SOVIET INDUSTRIALIZATION RECONSIDERED: SOME PRELIMINARY CONCLUSIONS ABOUT ECONOMIC DEVELOPMENT BETWEEN 1926 AND 1941

By
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1939, and Soviet Economic Development since 1917, by the Marxist economist Maurice Dobb, who worked in almost complete isolation in Cambridge in the 1930s. Dobb had already published a pioneering study of the first decade of the Soviet economy as early as 1928; and Dobb’s book continued to be the principal text in the field until the publication of Alec Nove’s Economic History of the USSR in 1969. The principal appeal and the academic strength of Baykov’s and Dobb’s books lay in their constant preoccupation with the major developmental trends resulting from the impact of state-planned industrialization on an agrarian country; their principal weaknesses, which reflected the state of knowledge at the time, were their inadequate understanding of the political framework for economic development, their inadequate statistical basis, and their underestimation of the economic and human costs of industrialization.

In the first decade after the Second World War, much progress was made with the quantitative evaluation of Soviet development. In 1946-55 a United States team headed by Prof. Abram Bergson, developing work undertaken by the Office of Strategic Services during the war, prepared a series of major sectoral studies which enabled the production of solidly based national income statistics in fixed and current prices for the years 1928, 1937 and 1940. Simultaneously, the émigré Russian economist Naum Jasny produced a wide-ranging and sceptical critique of Soviet agriculture and industry. In Britain, another one-man research team, in the person of E. H. Carr, began work in 1942 on His History of Soviet Russia; several volumes of his published work between 1952 and 1969, are devoted to the economy; Carr’s History breaks off on the eve of forced industrialization in 1929. In the Soviet Union after Stalin’s death in 1953 important studies appeared of economic policy and practice in the early 1920s and of the crucial decisions which led to the collectivization of agriculture in 1929-30.

All these studies implicitly or explicitly assumed that the resources for industrialization were obtained through a squeeze on agriculture, imposed by collectivization, which released a “surplus” in the form of agricultural production and labour, and thus provided the basis for industrial accumulation. In the past 15 years this view has been strongly challenged. The American economist James Millar, drawing on data in studies by the Soviet economist Barsov, has argued that “economically no one gained from collectivization” and that any agricultural surplus required for industrialization could have been obtained through a market mechanism. In reply, R. M. Harrison, Alec

* This paper was originally presented to an SSRC (now ESRC) Conference on Soviet Economic Development held at the University of Birmingham in connection with the Birmingham ESRC-supported research project on Soviet Industrialization (the acronym of which is SIPS). The authors are grateful to the members of the conference for their comments, and especially to M. Eilin, G. H. Feinstein, M. Harrold, H. Hunter, J. Miller and A. Noe.

1 These were published in Russian under the title Izvestiya Ekonomicheskogo Kabinetu Prof. S. N. Prokopovicha, and some articles were subsequently translated into English in a series of Memoranda of the Bureau of Research on Russian Economic Conditions, University of Birmingham (Nos. 1-13, 1931-40).

2 The work of Bergson and his team is summarized in A. Bergson, The Real National Income of Soviet Russia since 1928 (Cambridge, Mass., 1965).


Soviet Development between 1926 and 1941

In the past 15 years, more or less simultaneously with this controversy, the Soviet economy of the 1930s has for the first time become the object of detailed investigation by economic historians. Research has continued the tradition of Baykov and Dobb in the sense that the focus of interest has been the conscious effort of government to determine the future shape of the economy through comprehensive planning. But the findings and approaches of previous postwar research have been incorporated in these recent studies, and they have been based on a much wider range of sources, including previously inaccessible statistical and archival materials. The French scholar Eugène Zaleski has examined in great depth the role of the hierarchy of five-year, annual, quarterly and monthly plans in the management of the economy.8 Our Birmingham group, active since the early 1970s, is seeking to extend into the 1930s E. H. Carr’s examination of the mutual impact of economic policy and performance.9 These broad if detailed studies of the economy as a whole have been supported by monographic works on particular sectors, with special attention to the vast but inconsistent body of statistics available for this period. The earlier American statistical studies were primarily concerned with the assessment of the growth of Soviet power (they were financed by the United States Air Force!): we are seeking to relate the statistical data to our much expanded knowledge of policy changes and the operation of the Soviet system.

The present article presents some of our own conclusions against the background of the work of other scholars. Our examination of the 1930s has led us to reconsider some aspects of earlier Soviet economic history; accordingly, Section I presents some findings about the mixed economic system of the “New Economic Policy” of the 1920s (NEP), focusing on


2 These volumes of W. Davies, The Industrialisation of Soviet Russia, have so far appeared: The Socialist Offensive: The Collectivization of Soviet Agriculture, 1929-1930 (London and Cambridge, Mass., 1980) and The Soviet Collective Farm, 1929-1930 (London and Cambridge, Mass., 1980), and further volumes are in progress on industry and planning in 1929-33 and on the agricultural crisis of 1931-3 (S. G. Wheatcroft will be co-author of the latter volume).

The capacity of that system to generate economic development. Section II reconsiders the impressive development of industry, the problems and disasters of agriculture, and some of the human costs and demographic consequences of the industrialization drive of the 1930s. Section III sits out to consider what were the determining influences on the pattern of economic growth described in Section II, considering the influence on the industrialization process of ideology, of the political and social system, of the historical heritage, and of climatic and other exogenous factors. Section IV briefly summarizes our findings and compares them with those of other scholars.

I

After the chaos and destruction of the civil war (1918-20), the New Economic Policy instituted in 1921 a remarkable attempt to restore the shattered economy by establishing a mixed system in which the transactions of a relatively small and primarily state-owned industrial sector with over 20 million individual peasant households were undertaken via a relatively free market. Recovery was rapid after the initial set-back of a serious famine in 1921-2. But the extent of the recovery and the ability of the NEP economy to maintain the impetus of its early years were much disputed in the 1920s, and the dispute still continues.

According to estimates made at the time by the Soviet State Planning Commission, Gosplan, Soviet national income already exceeded the 1913 level in the economic year 1926/7, and was at least 11 per cent above that level in 1927/8.10 But Prof. Paul Gregory concludes in his important new study that in the calendar year 1928 national income, estimated by end-use, was still some 5 per cent below the 1913 level (15-20 per cent in per capita terms).11 Our own work on industrial and agricultural production (an example perhaps of what Stalin once called the “crafty compromise” of the British bourgeoisie) indicates that Gosplan may have overestimated and Gregory underestimated the extent of the recovery. According to Soviet estimates made at the time, the gross production of “census” or large-scale industry, measured in 1913 prices, was some 5,200-6,500 million rubles in 1913, 6,800 millions in 1926/7 and 8,400 millions in 1927/8. Our preliminary examination of these figures indicates that they tend to exaggerate the growth of industry, and that the correct figure for 1927/8 would appear to be some 5,800 to 6,500 million rubles. The gross production of small-scale, mainly artisan, industry seems to have been about the same in both 1926/7 and 1927/8 as in 1913, some 2,000 million rubles. If these figures are approximately correct, gross industrial production as a whole in 1927/8 was 18-23 per cent higher than in 1913; in 1926/7 it was 2-6 per cent higher than in 1913.12

1 A. Nikitich estimated national income in 1913 (pre-1919 frontier) at 7,450 million rubles, Strumilin at 14,534 million rubles, and Smirnov at 14,678 million rubles (though the latter mistakenly included 6,650 million rubles of exports). (A. Nikitich, Narodnoe dobro Rossii i SSSR: Moskva 1861-1917 (Moscow, 1926), p. 64.)


In agriculture, the position is very complex. Grain production in the second half of the 1920s was generally more than 5 per cent below 1909-13 (average) and more than 20 per cent below the exceptional 1913 harvest. It approached the same level as in 1909-13 (average) only in the best year of the 1920s—1926—and this was still some 15 per cent below the 1913 level. As for livestock, as late as 1928 the number of horses was still 14 per cent below 1914 and the number of cattle and pigs had reached only 7 per cent and 10 per cent above 1914.14 But it would be wrong to conclude from this evidence that agricultural production as a whole was lower than before the war. The increase in production of industrial crops, vegetables and especially potatoes offset the decline in grain production. And the change in the structure of the livestock herd, and its quality, seems to have greatly improved its productivity, so that livestock production in 1925 was already above the prewar level. Grain was being fed to animals instead of being exported, and partly because of this the number of livestock was growing rapidly, and they were apparently better fed, healthier and more productive than before the war. According to our estimates, in 1928 gross agricultural production as a whole was some 4-6 per cent higher than in 1913, or 10-12 per cent higher if the average grain harvest for 1909-13 is substituted for the exceptional harvest of 1913 (see Table 3).15 And agriculture had moved towards a more diversified and intensified form of development. Before the revolution, agriculture was dominated by extensive grain production; grain accounted for 90 per cent of the sown area, and almost 40 per cent of gross agricultural production. By 1928, only 82 per cent of the sown area was sown to grain, and grain production accounted for just over 31 per cent of gross agricultural production.16

These estimates for gross industrial and particularly agricultural production in 1928 are difficult to reconcile with Gregory's estimates that national income in that year was below the 1913 level, and in particular with his conclusion that agricultural consumption in kind had substantially declined.17 But while Gregory's estimates of national income in 1928 may be somewhat pessimistic, his estimates of capital investment in that year seem to be somewhat exaggerated. According to Gregory, while national income as a whole was below the 1913 level in 1928, capital investment already exceeded that level; it may be estimated from his data that net capital investment at

14 See Davies, Socialist Offensive, p. 420.
15 According to Soviet official figures, gross agricultural production in 1928 was 25 per cent higher than in 1913 (D. N. Khvostov, 'Kharakterizatsiya SSR' (Moscow, 1971), p. 353); the American economists Johnson and Kahan put the increase at 10 per cent (A. Bergson and S. Kuznets, eds., Economic Trends in the Soviet Union (Cambridge, Mass., 1963), p. 208).
16 For sown area see Ploshchad' pashnogo SSR, (Moscow, 1936), p. 5; for the grain share in agricultural production see our Table 3.
17 The main reason for this discrepancy seems to be that Gregory's 1913 data for marketings are calculated on the basis of rail and water transport data, and unlike the Bergson-Hoeffling data for 1928 exclude supplies by carts, etc. to local towns. His 1928 data also exclude peasant food consumption of minor grains. For both these reasons his 1913 data for consumption in kind, which are calculated as a residual, are high relative to Gregory's data. See Gregory, Soviet National Income, Appendix D, and G. Hoeffling, Soviet National Income and Product in 1928 (New York, 1944), pp. 44-58 (1929-30 prices). The excess marketings in the 1920s, see H. W. Davies, 'A Note on Grain Statistics', Soviet Studies, xx (1969-70), pp. 31, 74. Kondratieff-Nichelson's grain marketings estimate for 1920-19 in confirmation of his prewar figures, but the Kondratieff data refer only to the European grain-surplus areas, and ignored the more complex marketing patterns of other areas.

1913 market prices was as much as 2.44 million rubles (15-6 per cent of net national product) as compared with some 1.89 million in 1913 (11.4 per cent of NNP).18 Net investment in the economic year 1926/7, which was some 80 per cent of 1927/8, would on this estimate already be substantially higher than in 1913. But Gregory's estimates assume that construction in 1928 prices may be converted into 1913 prices by using the Gosplan index of the wholesale prices of building materials. Other Soviet price indexes for building materials are higher, and building wages had undoubtedly increased much more than the prices of building materials. If we assume construction costs in 1928 were 247, as compared with Gregory's 208 (1913 = 100), the net investment figure would fall to about 2.1 million rubles, which is still higher than the 1913 level.19 Net investment in 1926/7, on this estimate, would be slightly below the 1913 level.

While detailed comparisons between the different sub-categories of investment in 1913 and in the 1920s have not yet been made, available information on some major items reveals a very substantial shift in resources. In 1926/7 and 1927/8 net investment in urban housing was very much lower than in 1913; and net investment in rural structures (housing and farm buildings) was somewhat lower than in 1913.20 Investment in livestock on the other hand, was much higher than in 1913: in 1913, according to Gregory, it was some 90 million rubles; but it was as much as 315 million in 1926/7 and 224 million rubles in 1927/8.21 The most important shift as compared with 1913 was in industrial investment. According to Vainshtein's estimates net investment in industrial structures in 1913 amounted to 248 million rubles, and net investment in industrial equipment 176 million rubles, a total of 424 million rubles, or 346 million rubles when roughly adjusted to pre-1939 territory of the U.S.S.R. 22 In 1926/7, in prices of the current year, net investment in industry amounted to 1,049 million rubles, and this rose to 1,440 millions in 1927/8.23 The investment in industrial structures in 1926/7 could not have been higher in 1913 (100 = 100), so clearly net industrial investment in 1926/7 was already in excess of the 1913 level when measured in comparable prices.

Estimates of gross investment in industry made in the late 1920s confirm this conclusion. According to the Soviet economist, Barun, in 1926/7 gross
capital investment in industry as a whole (including the electricity industry) already amounted to about 1,300 million rubles in current prices, or 746 million rubles in prewar prices.24 The maximum estimate for gross annual industrial investment in fixed capital in the last prewar year 1912/13, made by the Soviet economist Strumilin, was only 700 million rubles in 1913 prices. This estimate is rightly considered by both Barun and Vainshtein to be exaggerated (the figures for the previous two years are 405 and 362 million rubles).25 Capital investment in Soviet industry in 1926/7, on internal resources, was thus higher than investment in pre-revolutionary industry in 1912/13 by both internal and foreign capital.

It was once a commonly held view that the Soviet economy had reached an impasse by the mid-1920s. Gerschenkron, for example, held that by this time "barring further fundamental changes in the economic structure of the country, the conditions for the resumption of industrial growth would seem to have been rather unfavourable".26 The above estimates both for production and for investment cast considerable doubt on this conclusion. Agricultural and industrial production had risen above the prewar level by 1926/7, and were still expanding. By 1926/7 net capital investment in the economy as a whole was equal to or slightly below that in 1913. Investment in industry was very substantially above the 1913 level, and was clearly sufficient to enable industrial production to increase by at least the annual rate of 6 per cent a year which was achieved in the immediate pre-1914 years.27 The NEP economy was not static but dynamic.

However, substantial limitations of these successes should be pointed out. First, the achievement of a level of investment in industry in 1926/7 equal to or in excess of that in 1913 already carried with it certain important negative consequences. Other sectors, such as the railways and education, claimed that they were starved of capital investment; and the relative neglect of the defence sector was causing alarm in official circles.28 The high level of investment in industry in 1926/7 was also partly responsible for the excess of demand over supply on the retail market in 1927. It is certainly true that blunders and errors in price policy (especially the decision in February 1927 to reduce the retail prices of industrial consumer goods) worsened the situation. And the rapid rise in investment in 1926/7 was a major factor leading to the grain crisis in the winter of 1927/8.

Secondly, the level of industrial investment reached in 1926/7, and even the much higher level of the next two years, were in some important senses inadequate for the achievement of the goals of the Soviet leaders as they were expressed in that period, even before they became much more ambitious after the defeat of Bukharin and the right wing of the party in 1929. Soviet industry

24 M. Barun, Osnovni kapital presvykhodnosti SSSR (Moscow, 1930), pp. 237-8. Barun's conversion coefficient from 1926/7 to 1913 prices is almost certainly too low: 560 million rubles would be a more realistic figure than 746 million.

25 Ibid., pp. 32-3. Compare Vainshtein's estimate that the value of all industrial physical property increased by 560-3 million rubles in 1913 (Narodnoe khozyaystvo, p. 237).


27 Industrial production in fact rose much more smoothly than this after 1926, but much of this increase was due to the bringing back of unused capacity into use.

28 A comparison of these sectors with 1913 requires further work.
livestock and other agricultural activities; this discouraged grain production and encouraged consumption of grain by the rural population and the feeding of grain to livestock. The price policy of the Soviet government resulted in a paradox, which was not admitted, and probably not fully understood, by the Soviet leaders. The low price of grain promoted the intensive livestock development which was the major “modernization” of agriculture achieved by NEP; at the same time it necessarily discouraged grain marketings. The Soviet leaders vainly hoped to achieve voluntary improvements in grain marketings in spite of the relatively low grain prices.

What was the way out of the dilemma? Millar has argued that a substantial shift in the terms of trade against agricultural production as a whole, presumably by lowering the relative price for livestock products, would have forced the peasants, whose demand for industrial goods was inelastic, to market more grain and other products.32 Harrison has endeavoured to establish how peasants did in fact react to shifts in the terms of trade in the 1920s, but his results are frustratingly inconclusive.33 It seems that even an unprejudiced Soviet economist, armed with the advantages of hindsight, would not have had a strong basis to recommend to his government that the problem of increasing agricultural supplies while simultaneously increasing the level of industrial investment could be resolved by the “Millar solution”, a drastic encouragement of grain marketings by increasing the price of grain relative to livestock, even if administratively feasible, would have simultaneously discouraged the technologically progressive intensification of agriculture.

Soviet statistical data depicting the economic transformation of the 1920s are much more abundant than is generally realized. But they are patchy and often more unreliable than those for the 1920s, especially from the mid-1920s onwards; it will therefore be necessary to engage in a few tedious manipulations and qualifications of the official figures in the account which follows.

32 See n. 6 above.

## II

### Soviet Development between 1926 and 1941

The pace of Soviet industrialization was strikingly reflected in the rate of urbanization and to an even greater extent in the rapid changes in the pattern of employment between the 1926 and 1939 population censuses.34 The crude data for urban and rural population show an increase in urban population from 26.3 to 55.9 million, or from 17.9 to 32.8 per cent of a total population which increased from 147.0 to 170.5 million.35 And while the urban population doubled during these twelve years, non-agricultural employment more than trebled (see Table 1). The substantial increase in the participation rate was due to the breakdown of the market economy of NEP.

<table>
<thead>
<tr>
<th>Year</th>
<th>Employment (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1926</td>
<td>Industry, construction, transport and communications 6.4 23.7 370</td>
</tr>
<tr>
<td>1929</td>
<td>Other non-agricultural employment 5.2 15.6 300</td>
</tr>
<tr>
<td>1939</td>
<td>Total non-agricultural employment 11.6 39.3 339</td>
</tr>
<tr>
<td></td>
<td>Total agricultural employment 71.7 47.7 67</td>
</tr>
<tr>
<td></td>
<td>Total employment 83.3 87.0 104</td>
</tr>
</tbody>
</table>

Source: Estimated from Vsevyzyamnye perepisi naseleniya 1926 goda, vol. XXXIV (Moscow, 1930), pp. 120-42, and Vsevyzyamnye perepisi naseleniya SSSR 1939, vol. XXII (Moscow, 1962), p. 110. On Soviet definitions “industry” covers both mining and manufacture but excludes the building industry “construction”. A forthcoming study by Wheatcroft of the breakdown of the data by type of occupation will result in some minor modifications in these totals.

Note: The decline in total agricultural employment is somewhat exaggerated, possibly by as much as 6 million peasants. The 1939 census excluded all children under 16, men over 60 and women over 45 years of age from the active population. But the 1936 census included among family members engaged in non-socialised agriculture 11-18 million children aged 10-15 (below the later active minimum) and 6-5 million people aged above what later came to be accepted as the minimum active age. While it is possible to accept that most of the 11-4 million decline in child employment represented a real decline in employment owing to increased school attendance, it is far more questionable whether the disappearance of employment in the older age groups was a real event.

The number of persons engaged in agriculture declined rapidly, and the nature of agricultural employment was transformed with the replacement of 20 million

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34 The census of 17 December 1926 was published in 36 volumes between 1928 and 1933, and only three brief tables from the census of 17 January 1939 have appeared in various publications between 1939 and 1963.
35 Changes in the coverage of “urban population” between the censuses were of minor importance: F. Lorzick, The Population of the Soviet Union: History and Prospects (Geneva, 1948), p. 147. There is some possibility that the population figure for 1939 is a little exaggerated. A comparison of the age pattern of male survivors from 1936 and 1939 and from 1939 to the next census in 1959 indicates the probability that 1-2 million men born in the 1916-1918 period were registered as alive in 1939, whereas the official standard mortality tables they should have already died. The loss to this same cohort in the period 1939-59 is higher than expected for this age group given the expected level of losses and the expected age structure of war-time losses. We estimate that the size of the population is exaggerated by at most 20 million.
individual peasant family households by primarily collective employment on 4,000 state farms and over 200,000 collective farms (together with ancillary employment on household plots). The dramatic drop in the numbers employed in agriculture from 72 million in 1926 to 48 million in 1939 shown in Table 1 is, however, somewhat exaggerated, possibly by some 6 million (see note to Table 1).

The rapid increase of the labour force in the non-agricultural sectors, and particularly in industry itself, was accompanied by an even more rapid increase in capital investment and capital stock in these sectors. The magnitude of the increases varies considerably according to the prices used. In the initial years used in most estimates, 1926/7 or 1928, machinery costs and prices were relatively high because most machinery was produced on a small scale. By the last year of the second five-year plan, 1937, the concentration of resources on the capital goods industries in general, and on the machine-building industry in particular, had led to a rapid fall in the costs and prices of machinery relative to those of other products, particularly consumer goods and agricultural products. In addition the costing system introduced in the 1930s underestimated capital costs, which were particularly high in the capital goods industries. These trends resulted in the "Gershenkron" effect. The economy tends to grow much more rapidly when growth is measured in 1928 rather than in 1937 prices; and capital investment—a substantial part of which is machinery—tends to be a much higher proportion of the national income. But, whichever prices are used, the share of capital investment in GNP rose extremely rapidly. According to a careful Western estimate, gross investment rose from 8.4 per cent of GNP in 1928 to 21.1 per cent in 1937 when measured in 1937 prices, and from 20.3 to 40.5 per cent in 1928 prices.46 In the peak year, 1938, gross investment in fixed capital was nearly four times the 1928 level in 1937 prices and as much as 5.5 times that level in 1928 prices (see Table 2). As a result of this high and sustained level of investment, the stock of fixed capital increased more rapidly than the total labour force or the national product, and capital-output and capital-labour ratios rose substantially.47 These results indicate that the conventional view of "Stalinist industrialization" as labour-intensive "extensive growth" must be carefully qualified.

The share of capital investment in GNP increased much more rapidly in 1928-41 in the Soviet Union than in the roughly equivalent period of development in the United States and nearly all other industrialized countries.48 The enormous and rapid increase in resources devoted to capital investment was a major distinctive feature of Soviet industrialization. The growth was from a relatively low level. On the basis of estimates by an American building engineer who held a senior position in the Soviet building industry in the early 30s, it may be calculated that in 1928 Soviet capital investment was a mere 4.9 per cent of the United States' pre-depression level (1925-9 average); by 1932 this had increased to 9.18 per cent, and by the peak year 1936 to 14.32 per cent.49

<table>
<thead>
<tr>
<th>Year</th>
<th>1926 index (1926 = 100)</th>
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<tbody>
<tr>
<td>1928</td>
<td>28.48</td>
</tr>
<tr>
<td>1937</td>
<td>55.33</td>
</tr>
</tbody>
</table>


Table 2. Investment in Fixed Capital, 1928 and 1936 (in million rubles)

<table>
<thead>
<tr>
<th>Year</th>
<th>1928</th>
<th>1936</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross investment in fixed capital (excluding capital repairs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>of which, industry</td>
<td>5.15</td>
<td>14.08</td>
</tr>
<tr>
<td>equipment</td>
<td>1.41</td>
<td>1.99</td>
</tr>
<tr>
<td>agriculture</td>
<td>0.90</td>
<td>5.46</td>
</tr>
<tr>
<td>education and health</td>
<td>0.20</td>
<td>4.40</td>
</tr>
<tr>
<td>housing (including industrial and rural)</td>
<td>1.71</td>
<td>3.60</td>
</tr>
<tr>
<td>Gross investment in fixed capital (including capital repairs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>of which, industry</td>
<td>6.34</td>
<td>20.21</td>
</tr>
<tr>
<td>equipment</td>
<td>1.84</td>
<td>14.20</td>
</tr>
<tr>
<td>agriculture</td>
<td>1.47</td>
<td>19.44</td>
</tr>
<tr>
<td>education and health</td>
<td>0.59</td>
<td>6.32</td>
</tr>
<tr>
<td>housing (including industrial and rural)</td>
<td>1.71</td>
<td>3.60</td>
</tr>
</tbody>
</table>


46. 'Kapital' v ishii sini bonyakhoiakh SSR na 1926/1927 god (Moscow, 1928), p. 145-51; excludes housing, which appears below.
47. Ibid., pp. 145-51.
49. Ibid., pp. 145-51.
50. Ibid., pp. 145-51.
51. Ibid., pp. 145-51.
52. Ibid., pp. 145-51.
53. Ibid., pp. 145-51.
54. Ibid., pp. 145-51.
55. Ibid., pp. 145-51.
56. Ibid., pp. 145-51.
57. Ibid., pp. 145-51.
58. Ibid., pp. 145-51.
60. Ibid., pp. 145-51.
61. Ibid., pp. 145-51.
63. Ibid., pp. 145-51.
64. Ibid., pp. 145-51.
65. Ibid., pp. 145-51.
68. Ibid., pp. 145-51.
69. Ibid., pp. 145-51.
70. Ibid., pp. 145-51.
71. Ibid., pp. 145-51.
72. Ibid., pp. 145-51.
73. Ibid., pp. 145-51.
74. Ibid., pp. 145-51.
75. Ibid., pp. 145-51.
76. Ibid., pp. 145-51.
77. Ibid., pp. 145-51.
78. Ibid., pp. 145-51.
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98. Ibid., pp. 145-51.
100. Ibid., pp. 145-51.
102. Ibid., pp. 145-51.
103. Ibid., pp. 145-51.
104. Ibid., pp. 145-51.
105. Ibid., pp. 145-51.
106. Ibid., pp. 145-51.
110. Ibid., pp. 145-51.
111. Ibid., pp. 145-51.
112. Ibid., pp. 145-51.
113. Ibid., pp. 145-51.
114. Ibid., pp. 145-51.
115. Ibid., pp. 145-51.
117. Ibid., pp. 145-51.
118. Ibid., pp. 145-51.
119. Ibid., pp. 145-51.
120. Ibid., pp. 145-51.
121. Ibid., pp. 145-51.
122. Ibid., pp. 145-51.
123. Ibid., pp. 145-51.
125. Ibid., pp. 145-51.
126. Ibid., pp. 145-51.
127. Ibid., pp. 145-51.
128. Ibid., pp. 145-51.
129. Ibid., pp. 145-51.
130. Ibid., pp. 145-51.
131. Ibid., pp. 145-51.
132. Ibid., pp. 145-51.
133. Ibid., pp. 145-51.
134. Ibid., pp. 145-51.
135. Ibid., pp. 145-51.
137. Ibid., pp. 145-51.
139. Ibid., pp. 145-51.
140. Ibid., pp. 145-51.
141. Ibid., pp. 145-51.
142. Ibid., pp. 145-51.
As Table 2 shows, capital investment was heavily concentrated on industry, and particularly the capital goods industries. The residential sector, already squeezed in 1928 as compared with 1913, was now squeezed much further: between 1928 and 1936 investment in this sector fell from 27 per cent to about 5 per cent of total investment. Investment in rural housing was reduced particularly drastically; but even in the towns, in spite of the fact that urban population more than doubled in 1929-37, the absolute level of annual investment in housing in real terms in this period was little higher than in 1925-8.

Investment in agriculture (excluding housing) is difficult to measure accurately; it certainly rose much less rapidly than investment as a whole (see Table 2), primarily as a result of the low level of investment in farm buildings. However, investment in agricultural equipment, which had to provide tractors and lorries to replace horses destroyed during the first five-year plan, rose very substantially: it amounted to 24 per cent of all investment in equipment in 1928, and increased to 28 per cent in 1933-5 (measured in 1937 prices; the equivalent figures in 1928 prices are 19 per cent in 1928, rising to 34 per cent in 1935).

The rise in investment was almost entirely concentrated into two sub-periods: 1928-32 and 1934-6. In a mere two years between 1929 and 1931, investment in fixed capital doubled even when measured in 1937 prices; the increase in investment in industry was responsible for more than half the total increase. During this period many major new capital projects in industry were started, and the amount of incomplete construction grew rapidly.

The investment drive was interrupted in 1933, the first year since the Civil War in which investment in fixed capital declined absolutely; this was the famine year, a moment of major crisis. In the following three years, 1934-6, investment again expanded, and the major projects of the early 1930s were brought into operation; in this period, unlike the rest of the 1930s, the cost of investment remained stable or even fell slightly. The last 48 years before the war (1937-41), were a further period of difficulty. Annual investment in real terms declined, and costs rose. The difficulties in investment were owing partly to the diversion of labour and materials to the defence industries, and partly to the disruption resulting from the large number of arrests of managers and engineers in 1936-8.

In spite of setbacks, the large increases in capital investment resulted in a very substantial rise in capital stock in 1928-41. According to the best Western estimates, by 1 January 1941 net fixed capital in the non-agricultural, non-residential sectors had reached 65% per cent of the 1 January 1928 level, when measured in 1928 prices, and 56% per cent of that level when measured in 1937 prices.40 The rise in fixed capital was of course particularly rapid in industry itself. Detailed figures are available only for the period up to 1935. According to official figures in 1933 prices, the stock of fixed

40 Moorsteen and Powell, Capital Stock, pp. 348-9; Moorsteen and Powell's figures have been adjusted by one of the present authors so as to obtain comparable territory; the percentage in 1937 prices was obtained by us after correcting a mistaken assumption by Moorsteen and Powell (see Davies, 'Capital Investment', Table 4, General Note to Table 4).

41 Estimated from official data in Plans, No. 3, 1934, p. 51; and No. 3, 1936, p. 19; Problemy ekonomiki, No. 2, 1937, p. 56; and Sovetskiye stroitel'stvo SSSR (Moscow, 1939), p. xxi. These data are at full restoration cost.

42 Sovetskiye stroitel'stvo SSSR (Moscow, 1939), p. 48; these figures exclude mining, and are for the industrial commissariats only.

43 Sovetskiye stroitel'stvo SSSR (Moscow, 1939), p. 179; Bishaya svedenya otsentrologii, 131 (Moscow, 1934), col. 318-83.

44 Sovetskiye stroitel'stvo SSSR (Moscow, 1939), p. xxi.


46 See Davies, 'Industrial Production', pp. 51-6.
considerable increase reflected the shift towards industrial processing in industries, such as textiles and bread-baking, where factory production of the final product was relatively unimportant in 1928 (textiles were bought in lengths not as garments; bread was baked at home). But this could explain only part of the increase. It seems certain that many foodstuffs and consumer goods must have been included in the 1937 official total at unjustifiably high prices.\(^7\)

From these various statistical series, duly adjusted by western experts, certain major features of the expansion of Soviet industry in the 1930s clearly emerge. Firstly, at the core of the expansion was the massive growth of the capital goods industries; while this was accompanied by an auxiliary substantial development of factory production of certain consumer goods and foodstuffs, this did not at all result in an equivalent rise in the standard of living. Secondly, as might be expected after the substantial investments in industry, labour productivity (output per person-year) increased substantially over the period 1928-31 as a whole. But the first few years of the industrialization drive were a time when millions of raw recruits flooded into industry, living conditions were bad, and materials were in short supply. Not surprisingly there was a temporary decline in productivity. According to Hodgson's study, it declined by 8 per cent between 1928 and 1932. But it then rose to as much as 55 per cent above the 1928 level in 1937 and 69 per cent above the 1928 level in 1940.\(^8^\) Owing to the wide variations in the underlying production data, the various western estimates differ considerably and should be taken as merely a rough indication of the general direction of changes in productivity.\(^9^\) Thirdly, the important qualification should be made that none of these series adequately reflects changes in the quality of production. In the years of upheaval from 1929-33, the quality of production certainly greatly deteriorated for capital goods as well as consumer goods. Thereafter it improved rapidly in 1933-7, and in the case of many comparable capital goods recovered to the 1928 level; in the case of consumer goods, however, it is not clear how far quality had recovered by the late 1930s relative to the level of the 1920s.

But perhaps the most important point to make about all these series is that, particularly in the capital goods industries, an increasing proportion of production was new to the Soviet economy and not easily comparable in quantity or quality with that of earlier years. The western series all seek to incorporate these major changes to some extent, but often underestimate their importance; in the opposite direction, minor changes in product, particularly in the case of consumer goods, were certainly a factor in the exaggerated growth of the official Soviet index.

The transformation which occurred in the capital goods industries may be illustrated by the example of the machine-tool industry.\(^10^\) In 1929-30, output expanded very rapidly as a result of the production in large batches at specialized factories of models designed before the First World War or in the early 1920s. From 1932 onwards, a qualitatively new stage began, with the production of fundamentally new models based on the latest German and United States designs. As the inadequately trained workers and engineers grappled with the assimilation of high-precision technology, the output of the specialized machine-tool industry fell, and an overall growth of output between 1931 and 1935 was achieved by expanding small-scale production at other engineering factories. But by 1934 automatic and semi-automatic lathes, centreless grinding machines and threading machines were being produced in the USSR for the first time, and by 1937, the last year of the second five-year plan, the Soviet industry was able to build almost all types of machine-tools and the structure of output was substantially modernized. Most new models were copies of foreign designs, but the copying and innovation were almost entirely undertaken by Soviet engineers and workers, as was the construction of the new machine-tool factories.\(^11^\)

Major technological advances also occurred in many other industries. During the first five-year plan alone, Soviet industry mastered the production of, for example, synthetic rubber, motor cycles, wristwatches, cameras, excavators, high-grade cement, and a variety of quality steels. These were the years in which the Soviet research and development network was firmly established. According to R. A. Lewis's estimates, in 1935 the U.S.S.R. was spending some 0.6 per cent of its national income on research and development (R and D), as compared with 0.35 per cent in the United States in the same year.\(^12^\)

Simultaneously, with the huge expansion of capital investment and with these technical changes in industry, steadily increasing resources were devoted to defence and the defence industries. Evidence published from the Soviet archives indicates that during the first five-year plan defence expenditure was substantially higher than the official budget figures previously showed, amounting between 1 October 1928 and 31 December 1932 to 8,500 million rubles in current prices, 10-8 per cent of state budget expenditure, as compared with the earlier figure, 4,944 million rubles, only 6.3 per cent of expenditure. Even the revised figure excludes the state budget allocation to capital investment and additional working capital in the defence industries.\(^13^\) As early as

\(^7^\) See Cooper, 'Machine Tool Industry'.

\(^8^\) A. C. Sutton, 'Western Technology and Soviet Economic Development, 1920 to 1945 (Stanford, 1971)', pp. 139-44, rates the machine-tool industry 9 on a 10 point scale for the degree to which it depended on foreign technical assistance, but our own research shows that the industry was to a considerable extent an independent Soviet achievement. Sutton wrongly asserts that the total Soviet demand for machine-tool equipment did not fall in the 1930s (ibid. p. 136) and he purports to demonstrate the backwardness of Soviet machine-tool output by comparing the composition of production in 1943, the last year of the Second World War, and in 1938, although Soviet production of boring, broaching, and slitting machines, of radial drills and of 'large, heavy, unique' machines, the examples cited by Sutton (ibid. p. 140), was in every case much higher in 1940 than in 1943 (a total for these groups of 1,221 compared with 115).

\(^9^\) R. A. Lewis, Science, Technology, and Soviet Economic Development, 1917-1940 (1979), pp. 16-17. The author calculates that expenditure on 'science' was already a higher proportion of national income in the Soviet Union than in the United States as early as 1936 if this is corrected for special categories of expenditure R and D that, in comparative terms, was the most important feature of Soviet development in the 1920s.

1922, 21·9 per cent of rolled metal was allocated to "other machine-building" (i.e. the defence industries), 41·3 per cent of all rolled metal allocated to "machine-building".54

The defence industry was highly privileged. It was afforded priority in the supply of fuel, materials and machinery; it was able to impose high quality requirements on other industries; it absorbed highly skilled engineers and designers; the pay and conditions of its workers were better than those in equivalent civilian industries. All this of course drew potential resources away from civilian industries. The paramount requirements of defence also influenced the general shape of economic development in other ways. Strategic considerations played a major part in the decision of 1929-30 to go ahead with the expensive Ural-Kuznetsk iron and steel combine.55 Throughout the 1930s new factories were planned and built with a view to possible conversion to military production, particularly in the Urals and beyond.56 In the final months preceding the German invasion, over half the total output of the industry of the Urals was for military purposes.57

In contrast to the developments in industry, the story of agriculture in the 1930s was dominated by crises and disaster. Livestock production collapsed, while grain production declined and did not recover sufficiently to reach the prewar level. The production of industrial crops, potatoes and vegetables, however, increased substantially.

The collapse of livestock determined the general direction of gross agricultural production. The annual growth in the 1920s was suddenly reversed in 1928/9; a low point was reached in 1932. For agriculture as a whole, production in 1932 was about 27 per cent below the 1928 peak and about 18 per cent below the 1929-31 average level. For the livestock sector the 1932 level was 55 per cent below 1928 and 43 per cent below the 1929/31 average (Table 3). After 1932 both livestock and arable production recovered substantially; gross agricultural production in every year of the late 1930s, with the possible exception of 1936, was higher than in 1928. There are, however, enormous difficulties in attempting to assess the exact scale of the decline in agricultural production in the early 1930s and its subsequent recovery in the late 1930s. The main problem lies in the evaluation of the scale of grain production. It is now agreed by all historians (both Soviet and Western) that the level of grain production recorded in official Soviet statistical handbooks from 1933 until the early 1950s greatly exaggerated the true scale of production: this was the period in which the harvest was measured in terms of the so-called "biological" yield instead of the barn yield.58 But it remains uncertain how

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far the revised current Soviet evaluation in terms of barn yield is comparable with the data for the pre-revolutionary period, the 1920s and especially for the highly disturbed 1929-32 period. We have therefore recommended the use of a high and low series of comparable figures together with an additional error margin for the particularly uncertain years of 1929-32. Our provisional conclusion is that the decline in grain production in 1931 and 1932, and the recovery in 1933 and 1934, were both far more substantial than indicated by other estimates, whether western or Soviet.

Table 4.

| Note | 
|------|------|
| TsSU: | Central Statistical Administration. The main state statistical agency established in 1918 and abolished in 1920 when its functions were transferred to Gosplan and TsUNKhU. In 1941 TsUNKhU was renamed TsSU but did not regain independence from Gosplan until 1948. |
| Gosplan: | State Planning Commission, established in 1924. |
| TsUNKhU: | Central Administration for National-Economic Records, attached to Gosplan. Created in 1926 and renamed TsSU in 1941. |

Sources:

SOVIEFT OFFICIAL SERIES


Current: 1900-13 (average), 1911, 1926-32 (average), 1932-37 (average), 1938-40 (average), grain production. Sotsial’no-khokhutnoe khoziaistvo SSSR (Moscow, 1960), p. 166. The annual production figures for the 1920s were calculated by one of the present authors using data from the following sources: Kolkhoz barn yields, biological yield ratios for the years. The kolkhoz barn yields were obtained from I. E. Zelenin and M. A. Vol’fman in Zemledel’stvo po agrarnoi statisticheskoi initi Stavke (Moscow, 1970), pp. 471-3. See also Y. A. Maslennikov in Voprosy sovetskoi khoziaistvennoi statistiki (Moscow, 1966), p. 219.

WESTERN ESTIMATES


SIPS revised: See forthcoming Discussion Paper by S. G. Wheatcroft, 'Grain Production in the USSR in the 1920s and 1930s: a revised SIPS estimate.'

SOVIET DEVELOPMENT BETWEEN 1926 AND 1941
Among industrial crops, the remarkable increase in the production of cotton was more than sufficient to replace imports, which declined from 45-1 per cent of consumption in 1926/7 to 2-6 per cent in 1933, as is shown in Table 5:69

<table>
<thead>
<tr>
<th>Year</th>
<th>Cotton Consumed</th>
<th>Home-Produced Cotton Consumed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1926/7</td>
<td>306-8</td>
<td>186-4</td>
</tr>
<tr>
<td>1933</td>
<td>405-3</td>
<td>394-5</td>
</tr>
</tbody>
</table>

The achievements in industrial crops were overshadowed by the disastrous fall in livestock. In 1933 there were only one-third as many sheep, half as many horses and pigs, and 54 per cent as many cattle as in 1928.60 The number of work horses fell from 23-4 millions in the spring of 1929 to 12-8 millions in July 1934, and this decline was only gradually compensated by the increase in the stock of tractors.61 As the total value of all livestock in 1928 amounted to about half the total value of means of production in Soviet agriculture,62 the destruction of livestock thus removed about a quarter of all existing agricultural capital. And these figures do not take into account the lower quality of the remaining animals as compared with 1928—there is no doubt that by 1933-4 the surviving animals were smaller and weaker, with less meat on them.63 The value of the milk was less, and compared with 32-4 per thousand at the time of 1926/7, the milk price in 1926/7 was still as high as about 45 per thousand.64 Both birth and death rates continued to decline after 1927, though there was some interruption in the early 1930s.65

The increase in population in 1926-39, though much more rapid than experienced in the West at the time, was much lower than the authorities anticipated. The latest five-year plan, for example, assumed that a high birth rate would continue to be associated with a declining death rate, and hence that the population would grow by as much as 3-6 millions, or 2-3 per cent, per year.66 Several attempts have been made by western scholars to establish the loss in population owing to excess mortality between the 1926 and 1939 censuses: age-specific mortality rates are applied to the population recorded in the 1926 census and the results are compared with the number of survivors registered in the 1939 census. The most careful study is still that by Lorimer, published in 1946, which found a "discrepancy" of about 5-5 million.67

59 Calculated from Sotsialisticheskoe stroitel'stvo SSSR (Moscow, 1931), p. 367.
60 Narodное хозяйство SSSR (Moscow, 1932), p. 188-9, Sotsialisticheskoe stroitel'stvo SSSR (Moscow, 1935), p. 367.
61 Ibid. pp. 367, 291. Assuming that 1 horse = 0-75 mechanical horse-power, Janey estimated that total mechanical and animal horse-power did not recover to the 1929 level until after 1935; N. Janey, The Socialized Agriculture of the USSR: Plans and Performance (Stanford, 1949), p. 458. On the more reasonable assumption that 1 horse = only 0-5 mechanical horse-power, the recovery occurred by 1935.
62 Narodnoe khozyaistvo SSSR (Moscow, 1932), p. 144.
63 However, it should be pointed out that there was a definite trend to preserve pure-bred stock at the expense of other stocks, so that the share of pure-bred stock rose.
64 These figures are based on part of a grain-fodder balance which has been constructed using official livestock data and the livestock feed norms that were in use in the late 1920s. For further details on the methods of constructing these balances and the livestock feed norms used see Wheatcroft, 'Grain Production', pp. 485-492.
66 Narodnoe khozyaistvo SSSR, 1922-1972 (Moscow, 1972), pp. 41, 43. According to Lorimer these registered mortality figures are somewhat underestimated (Lorimer, The Population of the Soviet Union, pp. 133-6).
67 By 1939 the crude death rate had fallen further to 17-4 per thousand and the birth rate had fallen to 36-5 per thousand: Narodnoe khozyaistvo SSSR, 1922-1972 (Moscow, 1972), p. 40. It should be noted, however, that an age-by-sex analysis of the 1939 mortality data indicates that this crude death rate corresponds more to an actuarial indicator of normal mortality than to a record of real mortality including exceptional deaths from violence: G. W. Wheatcroft, 'The Population Dynamic and Factors affecting it in the Soviet Union in the 1920s and 1930s', unpublished CREES Discussion Papers, University of Birmingham, SIPS Nos. 1-4 (1976), p. 32. By 1940 the birth rate had fallen substantially to 26-7 per thousand, it had then gradually increased in the next 10 years after the abolition of abortion in 1959 (see p. 366 below).
68 Calculated from Pyatnychnyi plan narodnoho khozyaistvo SSSR, i (Moscow, 1930), p. 129. This optimism was reflected in statements by Stalin in 1929-30: L. Stalin, Sochineniya, xii (Moscow, 1949), p. 299, and xiii (Moscow, 1951), p. 336.
In order to establish this discrepancy, Lorimer examined what the population would have been if there was (i) a straight-line relationship between his revised estimate of the crude death rates of 1926/7 and the official figure for 1938, the only year available to him; and (ii) a steady decline in birth rates to 1935, followed by a temporary increase after abortion was made illegal in 1936. The general order of magnitude of Lorimer's assumptions about birth rates has been partly confirmed by data published subsequently to 1946. The decline in the birth rate was a long-term trend, already visible before the First World War, which certainly continued after the immediate postwar bulge. Women began to shorten the age span over which they would give birth to children. In the 1930s this was to some extent a natural response to the decline in infant mortality, which occurred in spite of the often unpleasant living conditions and the food shortages. It was also a consequence of the increase in female employment. Abortion began to be widely used as a form of birth control. The ban on abortion introduced in 1936 in response to the decline in birth rate boosted births in 1937, but in the following years it again declined; the effect was even more short-lived than Lorimer assumed. The only certain consequence of this piece of legislation was to make the lives of many Soviet women extremely unpleasant, and to fill the hospitals with women suffering from dangerous illegal abortions that went wrong.

The main causes of the unexpected loss in population estimated by Lorimer at 5-5 million persons were the famine of 1932-3 and excess deaths in labour camps. While we now have much more information about these grim events, it remains uncertain how the loss should be distributed between them. Here we examine the major factors in turn.

The demographic significance of the famine is difficult to assess. Its worst immediate effects occurred in 1932 and 1933. Villages and households in grain areas—especially the Ukraine, the Volga and the North Caucasus—were given fixed collection targets in spite of a poor or indifferent harvest, and widespread starvation resulted. Households with insufficient foodstuffs from their own production, and not in receipt of state rations, felt the full force of the rapidly escalating private market prices. But epidemic disease was also widespread as after the famine, there was a general mortality from this cause is likely to have been smaller than after the earlier famine; and the 1932-3 famine had no long-term effect in reversing the declining trend in mortality.

Though infectious diseases resulted in some increases in mortality in the 1930s, the epidemic diseases were generally much less serious than those of the civil war and its aftermath (1918-22): the increases in typhus and typhoid were not at all comparable with the epidemics of 1918-23. The only infectious disease

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which reached the proportion of earlier epidemics was malaria. These new outbreaks were probably owing to the large decrease in livestock, which caused the vector anopholes to turn more to biting human beings. The presence of widespread malaria (there were over 9 million cases in 1934) led to the formation of the first All-Union People's Commissariat of Health and the carrying out of a very active anti-malaria campaign.

The demographic significance of purges and labour camps is even more difficult to assess than that of the famine. Involving millions of people, often in appalling conditions, they must have resulted in much loss of life. Nevertheless, the estimates of Dallin and Nikolaevsky, Conquest and Solzhenitsyn that 9-10 million people were in the camps in the 1930s appear to be exaggerated. As does Conquest's estimate that over 5 million people died as a result of the camps and purges by the end of 1938. We estimate that there were likely to have been a maximum of 4-5 million people in the labour camps at the time of the 1939 census and that deaths were likely to have been correspondingly smaller.

III

The pattern of development we have outlined, with its stark contrast between the progress of industry and the disruption of agriculture, was certainly in large part a result of the concentration of resources on the capital goods and defence industries at the expense of food production. It has been shown, for example, that an underlying reason for the decline in livestock in 1928-29 was the reduction in fodder, which was in turn a result of the huge increase in the grain collections; the extra grain collected was primarily used to feed the growing urban population or exported to pay for increased imports of machinery.

But the pattern of economic growth in the 1930s cannot be explained solely in terms of the concentration of resources on industrialization. Planned industrialization was compatible with a range of economic policies; and the policy chosen had unintended consequences for economic development which in turn led to modifications in policy. The ideological biases of the political leaders and their hierarchy of advisers influenced their decisions and their economic behaviour, with repercussions throughout the economy. The economic and political system of the 1930s was not, as has often been assumed, a ready-made "given" instrument for rapid industrialization; it underwent its own evolution, followed its own laws, and exerted a powerful influence on economic behaviour. And geographical and climatic factors, exogenous to policy and system, and inadequately appreciated by the policy-makers, exerted their own influence on economic progress. This section considers some of the effects of such complicating factors.

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17 These extra deaths were not included in the death rate indicators that were published for the late 1930s (see n. 67 above).
The crucial policy decision of the central authorities at the end of the 1920s—to force through a very rapid pace of industrialization without regard for its effect on the delicate market relation between the state and the peasantry—was by no means based on purely economic considerations. While all the influential leaders favoured some kind of planned industrialization, the extent of the international and internal threats to the regime, and hence the urgency of rapid industrialization, were hotly disputed at this time; and exigencies of the struggle with the more cautious "right wing" in the party inflected the policy outcome. From the outset, throughout most of the first five-year plan (1928-1932) economic plans were widely over-optimistic even in terms of the decision of Stalin and his supporters in the Politburo to force through rapid industrialization. Thus quite unrealistic revised industrial targets for the first five-year plan, approved early in 1930, remained in force for over two years. The most notorious was the plan to produce 17 million tons of pig-iron in 1932/3 (some said in 1931/2); this target was not achieved at all before the Second World War. Yet these plans influenced expectations about what could be achieved throughout the economy. It was estimated, for example, that the huge increase in the supply of iron and steel would enable the stock of tractors in the economy to rise from 391,000 horse-power on 1 October 1929 to 9 or 10 million h.p. in 1932/3, while in practice the stock reached only 3-2 million h.p. by 1 January 1934. 

Virtual stagnation had harmful practical effects. The belief that large capital investment projects could be brought very rapidly to fruition led to many capital investment projects being started which could be completed only after long delays, and hence to a very large increase in unfinished construction in industry. It resulted in the belief that tractors would replace horses throughout Soviet agriculture within a few years. In consequence, the leaders were insufficiently alarmed about the decline in the number of peasant horses in 1930 and 1931, and were thus encouraged to pursue rash policies towards the peasantry.

The most momentous of the unintended consequences of the unfeasible plans for the early 1930s—the deterioration of agriculture, and particularly of livestock farming—in turn had important repercussions on industrial policy. The need to replace dead horses by tractors was an urgent priority in the early 1930s. As the plans for expansion of the iron and steel industry were not fulfilled, the large increases which took place in tractor and combine harvester production, though much less than planned, were achieved only by a massive diversion of resources to the engineering industries serving agriculture. The big increases in production of quality steel of kinds never previously manufactured in the Soviet Union were at first mainly devoted to these industries:

69 See articles by Hunter and by Davies and Wheatcroft listed in n. 7 above.

72 See Davies, 'Economic Crisis', p. 4, n. 1.
in crop rotations in the course of the 1920s appears to have been undone. To the damage produced by these upheavals in agricultural structure was added the pressure of the authorities to increase sown area, particularly the area sown to grain, in practice at the expense of proper rotations. In 1932, the People's Commissariat for Agriculture stressed the unsatisfactory condition of crop rotation, but at the same time repeatedly emphasized that rotations must not be improved by reducing the area sown to grain. Ignorance by the authorities both of the agrotechnical consequences of pressure for short-term increases in the area sown to grain, and of the need for careful crop rotation, undoubtedly had a harmful effect. In the early 1930s the economic and political structure within which these industrialization policies were put into effect was neither ordered nor stable. A fully fledged Stalinist system of economic management and organization did not spring suddenly into existence at the end of 1929. The early 1930s were years of experimentation, of search for a viable system of economic management. At the end of 1929 and in the early months of 1930, the common assumption of the political leaders was that the days of the New Economic Policy were numbered, and that it would soon be superseded by a socialist economy; at this time a "socialist economy" meant a moneyless economy in which direct exchange and distribution would replace trade in commodities. For a few heady weeks at the beginning of 1930, a spate of articles in the economic and party press claimed that the new economic unit in the factories would be a factory commune in which surplus income was equally distributed. With the new economic unit in the countryside would be the giant kolkhoz as large as a whole administrative district (raion), and it was expected that these new units would be established immediately. At this time much publicity was given to grandiose socialist townships featuring progressive forms of communal living; agricultural towns (agrogoroda) were planned for the near future; and plans for a new revolutionary calendar were well advanced. The original proposals were for a two-in-one plan, and was endorsed by Stalin or the Politburo, and with the retreat from complete collectivization in the spring of 1930 such schemes were soon abandoned. Yet the Soviet economic system as it has existed since the mid-1930s did not emerge immediately. It was assumed for a further two years that peasant trade at free prices was speculative trade, and did not form part of the socialist economy. Three official or, semi-official "models" of the economic system succeeded one another in the early 1930s: the "moneyless" or "product-exchange" model, 60


62 For the factory commune, see for example the editorial in Bol'shevik, No. 3-4, February-December, 1929, pp. 427; for the giant kolkhoz see Davies, Collective Farm, pp. 27-30. 63

63 For the socialist towns, see for example, L. Sabotnikov in Ekonomicheskaya zhizn', 20 December 1929; for the agrogoroda see Davies, Collective Farm, pp. 44-6. In 1930 a government committee under Kaganovich proposed a plan to establish 12 months from each quarter consisting of six to 9 weeks of 5 days each; 7 revolutionary holidays would not form part of any month (Za industrializatsiyu, 25 February 1931). 64


end-1929 to mid-1930; the transitional model of 1930-1, which assumed that the money economy would continue, but that all exchange would be at official prices (called "socialist prices"); and the fully-developed model of 1930 onwards, which incorporated money, financial accounting, wages and collective-farm trade at market prices into the official concept of the socialist economy. 91

The uncertainties and shifts in practical organizational decisions which accompanied this search for a new Soviet economic system obviously carried significant, if unmeasurable, economic costs. The industrial reorganization at the end of 1929 and the subsequent readjustments in 1930-3; the credit reform of 1930 and its subsequent fundamental amendment in 1931; the repression of peasant trade at the beginning of 1930, and its subsequent resumption under conditions of illegality or near-illegality in 1930 and 1931—all these "experiments" resulted in confusion, sometimes in chaos. A stable economic system with its attendant advantages and disadvantages for the efficient application of economic policy did not emerge until 1933-4, more or less simultaneously with the adoption of more realistic economic policies. The influence of the political system on the economy is a further complication in our story. In some important respects, the informal powers of the party machine, and the enthusiasm of the party rank and file, undoubtedly played a positive part in the industrialization drive: the completion of the major new factories in the early 1930s depended on the strenuous efforts and long working hours of this minority. But Stalinist ideology was not just an industrializing ideology in its attribution failures and shortcomings to the activities of the class enemies or to the influence of their ideas, and hence provided a framework for acceptance, and even for active support, of the campaigns against leading bourgeois specialists as wreckers, and their arrest and trial. These ferocious campaigns—that against the "Industrial Party" in the autumn of 1930 is a striking example—provided a scapegoat for economic difficulties and prevented serious diagnosis of their causes. The prevailing climate also inhibited initiative more generally throughout the economy. And after a period of relative stability in the mid-1930s a new wave of political repression profoundly disturbed the economy in 1936-8. 92

Both western and Soviet historians have tended to neglect major exogenous factors or constraints influencing the pattern of Soviet economic growth. In industry, the most important was undoubtedly the increasingly threatening international situation, which was 'certainly beyond the control of the Soviet authorities from the time of the Japanese invasion of Manchuria in 1931 and Hitler's assumption of power in 1933. The direct requirements of the defence industries absorbed substantial and increasing resources throughout the 1930s; and impelled the diversion of resources and the postponement of plans. And

91 On these changes in the economic model, see R. W. Davies, 'The Emergence of the Soviet Economic System, 1927-1934', unpublished CREES Discussion Paper, University of Birmingham, SIPS No. 9 (1977). 92 On the interrelationship of politics, society and the economy see especially M. Lewis, 'Society and the Stalinist State in the Period of the Five-Year Plans', Social History 2 (May 1976), pp. 139-75; for a vivid impression of the influence of political factors on the operation of the iron and steel works at Magnitogorsk, by an American who worked there from 1933 to 1938, see John Scott, Behind the Urals (Cambridge, Mass. 1942).
the needs of defense were undoubtedly a major factor in the stagnation and decline of tractor production from 1935 onwards, with harmful consequences for agriculture.

And in agriculture the climatic conditions of the late 1920s and early 1930s, which have received little attention in the literature, certainly exerted a significant influence on production. Thus in the Ukraine in the winter of 1927-8, freak weather conditions resulted in the perishining of the crops in over five million hectares, half the entire winter-sown crop and 21 per cent of the total area sown. In the following winter, 1928-9, a further recurrence of bad weather conditions resulted in the perishining of 3.3 million hectares of winter-sown crop. In each case the authorities compensated for this loss by resowing the affected area in the following spring; but this in turn wiped out the progress which was being made in the mid-1920s towards an improved three-field rotation, of which winter sowings were an integral part.

Even more significant was the exceptional pattern of frequency of dry weather in this period. Because of the critical insufficiency in humidity in late spring and summer in a large part of the major grain-production regions (the Ukraine, the North Caucasus, the Volga area and Kazakhstan), these areas are particularly susceptible to changes in the weather. Crop yields fluctuate violently in close relationship with fluctuations in rainfall and temperature. It is often assumed that good-weather years tend to cancel out bad-weather years and that over any period as long as five years fluctuations can be ignored. This is demonstrably not the case. According to our relatively simple drought index the weather throughout the 1920s and 1930s, and particularly in the early 1920s and early 1930s, was significantly worse for a much longer period than during the two pre-revolutionary decades or the 1940s.

Given the exceptionally high frequency of unfavourable weather in these years, and its great importance in affecting the level of grain production, we obviously need to reconsider the real significance of those non-quantifiable factors traditionally held to be solely responsible for the decline in agricultural production in the late 1920s and the early 1930s.

Meteorological factors were completely neglected in Soviet plans, which assumed that increased applications of capital together with agrotechnical improvements would automatically increase yields without interruption. Here we have a special case of over-optimistic planning.

In this article, despite a considerable number of pustuliforme qualifica-

93 For these freak conditions, see V. I. Vitkovich, Sovetskaya selskoshetstvennaya meteorologiya (Moscow, 1960), p. 173; for the perishing of the winter crop see Davies, Socialist Offensive, p. 42 and Esghobodh po sel'skomu khzyaystvu (Moscow, 1931), pp. 246-7.
94 Esghobodh po sel'skomu khzyaystvu, pp. 246-7; Davies, Socialist Offensive, pp. 63, 104.
95 See S. G. Wheatcroft, The Significance of Climatic and Weather Change on Soviet Agriculture (with particular reference to the 1900s and 1930s), unpublished CREES Discussion Papers, University of Birmingham, 1997; and the same, 'The Use of Climatic Meteorological Data to Propose and Analyze Developments in Grain Yields in Russia and the USSR, 1889-1980', unpublished paper, Annual Conference of the SSRRC Work-Group on Quantitative Methods in Economic History, Cambridge, 1982. The drought-index model was based on the correlation of grain yields with temperature and rainfall variables for critical months over the 1889-1945 period for six regions (Orenburg, Saratov and Kazan in the Volga, Kirov and Odessa in the Ukraine, and Moscow in the Northern Grain-Consumption Region). The meteorological variables for these regions were then fed into the model for the subsequent period to derive the drought index for these years.

96 See sources cited in note 7 above.

SOVIET DEVELOPMENT BETWEEN 1926 AND 1941
can perhaps best be understood as establishing a framework, though certainly not an optimum one, within which essential agricultural supplies to the urban population and to industry were first secured and then increased.

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