, 1821, that an exceptional "principle" applies to staple grain; because a fall in its price cannot generally increase its consumption as human food; and, when it becomes dear, people will still buy enough of it to keep them alive so long as they have any means of purchase; in modern phraseology the demand for it is exceptionally inelastic.[2]

In some countries and among certain classes of people the consumption of wheat bread is probably nearly constant. On the other hand, there are areas where white bread and sweetened wheaten products are delicacies purchased only when the price is low; and there are large classes of the population with whom wheat bread competes in the diet with rye bread, potatoes, and even with maize. In the Germanic, Scandinavian, and North Slavic populations wheat and rye are traditionally merged into the concept bread grain, mixed bread is common, and in the country districts the two grains are freely substitutable. Obviously some fluctuation, possibly large, in the annual consumption of wheat may be expected under these conditions.

Still greater variations in the consumption of wheat are to be found in the other uses to which this cereal is put, notably as a feedstuff. The proportion of unmillable wheat in the crop varies widely from year to year. Wheat is used in the diet of farm animals sometimes directly, at other times after having been ground or mixed with other material, as is the case in many prepared poultry feeds. In the field of animal nutrition wheat has strong competitors. Maize, oats, barley, and other grains, as well as cottonseed cake and meal, compete with wheat as animal feedstuffs; and the demand for any one of them is determined largely by their relative prices in any given season.

In the countries in Group A, especially, variations occur in the consumption of wheat both as bread and as feed for farm animals. Consequently it is impossible to predict accurately the imports into these countries by assuming that the consumption of wheat will be the same year after year. In addition, a considerable proportion of the wheat crop of these countries is domestically produced. The import movement of grain is often quite small, and it rarely attains large proportions. As a result the development of grain trade is far behind that of the exporting countries, or of those importing countries which always import considerable quantities of wheat. The lack of facilities for distributing grain not only tends to raise prices unduly in lean years, but makes impossible a flow of grain sufficient to compensate for the poor harvests in these countries.[3]

Influence of Domestic Production

These considerations are of special significance in a study of the bearing of domestic crops upon consumption. In the countries of Group A a substantial proportion of the wheat crop is consumed in the province or community where it is

[1] In this connection, however, mention must be made of the formula recently devised by the United States Department of Agriculture for forecasting the May price of Northern Spring Wheat in Chicago from the September price. *Foreign Crops and Markets*, May 11, 1925, pp. 549 ff. This formula rests largely upon changes in production in the Northern Hemisphere as a unit and the Southern Hemisphere as a unit, and takes no account of international wheat movements as such.

[2] Alfred Marshall, *Industry and Trade*, London, 1919, p. 794.

[3] Cf. Perlmann, *op. cit.*, p. 12.

grown. Although none of these four countries is self-sufficient, each contains large areas which are practically independent of outside sources of supply. In such regions the domestic utilization of wheat is in direct proportion to production. When the harvest is bountiful the grain is used in larger quantities and in a greater variety of ways; when the harvest is meager the peasant "tightens his belt," practices "rural economies," but rarely imports wheat to make up the regional deficit.

In those countries, on the other hand, where imported wheat, or flour made from imported wheat, penetrates the most remote districts, the nature of the harvest has relatively little effect upon the domestic utilization of wheat. An increase in imports tends to compensate for a large part of the deficiency of local crops, in quantity and quality. Variations in the consumption of wheat may occur, and the returns of the local harvest may be one of the contributing factors; but the relationship is much less pronounced than in the case of the more nearly self-sufficient countries.

TABLE 2.—CORRELATION OF PRODUCTION WITH DOMESTIC UTILIZATION OF WHEAT, 1902–03 TO 1913–14, FOR EIGHT EUROPEAN IMPORTING COUNTRIES*

Group A countries	Coefficient of correlation	Group B countries	Coefficient of correlation
France	+ 0.71 ± .10	Sweden	+ 0.41 ± .16
Spain	+ 0.89 ± .04	Belgium	− 0.04 ± .19
Italy	+ 0.77 ± .08	United Kingdom	+ 0.32 ± .18
Germany	+ 0.80 ± .07	Netherlands	+ 0.20 ± .19

* Using in each case deviations from linear trend, determined by the method of least squares.

A strong tendency for domestic utilization to vary with domestic production in Group A countries is demonstrated in Table 2 by the use of the statistical device of correlation. High positive coefficients of correlation were found between production and consumption for all these countries. The coefficients range from +0.71 to +0.89, in every case more than six times the probable error. In Group B countries, on the other hand, although there is some indication of correlation in the case of Sweden, no definite proof of such a relationship is found. Even for Sweden the coefficient of correlation is less than three times the probable error.

While these results are prejudiced by the briefness of the period, they are sufficiently conclusive to warrant careful consideration, although they may not be acceptable as a basis for forecasting consumption in the post-war period.[1]

POST-WAR ESTIMATES CONSIDERED

The estimates of Sir James Wilson and Broomhall in 1922 and 1923 may now be considered. The outstanding features of European wheat crops from 1921 to 1923 may be summarized thus:

(1) Large crops in 1921,
(2) Small crops in 1922,
(3) Large crops in 1923.

In 1922 the problem was to estimate the increase in imports to be expected as a result of the diminished crop. In 1923 it was the reverse, that is, the effect of increased crops upon imports. In Tables 3 and 4 the estimates of Sir James Wilson and of Broomhall for the eight countries discussed above are shown, and changes in actual imports, as later reported by the same authorities, are also given for comparison. Table 5 (p. 214) is based on the latest reports of production and imports published by the International Institute of Agriculture.

It is significant that in 1922 neither Sir James Wilson nor Broomhall expected the countries in Group A to increase their imports by an amount equal to the decline in production, while they did anticipate that the deficit in the Group B countries would be largely compensated. A number of reasons were given in explanation of the forecast of diminished consumption in the Group A countries—high prices, financial

[1] The series have been extended as far back as the publications of the International Institute of Agriculture permit. The war and post-war period has been omitted because of the abnormal circumstances and because it is impossible to secure any definite idea of trend for consumption or production during this period. When series were used extending from 1902–03 to 1922–23, with no correction for secular trend, somewhat higher correlations were secured in every case, except Spain and Italy. This seems to have been due to the fact that, in many cases, the trends of consumption and production were very much alike.

conditions, and governmental regulations. The tendency of consumption to decrease with domestic production was not mentioned, although the estimators must have been aware of it and gave it some weight in their computations.

Both Sir James Wilson and Broomhall in advance greatly overestimated the imports of the countries in Group A as a whole. According to the figures of the International Institute of Agriculture, a decline in production of 168 million bushels was accom-

TABLE 3.—SIR JAMES WILSON'S ESTIMATES OF CHANGES FROM PRECEDING YEAR IN WHEAT IMPORTS, 1922–23, 1923–24, FOR EIGHT EUROPEAN COUNTRIES*

(Million bushels)

Country	1922–1923 Change in production *a*	1922–1923 Change in imports Estimated *a*	1922–1923 Change in imports Reported *b*	1923–1924 Change in production *c*	1923–1924 Change in imports Estimated *c*	1923–1924 Change in imports Reported *b*	Country
GROUP A							GROUP A
France	— 88.0	+ 48.0	+ 28.0	+ 47.2	— 13.6	+ 6.4	France
Spain	— 20.0	— 1.6	— 9.6	+ 26.4	0.0	0.0	Spain
Italy	— 33.6	+ 12.0	+ 17.6	+ 63.2	— 53.6	— 44.8	Italy
Germany	— 38.4	+ 26.4	— 32.0	+ 31.2	— 13.6	— 8.0	Germany
Total	— 180.0	+ 84.8	+ 4.0	+ 168.0	— 80.8	— 46.4	Total
GROUP B							GROUP B
Sweden	— 3.2	+ 4.0	+ 5.6	0.0	— 1.6	+ 3.2	Sweden
Belgium	— 4.8	+ 4.0	— 1.6	+ 2.4	+ 1.6	0.0	Belgium
United Kingdom	— 9.6	+ 2.4	+ 10.4[d]	— 5.6	+ 8.0	+ 16.0[d]	United Kingdom
Netherlands	— 3.2	+ 4.0	+ 4.0	0.0	0.0	+ 3.2	Netherlands
Total	— 20.8	+ 14.4	+ 18.4	— 3.2	+ 8.0	+ 22.4	Total

* *The World's Wheat.* Figures here are converted from round figures in quarters. Though based on International Institute of Agriculture data, they differ somewhat from latest figures of the International Institute. The process of conversion accounts for certain differences between these figures and those in Table 5.

a November 1922. *b* November 1924.
c October 1923. *d* Based on rough estimates, including Irish Free State.

TABLE 4.—BROOMHALL'S ESTIMATES OF CHANGES FROM PRECEDING YEAR IN WHEAT IMPORTS, 1922–23 AND 1923–24, FOR EIGHT EUROPEAN COUNTRIES*

(Million bushels)

Country	1922–1923 Change in production *a*	1922–1923 Change in imports Estimated *a*	1922–1923 Change in imports Reported *a d*	1923–1924 Change in production *b*	1923–1924 Change in imports Estimated *c*	1923–1924 Change in imports Reported *d*	Country
GROUP A							GROUP A
France	— 88.8	+ 39.2	+ 35.6	+ 46.4	— 16.8	+ 12.1	France
Spain	— 34.4	+ 6.4	— 8.4	+ 16.6	+ 7.2	— 0.3	Spain
Italy	— 28.8	+ 12.0	+ 17.6	+ 46.4	— 28.0	— 46.9	Italy
Germany	— 38.4	+ 10.4	— 32.0	+ 12.1	— 1.6	+ 6.4	Germany
Total	— 190.4	+ 68.0	+ 12.8	+ 121.5	— 39.2	— 28.7	Total
GROUP B							GROUP B
Sweden	— 4.8	+ 4.4	+ 4.9	+ 0.8	— 2.4	+ 4.2	Sweden
Belgium	— 4.0	+ 4.0	+ 3.2	+ 1.9	+ 1.6	+ 0.8	Belgium
United Kingdom	— 9.6	+ 16.0	+ 0.8	— 1.8	+ 16.0	+ 33.0	United Kingdom
Netherlands	— 4.0	+ 4.0	+ 3.4	+ 0.6	+ 0.8	+ 4.6	Netherlands
Total	— 22.4	+ 28.4	+ 12.3	+ 1.5	+ 16.0	+ 42.6	Total

* Broomhall's figures for imports are really for shipments to these countries.

a Broomhall's Corn Trade News, October 3, 1922. *b Ibid.*, September 4, 1923. *c Ibid.*, August 21, 1923. *d Broomhall's Corn Trade Year Book*, 1925, p. viii.

panied by a net increase in imports of only 3½ million bushels in this group. This was far below the estimates of either Sir James Wilson (85 million bushels) or Broomhall (68 million bushels).

TABLE 5. — CHANGES FROM PRECEDING YEAR IN WHEAT PRODUCTION AND IMPORTS, 1922–23, 1923–24, FOR EIGHT EUROPEAN COUNTRIES*

(Million bushels)

Country	1922–23		1923–24	
	Change in production	Change in imports	Change in production	Change in imports
GROUP A				
France	— 80.2	+ 28.5	+ 32.3	+ 7.4
Spain	— 19.7	— 8.2	+ 31.6	0.0
Italy	— 32.4	+ 15.2	+ 63.2	— 45.9
Germany	— 35.9	— 32.0	+ 34.5	— 6.6
Total	— 168.2	+ 3.5	+ 161.6	— 45.1
GROUP B				
Sweden	— 3.0	+ 4.9	+ 1.7	+ 3.6
Belgium	— 3.9	— 1.0	+ 2.8	+ 0.8
United Kingdom	— 8.5	+ 2.0	— 6.8	+ 31.2
Netherlands	— 2.4	+ 4.1	0.0	+ 2.8
Total	— 17.8	+ 10.0	— 2.3	+ 38.4

* As reported by *International Institute of Agriculture*, supplemented by official data from the Irish Free State.

The differences between estimated and actual movement are primarily due to the fact that instead of the substantial increase that was expected in German imports, there was a decided decline in purchases by that country. The anomaly of decreased imports into Germany after a decline in production, though partly due to imperfections in statistics, is largely explained in terms of unusual and (at least to some extent) unpredictable circumstances—the precipitous decline of the mark and the general disorganization of the economic life of Germany.

Both Broomhall and Sir James Wilson, however, overestimated imports of two other countries in Group A, by substantial amounts. While in these countries also financial and economic conditions exerted an unpredictable influence, the indications are that the estimators failed to give adequate weight to the tendency of consumption to decline with reduced domestic crops. The errors in estimating imports into Group B countries were much smaller, indeed very small when considered in relation to the actual movement, for the total imports of these countries were substantially greater than those of Group A countries.

The wheat crop of 1923, usually considered a uniformly large harvest, was indeed much larger than that of 1922 in the Group A countries.[1] In Group B countries, however, there was a net decline in production. Both Sir James Wilson and Broomhall, therefore, rightly estimated that there would be a net increase in imports of wheat into these countries, and again the errors in estimating imports of these countries were relatively small.

For 1923–24 both authorities estimated that in each country of Group A the decline in imports would be less than the increase in production. Again, however, the allowance was insufficient, for both authorities underestimated the decrease in imports for Group A as a whole. Broomhall's estimates were more accurate than those of Sir James Wilson. In fact, the error in Broomhall's estimates for Group A in 1923–24 was smaller than for Group B, although for Group B both authorities underestimated the change, whereas for Group A they overestimated it.

CONCLUSION

The foregoing discussion brings out clearly the special variability of consumption of wheat in the importing countries of Europe which are also large producers, and a tendency of consumption to vary with production in these countries,[2] so that wheat imports cannot be assumed to compensate for variations in wheat crops. It shows also that these tendencies are less

[1] "The world wheat crop of 1923–24 was far the largest since the war, and equal to all but the best pre-war crops. Indeed, if one excludes Russia or even Russian domestic consumption, the crop was the largest ever harvested. Good crops were general, and, on the whole the wheat was of high quality." WHEAT STUDIES, December 1924, p. 1.

[2] The same is also true of the Danube countries which are normally wheat exporters, and indeed the United States; in all of these countries exports constitute a small proportion of the total crop. Canada, Argentina, and Australia, on the other hand, normally export more than they utilize at home, and their domestic utilization shows slight tendency to vary with production.

apparent in countries which produce much less wheat than they import. It suggests that authoritative estimates of imports have erred in giving too little weight to the tendency of consumption to vary with production. These facts have no small bearing upon estimates of European wheat-import requirements for the coming year, when generally larger crops than those of 1924 are expected in Europe.

This issue is substantially the work of W. Blair Stewart.

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