

STRUCTURAL RETARDATION AND THE MODERNIZATION  
OF FRENCH AGRICULTURE: A SKEPTICAL VIEW

by

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The different institutional responses of the several European countries to declining grain prices in world markets in the latter part of the nineteenth century have been a matter of continuing interest to economic historians and agricultural policy analysts. In his classic paper on "Group Behavior and International Trade"<sup>1/</sup> Charles P. Kindleberger argued that the "differences in European responses to the decline in world prices of wheat in the 1870s and 1880s may be summarized as follows: In Britain agriculture was permitted to be liquidated. In Germany large scale agriculture sought and obtained protection for itself. In France . . . agriculture . . . successfully defended its position with tariffs. In Italy the response was to emigrate. In Denmark grain production was converted to animal husbandry."<sup>2/</sup>

In the fifty years after 1880 the annual rate of growth in agricultural output ranged from 0.21 in the United Kingdom, 0.76 in France, 1.31 in Germany to 2.07 in Denmark (table 2). The slow rate of growth of agricultural output in France, the country with perhaps the best agricultural resources in Western Europe, is particularly interesting.<sup>3/</sup> The

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conventional wisdom in much of the English language literature depicts the French agricultural sector during this period as characterized by low productivity, resistance to technical innovation; and protection from international competition. The persistent retardation is typically attributed to the economic and political consequences of a peasant system of agricultural organization--small owner-operated units, intensive use of family labor, unresponsiveness to the pressures of the intersector labor market, with production and investment decisions determined by sociological rather than economic considerations.<sup>4/</sup>

The structural retardation hypothesis locates the source of stagnation in French agriculture primarily within the agricultural sector. It has also been asserted that the poor performance of the agricultural sector has been an important constraint on growth in the non-agricultural sectors of the French economy.<sup>5/</sup> It is argued in this paper that an important part of the explanation for the slow rate of growth in French agriculture after the 1870s must be found outside the agricultural sector--in the limited opportunities for agricultural growth provided by the French economy.

Comparative Economic Performance<sup>6/</sup>

Comparative data on agricultural output, factor productivity, factor endowments, and factor price ratios for four Western European countries--Germany, Denmark, France and the United Kingdom--and for Japan and the United States for the period 1880-1970 are summarized in table 1. Data on annual rates of change in agricultural output, factor productivity and factor endowments are summarized in table 2. The decade to decade data for agricultural output, output per male worker, output per hectare, and land/labor ratio are plotted in figures 1-4.

It is clear that in 1880 agricultural output per worker in France was low by the standards of other industrializing nations. Among the six countries output per worker was lower only in Japan. Output per hectare in France was also low. Among the six countries output per hectare was lower only in the United States where land resources per worker were much more abundant. The differences among the four European countries were, however, small. Table 1 shows clearly the great similarity between France and Germany in 1880--in output per worker, output per hectare, and agricultural land per male worker. Differences in output per worker between France and Denmark in 1880 are explainable primarily in terms of the slightly higher amount of land per worker in Denmark in 1880. Output per worker was highest in the United Kingdom, exceeding even that in the United States. Output per hectare in Japan was more than double the level achieved by the four European countries.

During the next fifty years (1880-1930) the performance of the French agricultural sector was clearly poor by contemporary standards. Output grew at an annual rate of only 0.76 in France as compared to 1.32 in Germany and 2.07 in Denmark. Output per worker grew at an annual rate of 1.16 per year as compared to 1.42 in Germany and 1.66 in Denmark; output per hectare grew at an annual rate of only 0.70 as compared to 1.37 in Germany and 1.83 in Denmark. The high rate of growth in output per worker in Danish agriculture was achieved in spite of a decline in land per worker. By 1930 the average land area per worker in Denmark was lower than in France. The laggard in European agriculture during the 1880-1930 period was the United Kingdom, which experienced annual rates of increase in agricultural output of only 0.21, in output per worker of only 0.43 and in output per hectare of only 0.14.

The data for the 1880-1930 period appear consistent with the implications of the structural retardation hypothesis. The structure of peasant agricultural production remained essentially unchanged. French agricultural performance failed to retain its rough parity in land and labor productivity with Germany and Denmark. Output expanded slowly. It appeared dynamic only in comparison to the United Kingdom.

Evidence from the period since 1930 would also seem to be roughly consistent with the implications of the structural retardation hypothesis. After being shaken by the effects of the Great Depression and World War II and subjected to the stimulus of the post-war recovery, the performance of French agriculture during the late 1950s and through the 1960s was little short of spectacular. Between 1960 and 1970 agricultural output grew at an annual rate of 3.58 percent per year; output per worker at 6.02 percent and output per hectare at 4.08 percent. While absolute measures of performance were still modest in 1970--both output per worker and output per hectare remained low relative to the levels achieved by Germany and Denmark--farm size was rising and another decade of rapid growth might be expected to remove many of the remaining differences.

#### The Demand Constraint

In spite of the poor performance of French agriculture during the 1880-1930 period, the annual rate of growth in agricultural output appears to have exceeded the rate of growth in demand. Estimates of the rates of growth in the demand for agricultural output for Germany, Denmark, France and the United Kingdom are presented in table 3.<sup>7/</sup> We estimate that population growth and income growth combined to produce an annual rate of growth in demand for agricultural output of only 0.61 percent in

France between 1880 and 1960. This compares with an annual rate of growth in agricultural output of 0.76 percent per year.

During this same period prices received by agricultural producers declined.<sup>8/</sup> The decline is consistent with our estimate that the rate of growth in demand lagged behind the rate of growth in output. Between 1880 and 1930 the "inefficient" French peasant provided the urban-industrial sector with more food per capita and at lower real prices.<sup>9/</sup> Furthermore, this was accomplished with little assistance from the institutional infrastructure. Agricultural research, extension and credit systems, organized or subsidized by the public sector, were developed in Denmark, Germany, Japan and the United States to support expansion in agricultural production capacity, but not in France.<sup>10/</sup>

The demand constraint hypothesis is supported by the experience of Germany, Denmark and the United Kingdom during the 1880-1930 period. In Denmark the rapid growth in domestic demand, combined with access to an expanding market in the United Kingdom, permitted growth in agricultural output to exceed 2.0 percent per year, even as land area per worker declined. Germany also experienced a comparatively rapid growth in domestic demand. It seems likely that in both Denmark and Germany supply constraints were more significant than demand constraints in limiting the growth of agricultural output. Certainly limited resource endowments, particularly small size of farm unit, cannot be used to support any interpretation of why agricultural growth rates were slower in France than in Denmark and Germany.

In the United Kingdom, which like France lagged in the development of an effective institutional infrastructure to support agriculture, productivity growth was apparently inadequate to permit home agriculture

to compete with imports from Denmark, Eastern Europe, North America, Argentina and the colonies. As a result the growth of agricultural output in the United Kingdom fell far below the growth in domestic demand. It is worth noting that the United Kingdom, like France, was relatively late in developing an effective public sector institutional infrastructure to support agricultural development. Yet by the second half of the nineteenth century the old system of relying on innovation by progressive landowners had become an inadequate source of technical change in the United Kingdom.

The demand constraint hypothesis is confirmed by the rapid growth in French agricultural output after World War II. When the constraints on demand were removed by rapid growth of domestic demand and access to wider markets in the European Economic Community the structural constraints apparently associated with small-scale peasant organization of the agricultural sector ceased to be a barrier to rapid growth of output and productivity.<sup>11/</sup> This is not to argue that French agriculture had by 1970 become highly efficient by international standards. French agriculture is still protected by a complex of variable levies, tariff and non-tariff barriers which seem excessive by almost any criterion. French agricultural exports outside of the EEC are highly subsidized. It is apparent, however, that regardless of the absolute gaps in efficiency that remain, French agricultural performance has improved markedly in recent years, relative both to its own earlier performance and to that of the other countries in Western Europe.

But why, one might ask, did French agriculture not follow the Danish example and expand exports of livestock products to the United Kingdom

market and thus release the constraint imposed by slow growth of domestic demand? Part of the response to this question is to be found in the Méline tariff. The effect of the tariff was to increase the price of grain relative to that of livestock. Denmark, and to a lesser extent Germany, built a livestock economy on the basis of imported feed grains and concentrates. Incentives to expand the small-scale labor-intensive livestock sector in France were depressed by a series of increasingly protectionist tariffs on wheat and feedgrains in the 1880s and 1890s. The tariffs were erected in response to the political power of the syndicates representing the large-scale grain producers of the North of France. They represented policies which were directly opposed to the economic interests of the peasantry. The French peasant did expand the export of labor-intensive, high value commodities which were not affected by the tariff to the United Kingdom market.<sup>12/</sup>

One might also ask why, when confronted with limited opportunities for productive employment in agriculture, the French peasant did not migrate to the urban centers in larger numbers in search of industrial employment? The structuralist response is that the peasant--tied to the land by excessive individualism, pride of ownership and communal loyalty--withheld his labor from the market. A more relevant answer appears to be that the demand for labor in the non-agricultural sector grew so slowly that there were limited opportunities for productive employment in the urban-industrial sector. When the demand for labor in the non-agricultural sector rose rapidly for a brief period around the turn of this century and dramatically again in the 1950s and 1960s, structural constraints did not represent a serious barrier to rapid migration from rural areas.<sup>13/</sup>



### Conclusion

It seems hard to escape the conclusion that the peasant structure was not the major constraint on the performance of French agriculture since 1880. Indeed, the French peasant exhibited a highly rational response to the limited economic opportunities available to him. He was constrained by a national economy which exhibited slow growth in the demand for the products he produced and also for the excess labor available in rural areas. His incentives were distorted by a tariff designed to protect the interests of a limited number of large-scale grain producers. He was denied the supporting institutional infrastructure in research, extension and credit that supported peasant agricultural production in Denmark and Germany.

If the French peasant had expanded the rate of growth of agricultural output more rapidly in the 1880-1930 period he would have been punished by declining prices generated by inelastic demand for his product. And despite arguments to the effect that he was slow to move out of agriculture, the evidence suggests that it was the slow rate of growth in demand for labor in the non-farm sector which left him on the farm.

It seems clear also that the improvement in the performance of French agriculture since World War II was not the result of any dramatic structural change within the agricultural sector.<sup>14/</sup> Rather it reflects the removal of many external constraints that had earlier limited French peasants' performance. New opportunities for growth in output resulted from expanded markets; new opportunities for growth in labor productivity came from the more rapid growth in the demand for labor in the non-agricultural sector. Finally there came belated investment by the public sector in the development of the institutional infrastructure needed to serve a modern agriculture.

## FOOTNOTES

1/ Charles P. Kindleberger, "Group Behavior and International Trade," Journal of Political Economy 50 (February 1951), pp. 30-46.

2/ Ibid., p. 37.

3/ The annual rate of increase of 0.76 between 1880 and 1930 apparently represented a substantial decline from an annual rate of growth of approximately 1.1 percent per year during the period 1820-1880. See William H. Newell, "The Agricultural Revolution in Nineteenth Century France," The Journal of Economic History 33 (December 1973), pp. 697-731. For a more cautious interpretation of French agricultural growth in the first half of the nineteenth century see George W. Grantham, "Scale and Organization in French Farming, 1840-1880" in European Peasants and Their Markets, eds. William N. Parker and Eric L. Jones (Princeton: Princeton University Press, 1977), pp. 292-326; and George W. Grantham, "The Diffusion of the New Husbandry in Northern France, 1815-1840," The Journal of Economic History 38 (in press).

4/ The structural retardation hypothesis in the English language literature on French agricultural development dates at least to the first edition of J. H. Clapham, The Economic Development of France and Germany, 1815-1914 (Cambridge: Cambridge University Press, 1921). Clapham insisted that "Nothing has happened since the sixties of the nineteenth century to alter materially the framework of French rural society" (p. 160). He summarized his review of the progress in French agriculture

with the comment " . . . when all has been said, and however the figures are handled, it remains true that largely no doubt, owing to the extent and character of her peasant agriculture, she is behind her neighbors in arable farming. And it might be added that, excellent as her dairy farming is, it is inferior to that of Denmark" (pp. 177, 178). Clapham is, however, somewhat ambiguous in his view of technical progress in French agriculture between 1815 and 1914, "The most important reservation to be appended to the story of rural progress is that, in view of the possibilities of modern scientific agriculture, this progress was not so great as it might have been" (p. 177). Grantham has presented a more recent interpretation of the structural retardation hypothesis: "The survival of peasant farming was until recently a distinguishing characteristic of French agricultural organization. The persistence of a large number of small and poorly equipped farms retarded the technical transformation of French agriculture in this century, and has imposed substantial costs on French and Common Market consumers by way of inefficient schemes of income maintenance, mainly through subsidies and price supports. The most widely accepted explanation of the hardness of peasant farming in France stresses the wide distribution of property that had emerged by the end of the eighteenth century and the reluctance of French farmers to leave farming for other occupations" (George W. Grantham, "Scale and Organization," p. 293).

<sup>5/</sup> Rondo E. Cameron, France and the Economic Development of Europe, 1800-1914 (Princeton: Princeton University Press, 1961), p. 27; Paul Hohenberg, "Change in Rural France in the Period of Industrialization, 1830-1914," The Journal of Economic History 32 (March 1972), pp. 219-240; and Richard Roehl, "French Industrialization: A Reconsideration,"

Explorations in Economic History 13 (July 1976), pp. 233-281.

<sup>6/</sup>This section draws very heavily on William W. Wade, Institutional Determinants of Technical Change and Agricultural Productivity Growth: Denmark, France, and Great Britain, 1870-1965 (doctoral dissertation, University of Minnesota, 1973). See also Vernon W. Ruttan, Hans P. Binswanger, Yujiro Hayami, William W. Wade and Adolf Weber, "Factor Productivity and Growth: A Historical Interpretation" in Induced Innovation: Technology, Institutions and Development, eds. Hans P. Binswanger and Vernon W. Ruttan (Baltimore: The Johns Hopkins University Press, in press), Chapter 3.

<sup>7/</sup>Estimates of the income elasticity of demand for food at the farm level (supplier food) are lower than at the retail level since the demand for marketing services tends to be higher than the demand for supplier food. Most national level estimates of income elasticity of demand for all food are based on food expenditure estimates which include varying amounts of supplier food and retail food. In the United States the income elasticity of demand for food during the 1929-56 period has been estimated to fall in the 0.4-0.6 range at the retail level and in the neighborhood of 0.15 at the farm level. See Rex F. Daly, "Demand for Farm Products at the Retail and the Farm Level," Journal of the American Statistical Association 53 (September 1958), pp. 656-668. In Japan the income elasticity of demand for food at the farm level during the interwar period (1922-1937) has been estimated in the 0.3-0.4 range. Hiromitsu Kaneda, "Long Term Changes in Food Consumption Patterns in Japan," in Agriculture and Economic Growth: Japan's Experience, eds. Kazushi Ohkawa, Bruce F. Johnston and Hiromitsu Kaneda (Tokyo: University of Tokyo Press, 1969),

pp. 398-433. Estimates for several European countries of demand elasticities at the retail level, summarized by Stevens, typically fall in the 0.50-0.75 range and suggest farm level elasticities in the 0.3-0.4 range during the 1880-1930 period. See Robert D. Stevens, Elasticity of Food Consumption Associated with Changes in Income in Developing Countries (Washington: U.S. Department of Agriculture Foreign Agricultural Economic Report No. 23, March 1965).

<sup>8/</sup> Between 1880 and 1900 agricultural prices declined in both current and real terms. Between 1900 and 1920 real prices fluctuated at near the levels of 1900. Between 1920 and 1930 real prices of agricultural products again declined. See Michael Tracy, Agriculture in Western Europe: Crisis and Adaptation since 1880 (London: Jonathan Cape, 1964) and Helen C. Farnsworth, "Determinants of French Grain Production, Past and Prospective," Food Research Institute Studies 4 (1964), pp. 225-272.

<sup>9/</sup> I am not, however, able to completely share Hohenberg's enthusiasm: "French agriculture fed France . . . better than any country has been fed before or since. The quality and quantity of French produce . . . were directly related to the character of French agriculture: small scale, marked regional diversity, heavy use of labor . . . , reluctance to abandon the land, and continued reliance on informal, pre-industrial technology" (Hohenberg, "Change in Rural France," p. 238). It is fairly recent, however, that large numbers of French peasants were able to participate in the high quality of food consumption that their labor made available to urban consumers. They tended to sell what could be marketed and consume what the market would not take. See Eugene Weber, Peasants into Frenchmen, the Modernization of Rural France: 1870-1914 (Stanford: Stanford University Press, 1976), pp. 130-145.

<sup>10/</sup>The Ministry of Agriculture was not established until 1881. In the 33 years between 1881 and 1914 there were 42 different governments and 19 different Ministers of Agriculture. Most Ministers of Agriculture were doctors or lawyers with little interest or commitment to agriculture. It was not until after World War II that effective agricultural research and extension programs were instituted in France. Government efforts after the first World War to establish an agricultural research service were abolished in 1935 as an economy measure. An effort in the late 1920s by the Ministry of Agriculture to establish an extension service was eliminated from the budget by the Assembly. See Gordon Wright, Rural Revolution in France (Palo Alto: Stanford University Press, 1964), pp. 18, 34. See also Michael Tracy, Agriculture in Western Europe (London: Jonathan Cape, 1964), p. 81. Imperfections in the rural credit market, primarily the failure to develop an effective institutional credit market in rural areas, meant that land transfers and the acquisition of capital equipment depended primarily on the ability of the peasant or farm family to generate internal savings. This implied a shadow price for capital substantially in excess of the market rate of interest (George W. Grantham, "French Farming," p. 323).

<sup>11/</sup>While the focus of this note is on the period since 1880, evidence presented by William H. Newell suggests that demand also represented a serious constraint on agricultural production during the earlier period of relatively rapid growth between 1820 and 1880. During this period the high rates of growth in agricultural output and productivity occurred near the growing urban industrial centers where there was a strong demand for the products of labor intensive mixed farming. William H. Newell, "The Agricultural Revolution," pp. 725-729.

<sup>12/</sup> Clapham, Economic Development, pp. 173, 174.

<sup>13/</sup> J. J. Carré, P. Dubois, and E. Malinvaud, French Economic Growth (Stanford: Stanford University Press, 1975), pp. 1-16, 431-437. Malinvaud and his colleagues indicate considerable uncertainty about the sources of the poor performance of the French economy during the last part of the nineteenth century, "Although the French slowdown in the last third of the nineteenth century was partly provoked by the slump in agriculture--and without doubt aggravated by economic policy--did it also stem from earlier weaknesses in our institutions? We cannot of course make any pronouncement on this point, but our feeling is that this period, more than any other, deserves the attention of economic historians" (p. 15).

<sup>14/</sup> Folke Dovring, "Les Reconsements Agricoles Français," Bulletin Mensuel de Statistique (Institute National de la Statistique et des Etudes Economiques Pour la Metropole et la France D'Outre-Mer, Supplément Avril-Juin, 1955).

Table 1. Agricultural output, factor productivity, factor endowments, and factor price ratios in six countries, 1880-1970

Ratio	Year	Japan	Germany <sup>a/</sup>	Denmark <sup>b/</sup>	France	United Kingdom	United States
Agricultural output index (Y)	1880	100	100	100	100	100	100
	1930	223	192	279	146	111	204
	1960	334	316	422	235	185	340
	1970	428	412	459	334	236	403
Agricultural output per male worker in wheat units (Y/L)	1880	1.89	7.9	10.6	7.4	16.2	13.0
	1930	4.60	16.0	24.1	13.2	20.1	22.5
	1960	8.41	35.4	47.5	33.4	45.3	88.8
	1970	15.77	65.4	94.4	59.9	87.6	157.4
Agricultural output per hectare of agricultural land, in wheat units (Y/A)	1880	2.86	1.25	1.19	1.06	1.10	.513
	1930	5.06	2.47	2.95	1.50	1.18	.555
	1960	7.44	4.01	4.65	2.48	1.94	.811
	1970	10.03	5.40	5.27	3.70	2.61	.981
Agricultural land per male worker, in hectares (A/L)	1880	.659	6.34	8.91	6.96	14.7	25.4
	1930	.908	6.46	8.18	8.80	17.0	40.5
	1960	1.131	8.83	10.21	13.44	23.3	109.5
	1970	1.573	12.20	17.92	16.19	33.5	160.5
Days of labor to buy one hectare of arable land ( $P_A P_L$ )	1880	1,874	967	382	780	995	181
	1930	2,920	589	228	262	189	115
	1960	2,954	378	166	166	211	108
	1970	1,315	244	177	212	203	108

Notes on following page.



Notes to table 1.

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Source: Vernon W. Ruttan, Hans P. Binswanger, Yujiro Hayami, William W. Wade and Adolf Weber, "Factor Productivity and Growth: A Historical Interpretation" in Induced Innovation: Technology, Institutions and Development, ed. by Hans P. Binswanger and Vernon W. Ruttan (in press), Chapter 3.

Note: One wheat unit is equivalent to one ton of wheat. The method of constructing output measures in terms of wheat units is described in Yujiro Hayami and Vernon W. Ruttan, Agricultural Development: An International Perspective (Baltimore: The Johns Hopkins Press, 1971), pp. 308-25.

Definitions of agricultural land are not strictly comparable among countries and over time, but in general they include all land in farms, including cropland used for crops, pasture, and fallow, plus permanent pasture.

a/ For Germany the data for the pre-World War I period, the interwar period, and the post-World War II period are not comparable because of changes in boundaries after World Wars I and II. The several agricultural output and labor input measures for each year were first expressed on a per hectare basis and then adjusted to an 1880-1910 "undivided Germany" basis in order to link the indexes for the three time periods.

b/ In Denmark, land price includes the value of agricultural land and buildings.

Table 2. Annual rates of change in agricultural output, factor productivity, and factor endowments in six countries, 1880-1970

Time period/ratio	Japan	Germany <sup>a/</sup>	Denmark <sup>b/</sup>	France	United Kingdom	United States
<u>1880-1970</u>						
Agricultural output (Y)	1.63	1.59	1.71	1.35	0.96	1.56
Output per worker (Y/L)	2.39	2.37	2.46	2.35	1.89	2.81
Output per hectare (Y/A)	1.40	1.64	1.67	1.40	0.96	0.72
Land per worker (A/L)	0.97	0.73	0.78	0.94	0.92	2.07
<u>1880-1930</u>						
Agricultural output (Y)	1.62	1.31	2.07	0.76	0.21	1.44
Output per worker (Y/L)	1.79	1.42	1.66	1.16	0.43	1.10
Output per hectare (Y/A)	1.15	1.37	1.83	0.70	0.14	0.16
Land per worker (A/L)	0.64	0.04	-0.17	0.47	0.29	0.94
<u>1930-1970</u>						
Agricultural output (Y)	1.64	1.93	1.25	2.09	1.91	1.72
Output per worker (Y/L)	3.13	3.81	3.47	3.85	3.74	4.98
Output per hectare (Y/A)	1.73	1.97	1.44	2.28	2.00	1.43
Land per worker (A/L)	1.38	1.60	1.98	1.54	1.71	3.50
<u>1930-1960</u>						
Agricultural output (Y)	1.36	1.67	1.39	1.60	1.72	1.72
Output per worker (Y/L)	2.03	2.68	2.29	3.14	2.75	4.68
Output per hectare (Y/A)	1.29	1.63	1.53	1.69	1.67	1.27
Land per worker (A/L)	0.73	1.05	0.74	1.42	1.06	3.37
<u>1960-1970</u>						
Agricultural output (Y)	2.51	2.69	0.84	3.58	2.45	1.71
Output per worker (Y/L)	6.49	6.35	7.11	6.02	6.82	5.89
Output per hectare (Y/A)	3.03	3.02	1.26	4.08	3.01	1.92
Land per worker (A/L)	3.35	3.29	5.79	1.88	3.69	3.90

Notes on following page.

Notes to table 2.

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Source: Vernon W. Ruttan, Hans P. Binswanger, Yujiro Hayami, William W. Wade and Adolf Weber, "Factor Productivity and Growth: A Historical Interpretation" in Induced Innovation: Technology, Institutions and Development, ed. by Hans P. Binswanger and Vernon W. Ruttan (in press), Chapter 3.

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b/ In Denmark, land price includes the value of agricultural land and buildings.

Table 3. Rates of growth of population, per capita product, agricultural demand, and agricultural output in Germany, Denmark, France, and the United Kingdom, 1880-1960

Time period/category	Germany	Denmark	France	United Kingdom
<u>1880-1960</u>				
Population	1.07	1.06	0.20	0.70
Per capita product	1.59	1.73	1.35	1.04
Agricultural demand	1.54	1.58	0.61	1.01
Agricultural output	1.45	1.82	1.08	0.77
<u>1880-1930</u>				
Population	0.97	1.18	0.12	0.85
Per capita product	0.95	1.77	1.47	0.80
Agricultural demand	1.28	1.76	0.61	1.11
Agricultural output	1.31	2.07	0.76	0.21
<u>1930-1960</u>				
Population	1.23	0.85	0.33	0.46
Per capita product	2.67	1.67	1.15	1.44
Agricultural demand	1.90	1.27	0.62	0.82
Agricultural output	1.67	1.39	1.60	1.72

Source: For population and per capita product: Simon Kuznets, Economic Growth of Nations: Total Output and Production Structure (Cambridge: Harvard University Press, 1971). Data, which are for ten-year periods centered on 1880, 1930, and 1960, were computed from Kuznets' working tables. For agricultural output: table 1 in this paper. Demand for agricultural output was estimated using the Ohkawa equation:  $d = p + gn$  where  $p$  represents the rate of population growth;  $g$  represents the rate of growth in per capita product; and  $n$  represents the income elasticity of demand for food at the farm level. Income elasticities of demand for food at the farm level of 0.33 for 1880-1930 and 0.25 for 1930-1960 were assumed.

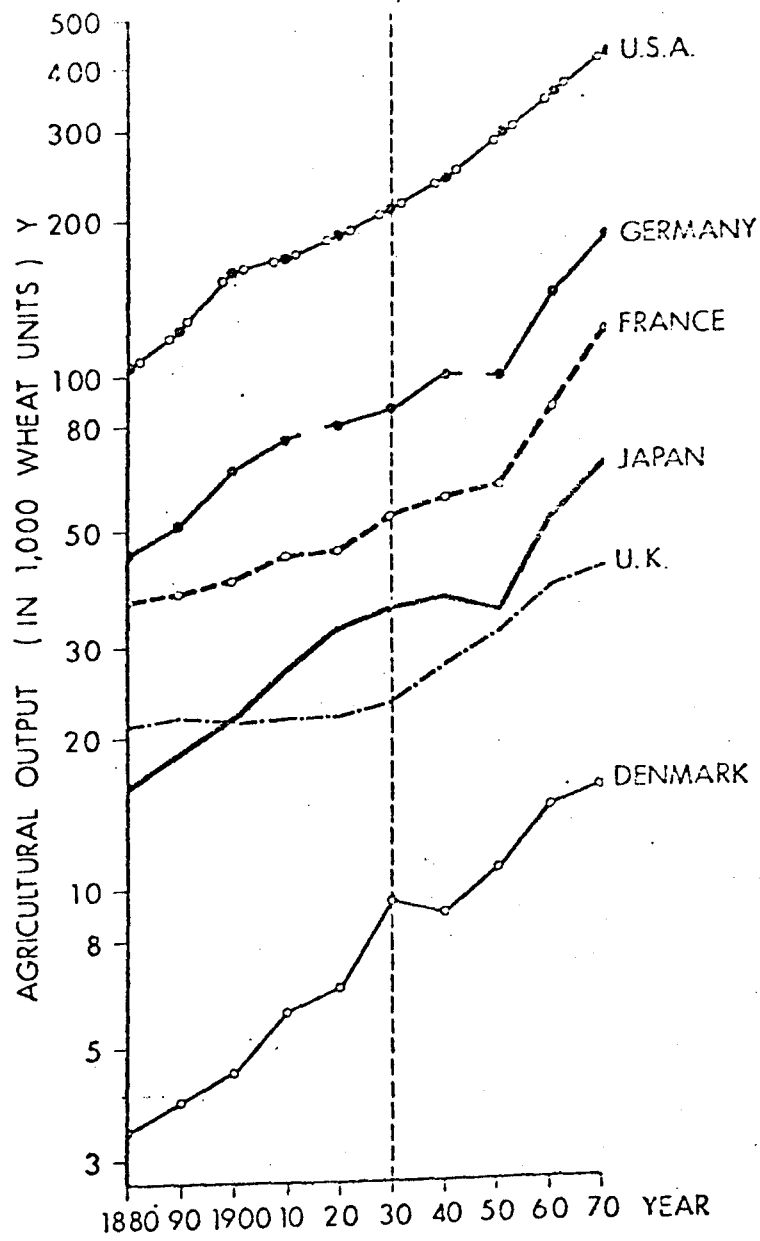


Figure 1. Agricultural output in six countries, 1880-1970. (In logs. Breaks in line indicate discontinuity in data series.)

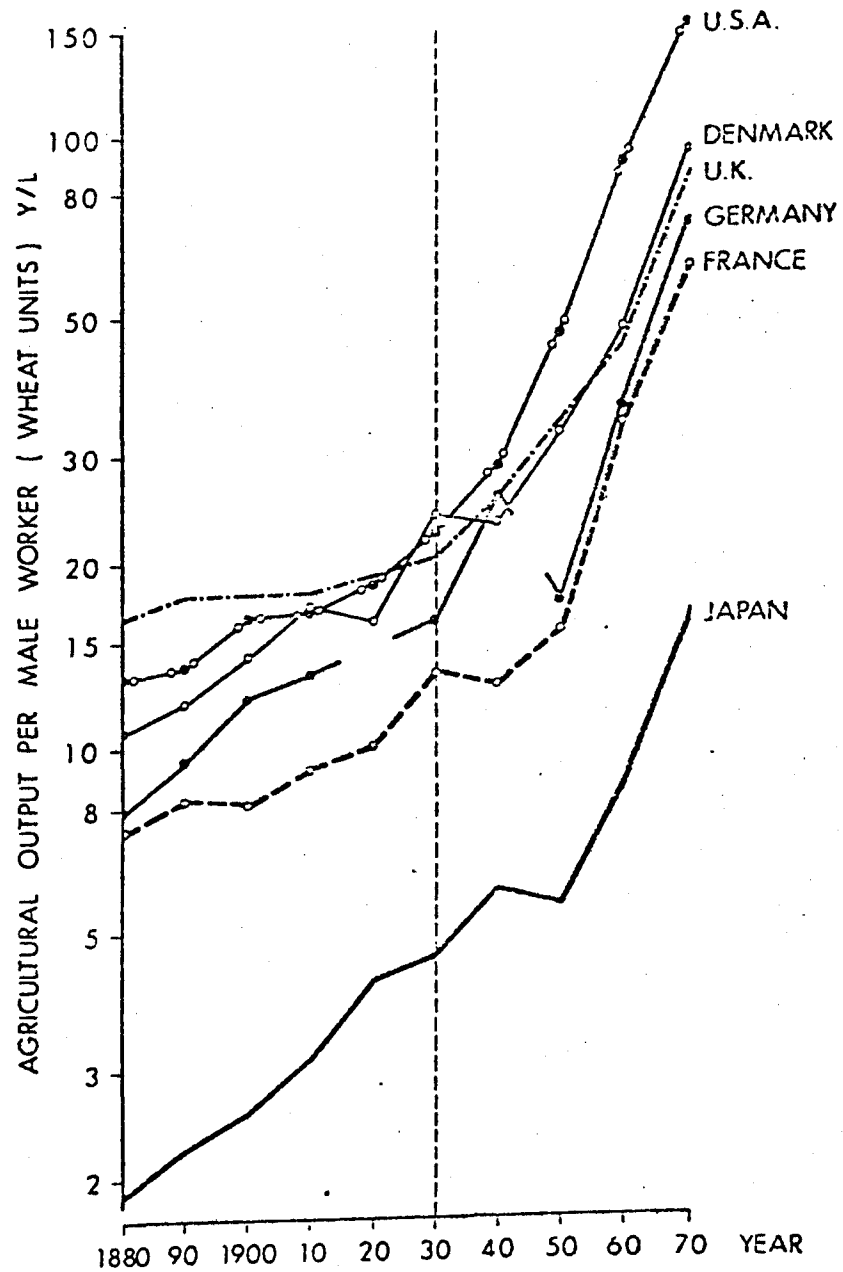


Figure 2. Agricultural output per male worker (Y/L) in six countries, 1880-1970. (In logs, Breaks in line indicate discontinuity in data series.)

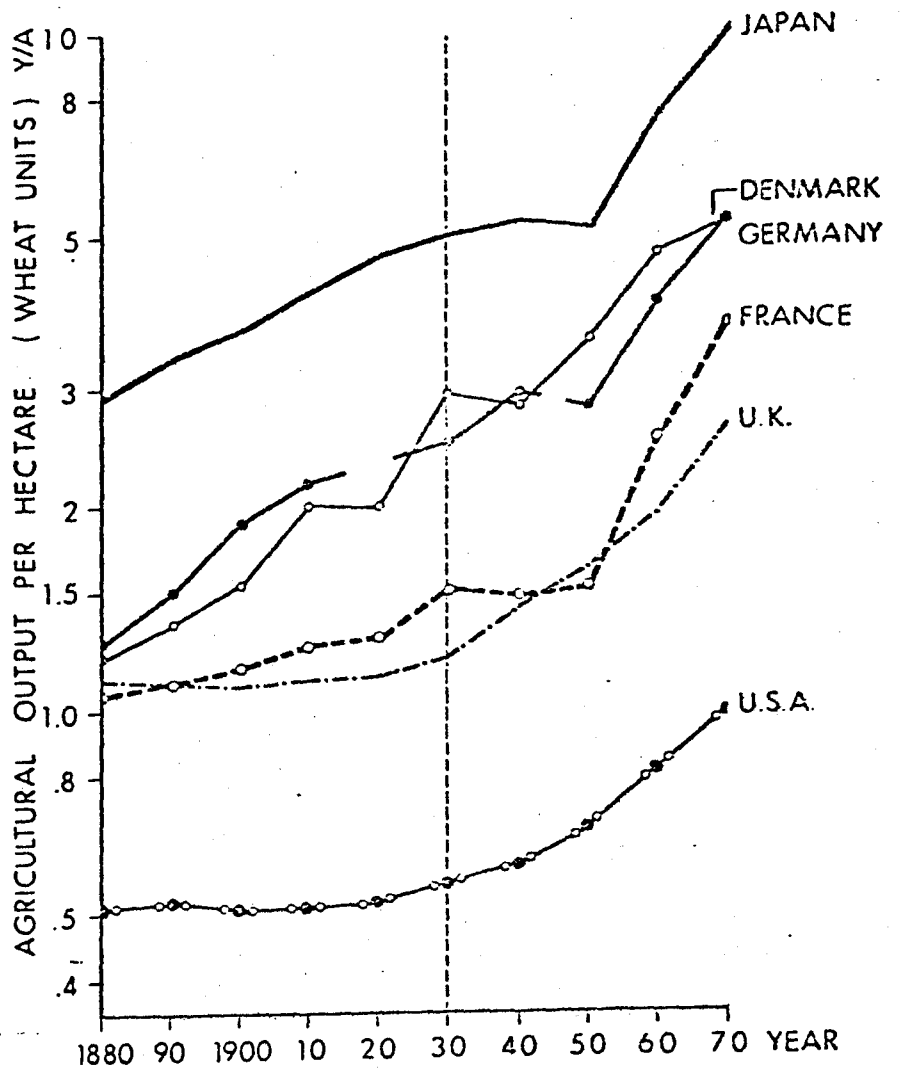


Figure 3. Agricultural output per hectare (Y/A) in six countries, 1880-1970. (In logs, Breaks in line indicate discontinuity in data series.)

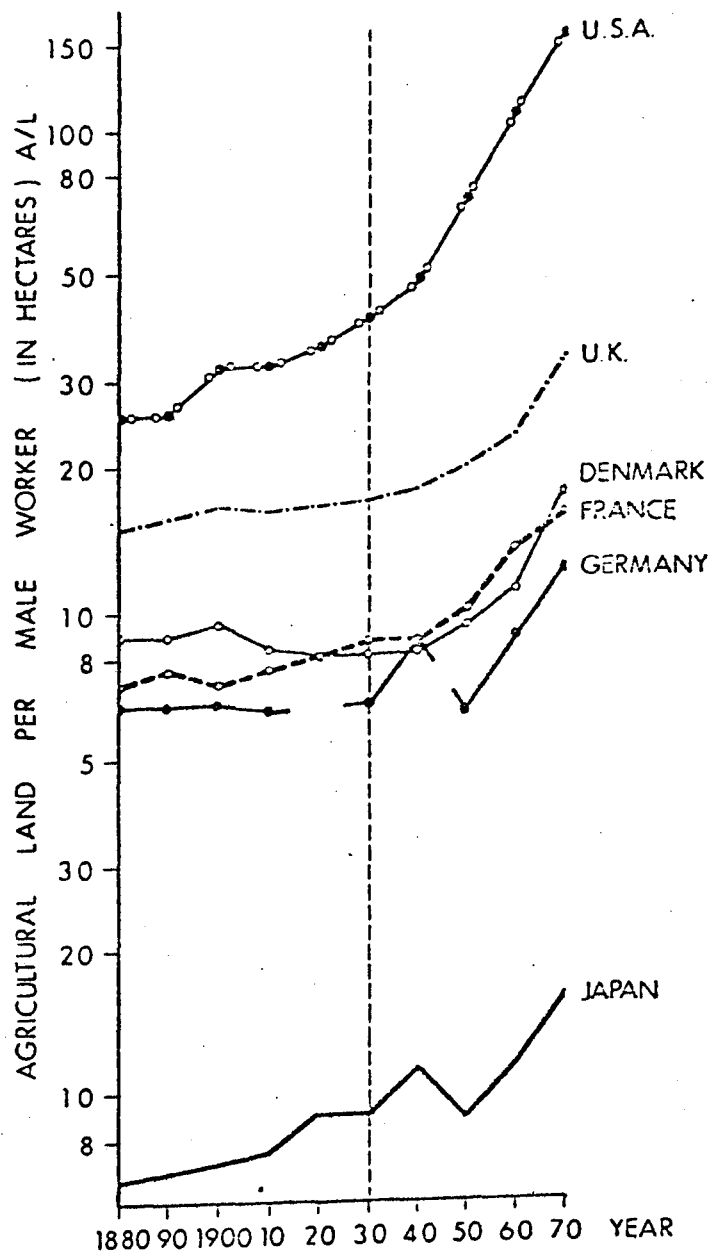


Figure 4. Agricultural land per worker (A/L) in six countries, 1880-1970. (In logs. Breaks in line indicate discontinuity in data series.)