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SOVIET LABOR PRODUCTIVITY

By

Irving H. Siegel

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ORO abstract

SOVIET LABOR PRODUCTIVITY

by

Irving H. Siegel

A study of Soviet labor productivity shows that:

- USSR is far behind the United States in output per worker and behind the Western World in output and consumption per capita.
- Disparity between Soviet and United States output per capita is greater than before the war.
- Measurement by the most authoritative Western methods would indicate more modest gains in output per worker than those claimed by USSR and would probably yield a 1950 figure no higher than that of 1940.
- Given a few years of peace, USSR should be able to raise its productivity well above the pre-war level, but peculiarities of the Soviet system would prevent full realization of the potential productivity implicit in its investment and labor-training programs.
- Slow liquidation of labor surplus as auxiliary industrial tasks are mechanized now depresses productivity; but, in the event of war, it may be possible for USSR to raise productivity sharply and maintain output while labor is released for military duty.

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Irving H. Siegel

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INTRODUCTION AND SUMMARY

This report on Soviet productivity refers primarily to "industry," the major components of which are manufacturing, mining, electric power generation and distribution, lumbering, and fishing. It covers such topics as the place of productivity in Soviet thought and practice, problems of measurement, trends and outlook, and international comparisons.

Meaning of "Productivity"

"Productivity" here means "productivity of labor" – the ratio of output to labor input, both measured in "real" terms. Frequently, such ratios are not explicitly computed – for example, when output is heterogeneous and cannot be significantly expressed in a "natural" unit – and measurement is restricted to index-number comparisons of different time periods or places.

The denominator of the productivity ratio is typically less comprehensive than the numerator in scope. Thus, it generally does not refer to all the personnel employed or all the man-hours worked in establishments in the economic sector of interest. Furthermore, the output of an establishment or a manufacturing "branch" is usually reckoned gross. In such a case, the labor denominator fails to reflect effort expended in producing the fuel, materials, and some other items entering into gross output.

As used here, the term "productivity" must be distinguished from the productivity concept of economic statics – of the law of "variable proportions" or "varying returns to scale." Since we make no attempt to keep all non-labor factors fixed as labor varies, our measures cannot reveal labor's intrinsic efficiency or its net contribution to output. Rather, they report changes through time in the effectiveness with which labor is utilized in combination with other factors.

Since the end of World War I, productivity computations for all levels of aggregation have become increasingly popular throughout the world. Within the enterprise, the observed or anticipated course of output per unit of labor input is taken into account in cost determinations, the setting of production standards, and other tasks of planning and administration. In the multiplant company and also in

socialized countries, interplant comparisons provide useful guides to the improvement of labor utilization. On the national level, productivity is relevant to the determination of wage-price policies and the rational allocation of manpower. It is particularly significant as the link between the basic resource, population, and the output on which the present and future scales of living of that population depend.

If the denominator of a national productivity measure could somehow be expanded to include the labor equivalent of other consumed or incorporated resources, the result would be a significant indicator of economic progress. The trend of this indicator would reflect the degree of success with which an economy renders human effort "scarce" in comparison with goods – that is, provides both leisure and goods. But, as has already been suggested, such a comprehensive measure can seldom be approximated; and some students would reject it in the (mistaken) belief that use of labor as an ultimate accounting unit implies acceptance of the "labor theory of value."

Role in Socialist Doctrine

Productivity occupies a key place in the Marxian doctrine of social and economic evolution and in the Soviet strategy for displacing capitalism. In USSR, the energies of the labor force are marshalled toward output maximization by institutional arrangements, material and non-material incentives, repression of living standards, punishment, and constant exhortation. Indeed, the major tasks of the Soviet state have been described by friend and foe alike as the elevation of productivity and the maintenance of military security.

USSR is now, according to official declarations, in the midst of a pilgrimage from "socialism" to "communism," in the course of which the "Soviet man" will evolve and the conditions for unprecedented productivity will be established. Under communism, which requires the material plenty achievable through huge capital investments, government is no longer oppressive, income is determined only by need, and work is a pleasant habit. But in the present less idyllic state of socialism,[1] the role of man as consumer is completely subordinated to his role as producer, remuneration depends on effort, and the obligation to work is universal.

[1] In Soviet literature, the term "socialism" is also commonly used in a general sense which includes "communism".

Much stress is laid on "labor enthusiasm" as the route to Soviet superproductivity. The role of the manager seems deliberately to be minimized. The worker is urged to do his utmost with given materials and equipment and also to suggest and develop superior methods and procedures. He is enrolled in "socialist competitions" and taught the techniques of "Stakhanovism". Despite the heat and pressure to which he has been subjected, his transformation into the "Soviet man" still seems remote. Differential monetary reward – the "socialist" system of incentive wages – remains the most effective lever for raising productivity.

Productivity Measurement Problems

Two types of difficulties handicap the student of Soviet productivity. The first is the limited availability (especially since the mid-1930's) and doubtful quality of the official statistics. The second is the inadequacy of conventional statistical devices, like index numbers, for ascertaining trends in countries undergoing drastic structural changes and for comparing countries which differ considerably in tastes, technology, assortment and quality of products, and price systems.

The Soviet gross industrial output index with so-called 1926-27 weights, which underlies the official productivity series for a number of years, ceased to be taken seriously by Soviet statisticians even before World War II. Though replaced by another index for planning purposes, its publication was continued, apparently for propaganda purposes.

Alternative choices of formulas, weights, and methods of introducing new products have considerable effect on measures of Soviet output and productivity. The most authoritative measurement procedures, which are not altogether satisfactory for periods of significant structural change, would indicate much more modest gains than have officially been claimed for USSR. On the other hand, the application of Soviet procedures to US data would lead to higher rates of growth than those indicated by the standard American indexes.

Productivity Trends

The official statistics claim that Soviet industrial output per worker in 1950 amounted to about 10 times the 1900 figure, almost 5 times the 1928 figure, and 37 percent more than the 1940 rate. The claimed increases in output per man-hour are of the same order. Available Western computations for USSR, which also are technically deficient, show smaller gains – perhaps too small for a country undertaking deliberate industrialization and starting from a primitive level.

If it were possible to compute Soviet output per worker by the most authoritative Western procedures, a decline would probably have been recorded for the first five-year plan (1928-32), a substantial gain for the subsequent period to 1940, a decline between 1940 and 1945, and a shaky recovery thereafter to something like the maximum pre-war level by 1950. As for man-hour productivity, the result yielded by Western methods for 1950 would most probably have been below the 1940 average.

Productivity Outlook

Given a few years of "peace," USSR should be able to raise its industrial productivity well above the pre-war level, as it reaps the benefits of previous and new investments in personnel and equipment. Attainment of parity with Great Britain and pre-war Germany (already claimed in the late 1930's) and even surpassing them would not seem difficult. But USSR could hardly catch up with US, which has traditionally maintained a substantial productivity advantage over the leading European nations and which is technologically still progressive.

The utilization of Soviet labor at something like the current American efficiency level is hampered by certain past and present policies, institutional peculiarities, and the circumstances of Soviet development. Among the many factors contributing to uneconomic use of labor are: the overriding emphasis on total output, the excessive integration of establishments and the limited opportunity for subcontracting under the pressures of planning, the absence of open markets for labor, the universal obligation to work, the inadequacy of administrative provisions for discovery and elimination of superfluous personnel, and the rapid transfer of labor to industry from an overpopulated agricultural sector.

The redundancy of labor in Soviet industry is particularly evident in activities auxiliary to basic production, including office work. The effective mechanization of these activities is discouraged by the existence of the low-paid surplus and by the absence of provisions for its automatic and continuous liquidation.

If the Soviet intention to mechanize auxiliary activities were actually carried out, the rate of productivity growth would depend on alternative dispositions of the aggravated labor surplus. Should "peace" continue, a slow gain in productivity would seem most probable, as the surplus is gradually absorbed into expanding basic production. Soviet leaders would find this solution preferable to the alternative of intensifying compulsion in labor allocation or the alternative of liberalizing the economy through the recognition of leisure.

Although surplus employment depresses absolute productivity, Soviet leaders may rationalize it in terms of on-the-job training and the registration, indoctrination, and control of the adult population. If the surplus were aggravated by rapid technological improvement, it would then become possible for USSR to recruit military personnel from industry in the event of war and, at the same time, raise productivity substantially and maintain the level of production. The low degree of auxiliary mechanization precluded accomplishment of such a feat during World War II.

International Comparisons

All available measures show a large gap between Soviet and American productivity before the war. The differential has probably increased since then. The statistics also show that USSR is far from accomplishment of what Stalin defined as the "cardinal economic task": it still lags far behind the Western nations in per capita output and consumption.

Soviet statisticians have claimed that Russian industrial output per worker was 2/5 the American average in 1937, about 1/4 in 1932, and about 1/6 in 1928. Similar claims were made for output per man-hour in the same years. If these figures are taken seriously, then one other Soviet estimate must be added – Lenin's computation that Russian output per worker in 1908 was 30 percent of the American figure. With this addition, it becomes clear that little gain was made in the four decades 1908-37 and that the increase between 1928 and 1937 largely represented recovery of lost ground.

Non-Soviet estimates, based at best on rough computations, generally indicate greater USSR-US differentials. For the post-war period, figures ranging from 1/5 to 1/2 are commonly cited for industry as a whole. In the war years, Soviet man-hour productivity in munitions making was said to be 2/5 the American rate and about as high as Great Britain's. According to the same source, the USSR-US ratio for 1935-38 was less than 3/8. For 1936, another source gives a ratio slightly above 1/5 for net output per man-hour of all persons employed in industry.

When the comparison is broadened to include all economic activity, the Soviet showing is even less impressive. In 1949, Soviet national income per person in the labor force was only 1/6 the corresponding American figure, about 3/8 the British figure, about 2/3 the French figure, and even lower than Western Germany's.

The disparity between Soviet and American output of basic materials per capita, already large before the war, has increased since. Thus, Soviet steel output per capita was 1/5 the American

figure in 1940 and 1/6 in 1948. The corresponding pig iron ratios are 1/4 and 1/5. The electric power ratios are 1/5 and 1/7. For many basic items, recent Soviet output per capita is still below the corresponding American figures for the beginning of the century.

The lag in Soviet consumption before and since the war is also remarkable. The quantity (weight) of textiles available per capita was 1/3 the American figure in 1938 and only 1/8 in 1947-48. In both periods, the Soviet figures were below the Western European average. The Soviet worker could buy only 1/7 as much food as his American counterpart with one hour of labor in 1949-50; in 1936, he could buy 1/4 as much. British, French, and West German workers also enjoy much superior purchasing power in terms of food.

In short, the Soviet challenge to the Western world could be dismissed if technological performance and living standards were the only critical factors. But there are other critical factors, and these lie outside the scope of the present study.

SOVIET LABOR PRODUCTIVITY

CHAPTER I

PRODUCTIVITY IN SOVIET THOUGHT AND PRACTICE

Productivity in Soviet Theory

Productivity, according to Marx and his followers, means output per unit of labor input in something like a "normal" or "trend" sense. It is a sort of cultural constant, the result of a given technology, population size and quality, supply of material resources, and pattern of property and exchange relationships. In discussing "surplus value," Marx considered fluctuations in labor intensity to be distinct from productivity change,[1] but this separation is not made in Soviet or any other time series. "Obviously," said Bukharin, a theoretician once ranked second only to Lenin, "the productivity of labor is a precise measure of the 'balance' between society and nature; it is a measure of the mutual interaction between the environment and the system by which the position of the system in the environment is determined, and an alteration of which will indicate inevitable changes throughout the internal life of society."[2] Labor's function then, is to bring forth the output implicit in the entire cultural complex.

Marxists regard capitalism as a moribund, self-limiting system, doomed because it cannot realize the output and productivity potentials implicit in its own spectacular technological development. It is to be superseded by a "higher" form of organization compatible with attainment of the new productivity heights. The founders and leaders of USSR regard the Soviet system as the successor to capitalism.

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[1] K. Marx, *Capital: A Critique of Political Economy* (Modern Library Edition), New York, p. 569.

[2] N. Bukharin, *Historical Materialism: A System of Sociology*, New York, 1925, p. 113. See, also, A. I. Rotshtein, *Problemy Promyshlennoi Statistiki SSSR* (Problems of USSR Industrial Statistics), III (1947), 9, where productivity is described as a cultural characteristic and the index is described as the "most general indicator of all factors of the organization and technique of social production as a whole."

The steady increase of productivity – supposedly possible only under the Soviet dispensation – is an object of deliberate policy. The future course of productivity is stipulated, together with consistent output and employment goals, in the "laws" promulgating the five-year plans – the intended fulfillment and overfulfillment of which is the focus of virtually all economic and social activity. According to an official Soviet handbook, productivity is the "most important national economic index."[3] After an indefinite number of planning periods, the material basis of full communism is at last to be established. Income distribution would then be governed by need; now, when mere enlargement of the aggregate income still requires strain, distribution is guided by the "socialist" principle of remuneration according to work.

If a dynamic USSR were to achieve world communism, the precise fashion in which the capitalist "mode of production" is superseded would be a minor detail. Realization of the Soviet version of the Promethean legend could come about through imitation; thus, the citizens of the various nations could themselves relegate capitalism to the limbo of feudalism and chattel slavery. But, if the Soviet example were not sufficiently persuasive, history could be given the necessary push along its supposedly preordained course. In either case, political power would follow superior productive force, superior labor productivity. Actually, USSR seems to be taking a third route, which is consistent, however, with the Leninist dialectic of power:[4] extension of its influence through military might and propaganda before having harvested at home the promised fruit of its creed.

The place of productivity in the Soviet design is neatly summed up by Towster as follows: "Soviet political theory suggests the following chain of internal links to liberty in the USSR: discipline – skill – productivity – abundance – equality – liberty. From the standpoint of predominantly external factors, the role of personal freedom is visualized in the following sequence of concepts: Socialism in one country or internal impregnability of the USSR – dilution of the 'capitalist encirclement' or attainment of a high degree of external safety – victory of world socialism or absolute security – the 'withering away of the state' everywhere or supreme individual liberty. It will be seen that the two key concepts of the respective sequences are 'productivity' and 'capitalist encirclement'."[5]

[3] *Slovar' Spravochnik po Sotsial'no-Ekonomicheskoi Statistike* (Dictionary Handbook of Social-Economic Statistics), 1948, p. 397.

[4] See E. Heimann, "Soviet Politics and Power," *Social Research*, May 1951, pp. 103-04, a review of B. Moore, Jr., *Soviet Politics -- The Dilemma of Power*, Cambridge (Mass.), 1950.

[5] J. H. Towster, *Political Power in the USSR: 1917-1947*, New York, 1948, pp. 410-11.

Vyshinsky in effect joins the two sequences, internal and external, isolated by Towster: "The process of the state's withering away is thus inevitably bound up with the highest development of the state — the highest flowering of the new community and new productive forces. It presupposes a high level of communist culture and great labor productivity."[6] Vyshinsky adds that, not only the "state," but also the "historic legacies" of "law" and "democracy" must be overcome in the process of achieving communism.[7]

In the "patristic" writings of Lenin and Stalin, frequent allusion is made to the significance of productivity for the world's future. These pronouncements, which elaborate earlier declarations of Marx and Engels, are echoed monotonously in the literature of lesser Soviet luminaries. The central importance of productivity has never been at issue, even in the conflicts which splintered the ranks of the "scientific" socialists. Thus, Trotsky wrote as late as 1937 that "socialism could not be justified by the abolition of exploitation alone: it must guarantee to society a higher economy of [labor] time than is guaranteed by capitalism." As for USSR, he observed that "the struggle to raise the productivity of labor, toegther with national defense, is the fundamental content of the activity of the Soviet government."[8]

Perhaps, the most celebrated statement on the significance of productivity for historical evolution and the eventual defeat of capitalism is to be found in Lenin's "A Great Beginning," written in 1919. This statement, cited by Stalin in 1929, has been requoted extensively: "In the last analysis, productivity of labor is the most important, the principal thing for the victory of the new social system. Capitalism created a productivity of labor unknown under serfdom. Capitalism can be utterly vanquished, and will be utterly vanquished, by the fact that socialism creates a new and much higher productivity of labor."[9] Earlier that year, Stalin criticized Premier Rykov's simple view that the central purpose of the first five-year plan was to raise productivity: "The difference between Soviet society and every other society lies in the very fact that it is interested, not in any kind of increase of productivity of labor, but in such an increase as will guarantee the supremacy of socialist forms of economy over other forms, and, primarily, over capitalist forms of economy, and will thus guarantee that the capitalist forms of economy will be overcome and eliminated."[10]

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[6] A. Vyshinsky, *The Law of the Soviet State*, New York, 1948, p. 60.
[7] *Ibid.*, p. 61.
[8] L. Trotsky, *The Revolution Betrayed*, New York, 1937, pp. 78-79.
[9] As translated in J. Stalin, *Selected Writings*, New York, 1942, p. 135. Stalin's address is entitled "A Year of Great Change."
[10] From an address on "The Right Deviation in the Communist Party of the Soviet Union." *Ibid.*, p. 123.

Stalin continued to stress the historic role of productivity increase. His well-known address of 1935 to the First All-Union Conference of Stakhanovites urged a labor productivity "which surpasses that of the foremost capitalist countries." Even, he added, as "capitalism smashed and defeated feudalism" by creating "higher standards of productivity of labor," socialism "can, should, and certainly will defeat the capitalist system of economy by reaching new productivity heights and producing greater wealth." With the attainment of unprecedented abundance, the distinction between manual and mental labor will disappear and the communist principle of distribution according to need instead of effort would come into operation.[11] In his report to the last prewar Communist Party Congress in 1939, Stalin observed that the higher the level of productivity and technology the sooner would it be possible to accomplish the "cardinal economic task" of outstripping the major capitalist countries in output per head of population. Accomplishment of this task would leave USSR "fully saturated with consumers' goods" and permit establishment of full communism.[12] Voznesenskii echoed Stalin's statement in 1947 when he reviewed wartime accomplishments and looked forward to further development after rehabilitation.[13] The "law" promulgating the 1946-1950 plan also gave due attention to productivity as a factor in the restoration and expansion of the economy.[14]

The date overtaking the advanced capitalistic countries is not clear. In 1939, Stalin claimed that USSR had already achieved a much higher rate of growth than other nations. He also claimed the superiority of Soviet industrial and agricultural technique and equipment.[15] Furthermore, Soviet economic writers have frequently contrasted the alleged productivity growth rates of the first and second five-year plans with the leisurely pace of capitalist development in the 19th and 20th centuries, asserting that the figures "prove the superiority of the socialist system, which ensures a rate of increase of the productivity of labor which capitalism could never attain."[16] The tremendous gains made, at least by the US, in output and productivity since 1929, are carefully ignored.

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[11] *Ibid.*, pp. 367-69.
[12] *Ibid.*, pp. 444-49.
[13] N. A. Voznesenskii, *Voennaya Ekonomika SSR v Period Otechestvennoi Voiny* (The War Economy of USSR in the Period of the Great Patriotic War), 1948, pp. 188-89.
[14] Embassy of the USSR, *Information Bulletin*, Special Supplement, June 1946, pp. 3-4, 12.
[15] *Selected Writings*, pp. 446-47.
[16] A. Leontyev, *Work under Capitalism and Socialism*, New York, 1942, p. 58.

In his 1939 speech, Stalin conceded that USSR still lagged in output per head of population. Using pig iron as an indicator, he suggested that, "to outstrip the US economically," it would be necessary to raise annual output to 50-60 million (metric) tons, to substantially more than the 1929 American total of 43 million tons. Since an annual increase of 2 - 2.5 million tons seemed achievable (albeit with some strain), he concluded that "we require time, and no little time at that" to surpass the capitalist nations.[17] During the 1946-1950 plan period, an annual increase of almost 2 million tons was achieved, but half of this gain involved the restoration of prewar capacity. In any case, the 1950 output of almost 20 million tons was still less than one third the US total.

The remoteness of the Soviet goal is indicated by the comments of the economist A. I. Notkin at a June 1950 conference on "Means of the Gradual Transition from Socialism to Communism."[18] Though impressed with the difficulty of "creating the material production base for communism," he felt that the task could be accomplished "in an historically short time — during the coming five-year plans." (Note the plural.) After observing that the US in "recent years" produces over 80 million metric tons of steel (he could well revise this figure to 90 million), he asserted that depressions reduce the American per capita output to the British average; hence the Stalin program of 50 million tons of pig iron and 60 million tons of steel would lead, in the "absence of crises and parasitic consumption under socialism," to higher per capita output than elsewhere. He assumed, of course, that US would meanwhile show no improvement at all, and he overlooked the important change in the American attitude toward government intervention in behalf of economic stabilization. The present American pig-iron output rate, in any case, is something like 65-70 million metric tons a year — a higher total than the goal sought for full communism in a state with a much higher population. Soviet steel output in 1950, about 25 million tons, was still less than half the objective and less than one-third the current US rate.

Also significant is the summary of the June 1950 conference by V. F. Vasyutin, who was disappointed that so much emphasis had been placed on principles of distribution of consumer goods and so little on the "signs of communism in the Soviet economy" and on the development of socialist wealth. "The main thing is to

[17] *Selected Writings*, pp. 448-49. See also H. Schwartz, *Russia's Soviet Economy*, New York, 1950, pp. 119, 558-65.

[18] A report on the conference, published in *Voprosy Ekonomiki* (Questions of Economics), pp. 99-108, is translated in *Current Digest of the Soviet Press*. 24 February 1951, pp. 2-9. Notkin's remarks appear in *Current Digest*, p. 5.

solve the basic economic task, to raise productivity of labor considerably, to achieve an abundance of consumers' goods, and then questions of distribution will be easily solved."[19]

Proletarian Road to High Productivity

The preceding discussion may already have suggested the essential features of the Soviet program for raising productivity to unprecedented heights. In 1949, one Soviet writer on the subject listed the following factors as responsible for the gains already achieved: (1) new technology and the mechanization of manual processes; (2) increase in workers' living standards; (3) growth of skill of workers; (4) organization of production and labor; (5) socialist principles of wage payment; and (6) socialist competition.[20] In 1950, another writer mentioned essentially the same items: "the improvement of techniques, rationalization of work, organization of production, improvement in the material position and elevation of the cultural level of the workers, strengthening of socialist labor discipline, organization of socialist competition, and the Stakhanov movement."[21] All of these elements have been stressed earlier, in one form or another, in the public statements of Stalin, and they have been anticipated in the works of Lenin.

The methods of raising productivity in USSR are for the most part the same as those employed in other industrial states. But there is a difference in emphasis traceable to the economic conditions, institutions, and ideology peculiar to USSR. There is also a unique device, "socialist competition," which is expected to prove decisive in the attempt to outstrip the capitalist nations. In US, the publicity concerning productivity generally emphasizes technology and managerial initiative and ability. In USSR, the role of management in whatever successes have been achieved is minimized, while the role of labor is magnified. Most of the items listed above emphasize the importance of the individual, not as a sovereign consumer, but as a producer. It is significant that the elevation of cultural and living standards is listed as a condition for raising productivity, not (at least for the present) as an end in itself.[22] But the individual

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[19] *Current Digest*, 24 February 1951, pp. 8-9.

[20] N. S. Maslova, *Proizvoditel'nost' Truda v Promyshlennosti SSSR* (Labor Productivity in USSR Industry), 1949, p. 80.

[21] M. Demchenko, *Puti Povysheniya Proizvoditel'nosti Truda v Sotsialisticheskoi Promyshlennosti* (The Paths of Increase of Labor Productivity in Socialist Industry), 1950, p. 10.

[22] In *Pravda*, 24 January 1949 (see *Soviet Press Translations*, 15 March 1949), one Olga Kozlova urged the need for more kindergarten, laundry, refrigeration, and communal dining facilities at the factories to "free" women for the study of production methods and the enhancement of their productivity.

reaches his zenith in official esteem when he puts forth extra effort in socialist competition. "Only the labor enthusiasm and the zeal of the millions," declared Stalin in 1929, "can guarantee the progressive increase of productivity without which the final victory of socialism over capitalism is inconceivable."[23]

In the rest of this chapter, we shall consider the incentives, penalties, and propaganda intended to evoke the labor compliance, initiative, and enthusiasm on which Soviet leadership founds its great hopes. This assortment of techniques has thus far succeeded in restraining consumption while advancing investment in a poor nation receiving little foreign assistance. Willingly or not, the mass of the population, harnessed to a "plan," has been straining under the double burden of labor and abstinence in behalf, at best, of a remote generation. Many of the techniques strike western observers as exaggerations of some of the worst evils of capitalism and as cynical perversions of some of the best features of socialism. Still there is always the disturbing possibility that they may be effective. Furthermore, they have already been exported to satellite countries, and they may be applied in China eventually. To "backward" countries having no democratic roots, looking forward to industrialization, and predisposed to accept Soviet claims at face, they have a definite appeal.

From the earliest days of the Soviet state, there has been a one-sided contest between the "productionist" and "consumptionist" viewpoints. With the inauguration of rigid planning in 1928, the doom of the latter position was sealed. The grip of the state on labor has progressively tightened, but the ideals of socialist fraternity and voluntarism continue to be preached. As early as 1920, Trotsky refused to see any real difference between free and compulsory labor under the new order. In reply to the Mensheviks, who argued that militarization of labor would lower productivity, he asserted that "the whole history of mankind is the history of its education for work, for higher productivity of labor"; that man is "lazy" and must be coerced or otherwise be persuaded to work; that "every labor is socially compulsory labor," for "man must work in order not to die"; that the socialist technique of persuasion would be superior to the "bourgeois" technique.[24]

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[23] *Selected Writings*, p. 135.

[24] A lengthy excerpt from Trotsky's remarks to the Third Congress of Trade Unions is quoted by I. Deutscher, *Soviet Trade Unions*, London and New York, 1950, pp. 36-38. W. H. Chamberlin, *The Russian Revolution*, New York, 1935, II, 293, quotes the Communist Party Central Committee as saying in 1920 that "socialist economy rejects in principle the liberal-capitalist principle of 'freedom of labor'."

When Bukharin tried to imagine the "withering away of the state," he speculated that the end of the "coercive character of labor" would come only after instruments of external force (army and navy) and organs of internal repression had disintegrated. Lenin wondered, however, if the order should not be reversed. Under the firm guidance of Stalin, the question as to which comes first has become vapid. What might be called the "doctrine of the permanent class struggle" within the socialist state has been established: state authority will dissolve, not through "weakening," but through "maximum intensification" against internal(!) and external remnants of "capitalism."[25] In 1949, a Soviet labor-law historian could still write that the distinction between free and conscript labor was meaningless: "When we are saying that in the socialist society the principle of voluntary labor is recognized we are not speaking of recognition of some kind of abstract principle of free labor and trade in a liberal and bourgeois sense, a principle which would be treated as a value per se ....it is impossible to secure the principle 'from each according to his ability' without a pressure by the state and law regarding the universal duty to work."[26]

The triumph of the productionist viewpoint and the coercive character of labor are revealed in many ways in Soviet economic life. At any time, the labor force is much larger than can be efficiently used in industry. A smaller staff could account for the same flow of end products from a typical establishment if a true labor stringency existed. Average productivity is much lower than it would be if more leisure were tolerated or if unemployment were legal. But total output is measured in a way which permits the inclusion of many superfluous costs, so intraplant labor surpluses are rendered respectable. Though these surpluses may be rationalized as contributing to current output and as controlled reserves available for defense or in training for more productive tasks, the fact still remains that they are economically the dysfunctional consequence of universal employment. In a sense, the same "wage fund" is distributed among a larger number of persons on the payroll rather than a smaller number.

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[25] Vyshinsky, p. 62.

[26] From a work by Dogadov quoted by V. Gsovski, "Elements of Labor: II," *Monthly Labor Review*, April 1951, p. 390.

Meanwhile, many types that could make up a "household" sector are also obligated to support themselves to the extent they can — like pregnant women, nursing mothers, disabled veterans just discharged from hospitals, and tubercular and psychiatric cases.[27] "He who does not work," says Article 12 of the Stalin Constitution, in language close to St. Paul's, "neither shall he eat."

In general, the hours and intensity of work are adapted to the material circumstances of production. By 1940, the "shortest workday in the world" had been raised to 8 hours and the weekly standard to 48 hours.[28] All overtime is obligatory.

Over the years, labor discipline has become more strict. Turnover, once tolerated with a kind of pride, gave way to a job freeze in 1940. Many workers (e.g., in railroad transportation and in utilities) are under quasi-military rule. The protective features of the basic labor code have been attenuated through administrative issues legalized by the "doctrine of normative acts." Discharge for disciplinary reasons is permissible only if, among other conditions, output is not thereby reduced.[29] Labor unions have no competence to bargain over wages and hours; they are primarily concerned with administration of social insurance and enlistment of labor interest in raising output sights and in fulfillment and overfulfillment of plan. Finally, it appears that even vacations are

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[27] The productive use of the mentally sick is especially interesting, in view of the fact that psychiatric cases comprise half of US hospital patients but only one tenth of the USSR hospital population. According to H. Berman, *Justice in Russia: An Interpretation of Soviet Law*, Cambridge (Mass.), 1950, p. 233, the purpose of the procedures adopted in the psychiatric approach to criminology in USSR is "not to promote the welfare of the individual, for his own sake, but to maintain his social productivity, in this sense to educate him, for society's sake." W. Jansen, reviewing a book on Soviet psychiatry, says in *Science and Society*, Spring 1951, p. 178, that in USSR "only the most acutely ill, unable to function, dangerous to themselves or others, are hospitalized. Every effort is made on every level to maintain the maximum functioning even in some actively hallucinating psychotic conditions....Work as therapy, when it is a contribution to the common good and not exploited for the profit of a minority, is only the consistent application to the mentally ill of the Soviet principle of the dignity of work as the very basis of creative productive social relationships."

[28] On regulations affecting labor, see Appendix B of this report; V. Gsovski, "Elements of Soviet Labor Law: I," *Monthly Labor Review*, March 1951, pp. 257-62, and *Soviet Civil Law*, Ann Arbor, 1949, I, 816-20; N. G. Aleksandrov, *Sovetskoye Trudovoye Pravo* (Soviet Labor Law), 1949; Schwartz, pp. 445-60, 479-84; and Deutscher, pp. 116-20.

[29] Moore, *op. cit.*, pp. 325-26.

"organized" in the interest of restoring the productive power of workers; the rule of "rest for labor" has superseded the "bourgeois" notion of "rest after labor."[30]

As has already been suggested in the remark on disciplinary discharge, the penalties to which workers and managers are subject also reflect the paramount interest in output.[31] Indeed, the increasing severity of the discipline may be regarded as an indication of the growing interdependence of an evolving industrial society. Absenteeism has come to be regarded as "desertion from the socialist labor front." An unexcused lateness of more than 20 minutes or three instances of tardiness of less than 20 minutes in one month may lead to imprisonment on the job for six months at 75 percent of normal pay. A worker dismissed for disciplinary reasons faces eviction from factory living quarters in 10 days. Prison labor is paid, like free labor, on an incentive basis.[32] Workers are liable for damage to tools and other state property. They may be docked for defective work and for various infractions of factory rules. A decree of 1940 declares the production of defective or incomplete goods to be a crime against the state quivalent to sabotage.

Managers are held responsible for discipline and for the efficiency and quality of the work of their personnel. Selective enforcement of the numerous laws they necessarily violate must be a potent psychological weapon. Memory of the purges of the 1930's may also keep them in line. Merciless criticism in the national press is another punitive device. Of course, managers must also be somewhat insensitive to abuse. Since Satan characteristically assumes the form of a manager or a nameless bureaucrat when something goes wrong in Soviet industry, such persons must expect to be the targets of inkwells.

Of all the stimuli to efficient labor in USSR, none is more frequently discussed than monetary rewards. "The socialist system of wages," according to Vyshinsky, "is the most potent instrumentality for raising labor productivity, for better employing the work day, for elevating the worker's qualification, for improving the quality of the work, for achieving complete mastery of the technique of production, and for bettering the workers' material position."[33] This

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[30] From a 1934 trade union pamphlet cited by M. Yvon, *What Has Become of the Russian Revolution*, New York, 1937, p. 31.

[31] In addition to Appendix B and works by Gsovski already cited, see E. T. Raymond, "Manager Ivan Ivanoff on the Production Trapeze," *United Nations World*, March 1950, pp. 28-31.

[32] See Chapter 6 of the "Corrective Labor Codex of the R.S.F.S.R." in American Federation of Labor, *Slave Labor in Russia*, 1949, pp. 168-69.

[33] Vyshinsky, p. 567.

wage system is based on the piece rate, straight or progressive. Its development began after the egalitarian principles of the 1918 Labor Code proved inimical to productivity advance.[34] It was strengthened in the 1930's with the establishment of skill and grade differentials, the termination of wage bargaining by unions and their virtual integration into the state planning and administrative apparatus, and the introduction of Stakhanovism and other techniques for the systematic elevation of output norms.[35] The Soviet corrective labor system, as was noted in the preceding paragraph, is also organized along incentive lines for maximum productivity in places of detention.

The ultimate dependence of high real wages on high labor productivity has, of course, been recognized by Soviet leaders from the very beginning. Awareness of the connection is implicit in the quotations cited earlier in this chapter. Out of the struggle against leveling tendencies and the victory of planned investment, a conscious wage policy has evolved. This policy, often stated in garbled or elliptical form in Soviet and satellite literature, amounts to the following: The rate of productivity advance should exceed (1) the rate of increase of average real wages, so that a sufficient surplus would accrue to the state for capital expansion, defense, and educational and social services; and (2) the rate of increase of average nominal wages, so that unit labor cost would fall and money prices of commodities could also be reduced.[36] If planning in

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[34] The program adopted by the Eighth Party Congress in 1919 announced that the ultimate objective of equal rewards for labor could not be realized "when only the first steps are being taken towards replacing capitalism by communism." (See J. H. Meisel and E. S. Kozera, *Materials for the Study of the Soviet System*, Ann Arbor, 1950, p. 115.)

[35] See, for example, Deutscher, pp. 100-27; M. Miller, *Labor in the USSR*, London, 1942, pp. 22-23; and Osovski, *Soviet Civil Law*, I, 92-96, and *Monthly Labor Review*, March 1951, pp. 258-61.

[36] On the Soviet attitude with respect to wages and productivity, see, for example, N. A. Voznesenskii, *The Growing Prosperity of the Soviet Union*, New York, 1941, p. 40; State Planning Commission of the USSR, *The Second Five-Year Plan*, New York, 1937, pp. 441-42; University of Birmingham Bureau of Research on Russian Economic Conditions, *Wages of Industrial Workers in the USSR* (Memorandum No. 6), July 1951, pp. 10-14; and Deutscher, pp. 100-03.

The Soviet wage-productivity objectives may be stated simply in symbolic form. If labor productivity in industry ($= Q/E$) rises faster than average *money* wages ($= W/E$), then we have the following index inequalities:
$[(Q_1/Q_0) \div (E_1/E_0)] > [(W_1/W_0) \div (E_1/E_0)]$, or $Q_1/Q_0 > W_1/W_0$, or $W_1/Q_1 < W_0/Q_0$. That is, unit labor cost ($= W/Q$) in period 1 must be less than in period 0. If labor productivity in industry rises faster than average *real* wages, then we have, in index form, $[(Q'_1 + Q''_1)/(Q'_0 + Q''_0) \div E_1/E_0] > [(Q'_1/Q'_0) \div E_1/E_0]$, or $Q''_1/Q''_0 > Q'_1/Q'_0$, where Q' represents the weighted industrial output of wage goods, and Q'' the weighted industrial output of non-wage (and consumption) goods at the disposal of the state, capital equipment, etc. The average real wage is the quotient of Q' and the total number of industrial workers, E. The inequality shows that the output of non-wage goods must rise faster than the output of wage goods for "socialist accumulation" to occur at a desirable rate.

terms of resources were perfect, the first relationship would be achievable without difficulty. If fiscal planning were correct, the second would be realizable, too. In US, where government "full" employment policy would have to be implemented by indirect means (like compensatory spending), there is more excuse for error.

Incidentally, it is interesting to note that proponents of economic stabilization in US have generally recommended maintenance of a static price level over time and the increase of wages at the same average rate as productivity. Since the price level would be stable, however, real and nominal wages would be almost proportional (not exactly proportional because relative prices need not remain fixed). The difference between this wage policy and that of USSR is the difference between the productionist and consumptionist philosophies.

Actual wage-price-productivity relationships during the Soviet epoch have been very different from the planners' ideal. Before the inauguration of full-scale planning, productivity failed to keep pace with advances in real or nominal wages.[37] Since the late 1920's, as may be seen from Appendix Table A-7, money wages have tended to rise faster than productivity, and absolute prices have also advanced.[38] Although Soviet spokesmen have claimed substantial increases in real wages during the planning era, there is reason for skepticism. They tend to ignore the wage inflation that accompanied industrialization, to confuse nominal and real wages.[39] Unfortunately, a definitive evaluation of the situation since 1928 cannot be made in the absence of even official price indexes after 1930 and in view of the uncertainty of the worth of non-monetary personal income (in the form of social benefits and low house rent). Nevertheless, such crude estimates as can be made support the view that real wages have declined substantially, despite Soviet assertions to the contrary.[40]

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[37] University of Birmingham, *Memorandum No. 6*, pp. 10-14.

[38] For an effort to reconstruct the Soviet price experience, see N. Jasny, "The Soviet Price System," *American Economic Review*, December 1950, pp. 845-63.

[39] Most Soviet reports simply quote the gains in nominal wages as though these are significant. Molotov actually identified real and nominal wage increases in his 1939 speech, *Tretii Pyatiletnii Plan Razvitiya Narodnogo Khozyaistva SSR* (Third Five Year Plan for the Growth of USSR National Economy), 1939, p. 9. On the confusion of real and nominal wages, see also M. Gordon, *Workers before and after Lenin*. New York, 1941, pp. 150-67. For an account which is sympathetic to the Soviet view, see R. M. Somerville, "That Soviet Standard of Living," *American Quarterly on the Soviet Union*, April 1940, pp. 3-27.

[40] According to S. Schwarz, "The Living Standard of the Soviet Worker: 1928, 1938, 1948," *Modern Review*, June 1948, pp. 272-86, the purchasing power of wage and salary earnings declined about 20 percent between 1928 and 1938 (while weekly hours declined slightly), about 40 percent between 1938 and 1948 (while hours rose substantially), and about 50 percent between 1928 and 1948. These estimates take no account of the "socialized" wage, but Schwarz regards the Soviet

In addition to the incentives built into the money wage system, there are other stimuli. Honorary titles, medals, and wide publicity are given to "labor heroes." Stalin prizes are awarded annually to worthy scientists, managers, workers, and artists. Patents – "certificates of authorship" – are available to inventors. Managers, foremen, and skilled workers may qualify for bonuses. Continuity of attachment to a firm affects the amount of entitlement to sickness and other social benefits, vacations, pensions, and priority in use of rest homes and sanatoria.[41]

Now, we consider the ultimate weapon being readied in the Soviet arsenal for the conquest of capitalism and the attainment of communism. Appropriately, this weapon is not a thing, but a man – sociocentric "Soviet man," of whom anticipations are glimpsed in spontaneous excesses of effort, in the orgies of "socialistic competition." The perfection of this new type would supposedly justify the sacrifices of the lost generations, the stern "duties" imposed under the "law," and the "oppressions" of the "state." This man would be the reply to the commonplace that "human nature cannot be changed." He would stand in relation to the paltry bourgeois "economic man" as Hyperion to a satyr. He would assure the achievement of a productivity level which lies beyond the reach of a man motivated by cupidity or avoidance of pain. As may be seen from the chronology presented in Appendix C of this report, Soviet propaganda has often had to sustain the wilted weary pilgrim with fresh signs and portents that the future was already here.

The basis for the transformation of man was laid in the Soviet Revolution. When the fetters of capitalism are struck off and the worker becomes a "collective master" of the economy, when he is freed of fear of unemployment and the vagaries of the price system,

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valuation of this supplement at 38 percent of the money wage to be a "gross exaggeration" (p. 283). The Birmingham wage study (*Memorandum No. 6*, p. 1), on the other hand, counted the supplement as 1/4 the money wage. For other estimates showing a decline in Soviet real wages during the planning era, see N. Jasny, *American Economic Review*, December 1950, pp. 847-52, and May 1951, p. 488, and *Review of Economics and Statistics*, February 1950, pp. 96-98; Schwartz, p. 461; and Prokopovicz's *Quarterly Bulletin of Soviet-Russian Economics*, April 1950, pp. 152-54. In estimating the worker's disposable income, according to Yvon (p. 24), a deduction must be made of 15-21 percent withheld from pay (for example, in the form of forced loans).

[41] Gsovski, *Soviet Civil Law*, I, 817-18, and *Monthly Labor Review*, April 1951, pp. 258-59. On the rewards for invention, see F. Hughes, "Incentives for Soviet Initiative," *Economic Journal*, September 1946, pp. 415-25.

he feels a new pride, dignity, energy, and enthusiasm. Work ceases to be the curse of Adam and becomes a positive joy. The worker strives to achieve a fine frenzy in the factory or on the collective farm. For him, to labor is to pray.

Lenin already saw the first rays of communism in the 1919 subbotnik, in "the rank-and-file's self-sacrificing concern that overcomes all obstacles for increasing the productivity of labor.[42]" In September 1926, the first "shock brigades" (udarniki) went into action. In 1929, Stalin called for "socialist emulation;" he was prepared to report remarkable results by November. Indeed, he found a "decisive change in the sphere of the productivity of labor" — "an expansion of the creative initiative and intense labor enthusiasm of the vast masses of the working class."[43] In 1930, the shock worker was honored with a special day (October 1). He was also accorded special privileges. Unions encouraged emulation, promising that a few years of effort without stint would convert USSR into a "Socialist America."

In August 1935, "a plain miner," Stakhanov, discovered in a coal pit the advantages of division of labor;[44] by November, Stalin addressed the First All-Union Conference of Stakhanovites. He hailed the "new wave of socialist emulation" — which spread "like a hurricane," a "conflagration," and grew "like a rolling snowball" — as pointing the way to the substantial productivity growth required "for the transition from socialism to communism and for the elimination of the distinction between mental and manual labor." He ascribed the movement to four causes: First, "life has become more joyous. And when life is joyous, work goes well." Second, labor is not exploited in USSR, where it is "a matter of honor and glory." Third, modern techniques have been made available. Finally, skilled cadres had been trained to master modern techniques.[45]

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[42]Quoted from "A Great Beginning" in Leontyev, p. 26.

[43]From "A Year of Great Change," *Selected Writings*, p. 134. E. Lokshin, *Industry in the USSR*, Moscow, 1948, p. 64, credits "socialist emulation" for the alleged 12.9 percent gain in output per worker in 1929. A. Rothstein, *Man and Plan in Soviet Economy*, London, 1948, p. 113, credits the gain of 1928-29 specifically to "production conferences."

[44]"A plain miner, the Donetz Basin hewer, Alexei Stakhanov, in response to Stalin's speech of May 4, 1935, the keynote of which was care for the human being and which marked a new stage in the development of the USSR, proposed a new system of labor organization for the extraction of coal." — V. I. Mezhlauk, in the introduction to *The Second Five-Year Plan*, xix.

[45]See *Selected Writings*, especially pp. 366-73.

Whether or not the Stakhanov "conflagration" was a case of Communist Party arson, as some foreign observers suggest,[46] heroic effort has become a part of Soviet folklore. As late as 1946, a writer flatly stated that "it is impossible to raise the general national productivity without the diffusion of Stakhanovism and its methods."[47] Glorification of Stakhanovism is as important as Stalinolatry. Leontyev grows ecstatic when describing the new approach to work: "In the USSR an entirely new, communist attitude towards work has arisen and become deep rooted. The advanced workers, peasants, and office employees in the Soviet Union, her Stakhanovites and shock-brigade workers, love their work, their machine, their factory and their office. While at work they feel and realize that what they are doing is above all a matter of public importance. They know that the more and better they work the higher will be their standard of living, and the respect and honor they earn. But it is not only personal incentive that inspires men and women to deeds of heroism at their work. The greatest stimulus to labor enthusiasm is the desire to devote all one's strength to the good of the socialist fatherland. It is the desire to serve the commonweal. It is genuine Soviet patriotism.

"This attitude toward work is the first step in the transformation of work as a duty into work as a prime necessity of life, into work for the pleasure of it. The work of a Stakhanovite, during which he displays all his physical and mental talents, is a source of added human dignity, a source of joy; it is a particle of the future in the present; it is a genuine ray of communism."[48]

It is with similar fervor that the penitent prodigal, Yugow, now speaks. In USSR, he says, "labor is lifted into the realm of passion and glory"; workers toil in a collective spirit, "not sparing their strength, without regard for hours spent"; and work, being merged with the social interest, becomes "the most vital part of a fully integrated way of life."[49]

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[46] L. E. Hubbard, *Soviet Labour and Industry*, London, 1942, pp. 76-78; and Deutscher, pp. 111-16. Premeditation may be read into one of the stated aims of the second five year plan: "To transform the entire working population into builders of a classless socialistic society."

[47] F. P. Koshelev, *Proizvoditel'nost' Truda v Novoi Pyatiletke* (Labor Productivity in the New Five Year Plan), 1946.

[48] Leontyev, pp. 59-60.

[49] A. Yugow, "Incentives in Soviet Economy," *Soviet Russia Today*, June 1949, pp. 15, 27. See also R. Parker, "He Who Does Not Work," *ibid.*, January 1949, pp. 14-15.

The role of the organs of propaganda in the spread of the new attitude toward work is described in a recent study by Inkeles. He quotes Pravda as declaring on Press Day in 1947: "The task of the Bolshevik press is to pick up and publicize everything... which increases the patriotic initiative of the masses and facilitates stepping up the pace at which the national economy is built and developed." He states prosaically that, in the absence of "the goods, the housing, and the other things that might of themselves result in high labor productivity and better discipline," the Party has recourse to the psychological weapon and coercion, with special emphasis on the former. The concentration on "exhortation" means that the national and local press has largely been "transformed into a kind of mass 'trade' journal."[50]

A less spiritual view of Stakhanovism is also taken, of course, by socialist and other critics of the Soviet Union. Answering Stalin's speech of 1935, Trotsky stated: "The motive force of the Stakhanovists, however, is not a 'happy' mood, but a desire to earn more money." He decried the use of "naked and crude" forms of exploitation which would not be tolerated in bourgeois countries, and the establishment of the rhythm of work in accordance with the "chase after the ruble." Workers do not, in these circumstances, "expend themselves 'according to ability'... but in violation of themselves."[51] A French worker who returned in disillusionment after 11 years of experience at various levels in Soviet factories, described Stakhanovism as the ultimate of the "sweating system." With "shock work", it amounted to the legalization and elevation to a state virtue of "the utilization of the strong-armed and big-bodied in order to augment the intensity of labor."[52] Deutscher notes the widespread spontaneous opposition to Stakhanovism at first; he observes that this "mixture of progressive rationalization and old-time sweated labour" was not securely ensconced until the unions were purged in 1937-38.[53] Finally, Yugow, in his unregenerate days, noted that the movement was soon corrupted, that cupidity and other un-communist motives came to dominate. Though it did raise the output sights of the worker, "it was unable to eliminate the main obstacle to high productivity of labor – defects in the organization of production which did not depend on the workers."[54] Indeed, "the fundamental vice of Stakhanovism

[50]A. Inkeles, *Public Opinion in Soviet Russia*, Boston, 1950, pp. 168-69.
[51]Trotsky, pp. 82, 124-25.
[52]Yvon, pp. 36-37.
[53]Deutscher, pp. 114-16.
[54]A. Yugow, *Russia's Economic Front for War and Peace*, New York, 1942, p. 194.

is that it transfers the center of gravity from the realm of scientific management and organization of production to the intensification of the individual effort of the worker. "[55]

[55] *Ibid.*, p. 192.

CHAPTER II

PRODUCTION AND PRODUCTIVITY MEASUREMENT IN USSR

Statistics in USSR

In statistical work, too, USSR keeps its political, economic, and social objectives to the fore. "Fact-finding," the accumulation of more or less interesting facts and their subsequent analysis, is scorned. The major series emerge out of "operating" or "administrative" statistics developed for planning and related purposes. But, like such statistics everywhere, Soviet tabulations are distinguished for their lack of explanatory notes and lack of technical meticulousness. The quantitative virtue of operating statistics — the completeness of establishment coverage, so highly prized by Soviet writers — is balanced by the defects of high cost and low quality. The inadequate training of the personnel preparing and policing reports, the violation of report instructions, the lack of coordination of the statistical agencies, and the excessive number of reports were commonly mentioned in the frank journal literature of the late 1930's. Sampling does not seem to be employed, despite the abundant opportunities, a sound tradition in mathematical statistics, and a dearth of modern computing equipment.[1]

Soviet writers frequently boast of the practical orientation of USSR statistics. Thus, Yugenberg points out that Soviet series on

[1]The large size of Soviet office staffs is partly due to the scarcity of equipment. See A. Arakelian, *Industrial Management in the USSR*, Washington, 1950, pp. 145-48, who urges mechanization of planning, accounting, and statistical work, which in some enterprises requires 20-25 percent of the employment total and represents 20-30 percent of production expenses. Although there is evidence that business machines, including electric tabulating equipment, have been produced in USSR since 1935, the numbers involved are unimpressive. Production of such items, furthermore, was interrupted by wartime conversion and apparently was not resumed until 1948-49. It is also significant that the first text on mechanical accounting equipment appeared in 1949 — G. P. Yevstigneyev and B. M. Drozdov, *Organizatsiya Mekhanizerovannogo Ucheta* (Organization of Mechanical Accounting).

production were developed, not to satisfy the "curiosity of some research institution," but in response to the "necessity of planning the requirement of each separate enterprise."[2] A textbook prepared by members of the Leningrad Institute of Philosophy stresses the role of statistics as an "active stimulus and effective guide to action." Indeed, productivity and other computations should supply "fighting slogans," indicate accomplishment, and disclose the magnitude of the problems ahead.[3] Rotshtein, the outstanding productivity technician of USSR, similarly emphasizes functionalism in his listing of the purposes of productivity measurement at the establishment level and above: (1) to assist operationally in plan fulfillment; (2) to provide the basis of planning directives; and (3) to reveal "unused reserves" (e.g., through comparison of the production rates of Stakhanovites and other workers).[4]

These brief remarks on the place of statistics in USSR would seem even less adequate if they made no reference to the recent discussions of accuracy.[5] On this score, the present report can offer only some new instances. There is no doubt about errors and distortions arising out of the reporting system[6] and the very conditions of Soviet development. There is also no doubt about the official exploitation of opportunities to represent Soviet progress in favorable terms and about the suppression of unfavorable statistics. If one could get close, one would probably discover that employees of the central statistical agency sing the following theme song (in Russian, of course) at their work:

"You gotta accentuate the positive,
Eliminate the negative."

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[2] From an article on production measurement translated in S. M. Kingsbury and M. Fairchild, *Factory, Family and Women in the Soviet Union*, New York, 1935, p. 300.

[3] *A Textbook of Marxist Philosophy*, London (no date), pp. 284-85.

[4] Rotshtein, III, 42. Interplant and interregional productivity comparisons (more detailed than the ones shown in our Appendix A, Tables A-10 and A-11) are also studied by central authorities for hints of "unused reserves."

[5] For example, the discussions by N. Jasny, A. Bergson, C. Clark, M. Dobb, A. Gerschenkron, A. Yugow, and H. Schwartz in November 1947, February 1948, and February 1950 issues of *Review of Economics and Statistics*.

[6] Incidentally, O. Morgenstern, *On the Accuracy of Economic Observations*, Princeton, 1950, p. 13, cites a "report" that, in the early 1930's, the central agency worked out "lie coefficients" for the correction of reports from various regions and industries. With apparent seriousness, he adds that "nothing definite is known, however."

Still, this writer feels that some who criticize Soviet series and estimate the degree of "overstatement" do not themselves know just what concepts are appropriate for an economy in transition and have a false idea of the sophistication of Western measurement technique. Is it sufficiently understood by students of the Soviet economy that the most careful Western students of production measurement avoid constructing indexes for machinery and other industries making a wide variety of products of changing specification – that is, for industries of great importance in the Soviet aggregate? Is it sufficiently appreciated that Western experts do not agree on how to adjust a composite output index for the omission of products difficult to measure? These and other technical difficulties often unwisely dismissed as unimportant in "mature" countries cannot be slighted at all in "new" countries. Any Soviet procedure adopted for production measurement would have been "wrong." A better job could have been done, but it is also true that Western practice has not provided a blueprint for the "right" index either.

Productivity Measurement

The obvious interest of USSR in productivity measurement makes the Soviet system only superficially unique, as Stalin himself noted. Although the word "productivity" may well be used more commonly there than elsewhere, the notion is basic to the "American profit system" and is expressed in the persistent effort to restrain or reduce "unit labor cost." Since the government dominates in the economic sphere in USSR, the press naturally assumes the character of a "mass trade journal." But, in US, the language of accounting and the very diffusion and "privacy" of enterprise may obscure the constant preoccupation of the entire business community with decisions affecting productivity. It is also not the American custom to emphasize the contribution of government toward preservation and extension of the conditions for high productivity; indeed, it is fashionable to assert the contrary.[7]

Significantly, Federal productivity series must "compete" in US with those devised (often from Federal statistics) by private organizations. Government interest in productivity by name has been most evident in US in periods of national emergency, like

[7] From our standpoint, S. E. Harris, *Economic Trends*, New York, 1949, pp. 49-54, errs in contrasting the "emphasis" on productivity in USSR and "underemphasis" in US.

depression and war; and it has also been encouraged by the idea that a national wage policy is desirable or necessary. The compilation of production, employment, and hours statistics for various industries may be traced to the pressures of such emergencies. The activities of the War Production Board's "War Production Drive" were strongly reminiscent of the Soviet publicity program for "selling" Stakhanovism. But, in the main, conscious interest in productivity in US is more apparent in non-government circles, in the abundant trade and technical literature usually unfamiliar to the professional economist, and in the vocabulary of labor and management spokesmen.

For the purpose of measurement, many specific labor productivity concepts are definable, though few may be implemented either in USSR or other countries. If the numerator refers to the output of end products of establishments or industries, then the denominator used in USSR should ideally include the labor "embodied" in consumed materials and equipment as well as the "living" labor added in those establishments or industries. The labor sum should be expressed in simple-labor units, as a current equivalent (analogous to reproduction cost) of homogeneous "average socially necessary" labor.[8] If the embodied labor is not counted, then the output numerator should ideally be measured "net."

Soviet statisticians, having inherited the classical materialistic bias through Marx, apparently prefer gross output indexes for productivity measurement, despite the duplication contained in the weighted aggregates and despite the omission of embodied labor from the denominator. Western students prefer net output measures, though they frequently must use gross indexes instead.[9] Thus, a productivity index for an American manufacturing industry typically is based on an output index of end products and a labor-added index of input. When industry output indexes are combined, however, an attempt is made to restore a certain degree of netness by the use of net industry weights, like value added or labor added. Actually, the result may be quite different from that obtained if composite output were measurable according to the principles of national income accounting. But what is of main interest to us here is that some Soviet writers even consciously reject the notion of a net output measure.[10]

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[8] Rotshtein (III, 115-24) is favorably disposed toward measures including "expanded" labor time but believes such computations not yet feasible.

[9] See, for example, S. Fabricant, *The Output of Manufacturing Industries, 1899-1937*, New York, 1940, especially Chapter II on gross and net production index formulas.

[10] D. V. Savinskii, *Kurs Promyshlennoi Statistiki* (Course in Industrial Statistics), 1949, pp. 223-24. On the other hand, the authoritative Sh. Ya. Turetskii did have something favorable to say about net output concepts some years earlier.

Labor input customarily is measured by duration – e.g., man-years or man-hours. Although data on man-hours are compiled in USSR, the widely-publicized industry productivity series and the plan estimates refer to output per worker (i.e., output per man-year).[11] Within the enterprise, however, output per man-hour statistics are also used for a variety of purposes (e.g., in the establishment of work norms and reduction of "dead time"). Publication of detailed data on the average length of the workday and days worked per year was discontinued in 1935; consequently, foreign students cannot make their own output per man-hour estimates.[12]

Since hours worked per day and per year have risen significantly since the early 1930's, output per worker has increased more sharply than output per man-hour, so the former concept presents a more favorable picture. But, even though the propaganda advantages of more favorable measures do not go unnoticed in USSR, a national index of output per worker may well seem adequate

[11] It is not clear whether the Soviet figures for workers (*rabochiye*) entering the productivity computations include the apprentices whose disposable output is recorded in the production index (*Slovar' Spravochnik*, 1948 ed., pp. 112-14). The Soviet "worker" category corresponds to the American "wage earner" or "production worker" category, but may be somewhat narrower. Soviet employment may be understated somewhat by the exclusion of certain workers engaged for 1-5 days during a month (*Slovar' Spravochnik*, 1948 ed., pp. 385-86). It appears that output per man-year is computed on a 300-day basis (Rotshtein, III, 35).

[12] It is odd that an official statistical compendium, published in 1939, shows a footnote to the effect that hours for 1935-37 had to be "extrapolated by us" for a man-hour productivity calculation. See *SSSR i Kapitalisticheskiye Strany* (USSR and Capitalist Countries), 1939, p. 75. Of course, the published Soviet statistics for average hours per day may be misleading even though they purport to include overtime. There is ample evidence in Soviet literature extolling the "heroism" of labor vanguardists that unpaid and unrecorded overtime was common. Indeed, Trotsky (p. 80) went so far as to say that Stakhanovism amounted largely to intensification and lengthening of the workday: "During the so-called 'nonworking' time, the Stakhanovists put their benches and tools in order and sort their raw material, the brigadiers instruct their brigades, etc. Of the seven-hour working day, there remains nothing but the name." Another critic, M. Gordon (pp. 263-68), cites instances of unpaid overtime required to accomplish the early plans, despite the limits established in the legal code. *Trud*, September 30, 1949, complained that "it is high time to put an end to the illegal use of overtime hours, to the postponement and cancellation of off-days, as well as the shortening of the dinner hour."

for an industrializing state striving to augment output per head of population through increasing participation in the labor force and raising the output per participant. If the proletarian dictatorship eventually achieves enough material prosperity to permit the recognition of leisure (in the form of reduced work hours as well as contraction of the labor force), then interest might shift to a national index of output per man-hour. Meanwhile, plants have the data for the output per man-hour computations they need to make.

In USSR as elsewhere, no adjustments are made in labor input measures for the heterogeneity of worker skills and for changes in labor intensity. A crude adjustment for skill differences on the basis of wage rates would be less justified under Soviet conditions than in a market economy. As for labor intensity, Soviet writers would deny the relevance of this notion to USSR computations — despite the obvious trend from leniency to stern discipline in the official policy toward labor, the evisceration of trade unions, the extension of the piece rate system and progressive norms, and the introduction of detailed accounting of time losses throughout the workday. Soviet commentators regard reported advances in output per worker or man-hour in USSR as true productivity increases in the Marxian sense, since technological and other improvements there are supposed to be continually changing the "balance between society and nature." On the other hand, they like to regard such US increases as they acknowledge after 1929 as evidences of heightened intensity.[13] One writer has even suggested recently that American statistics on actual hours are fraudulent, representing nominal hours, presumably because the lengthening workday anticipated by Marx has not materialized; that, if they really do represent actual hours, they reflect the rising intensity of the hour of work.[14]

Since alternative productivity index formulas, like alternative production formulas, could yield substantially different results for a country like USSR, it would be of interest to know the details of construction of the official index of output per industrial worker

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[13] For a "contrast" between USSR and US with respect to intensity, see E. Varga, *Two Systems: Socialist Economy and Capitalist Economy*, New York, 1939, pp. 58-63. See also I. A. Kraval's article in *Socialist Planned Economy in the Soviet Union*, New York, 1932, p. 118. Comments on the 1930's, when USSR was advancing industrially in the face of a worldwide depression, are still popular. For example, M. Demchenko, p. 7, compares the 1937 Magnitogorsk record of pig iron per worker with the US average for 1929, miscalled the peak year of American productivity.

[14] Savinskii, pp. 223 ff.

(pieced together in Appendix A, Table A-1). Although an attempt to ascertain those details met with only limited success, the findings seem worth recording.

Contrary to the inference which might be drawn from statements often made by foreign writers, the Soviet index of output per industrial worker has not been consistently computed as the quotient of aggregate output and employment measures. From Appendix Table A-2, it is evident, for example, that results which lie closer to the official series are obtained for the early 1930's if the productivity measures for the major industrial "branches" (corresponding roughly to our Census industries or industry groups) are averaged in some suitable fashion. Thus, like the official index, averages of productivity relatives with fixed money, fixed employment, or changing employment weights rise more rapidly than the quotient of total production and employment measures for industry.[15]

The turbulent period 1930-32 is of special interest. Table A-2 shows that the differently weighted averages of productivity measures and the quotient of aggregate production and employment indexes conform rather closely to the official series for output per worker until 1930. Between 1930 and 1932, however, the productivity quotient remains relatively stationary as the official index and the weighted averages continue to rise together. Perhaps, during this period of change-over from neutral to "bolshevist" statistics,[16] some sort of average of productivity indexes was adopted in lieu of the less favorable ratio of aggregate measures. A change in methods or data is suggested by the conflicting reports for those years, some of the contemporary reports even referred to declines, which have since been expunged from the official series.[17] Indeed,

[15] The algebraic conditions for the quotient of total output and employment indexes to lie below or rise above the average of productivity indexes may be analyzed by elementary vector or matrix methods described in the writer's "Note on a Common Statistical Inequality", *Journal of the American Statistical Association*, June 1943, pp. 217-22. By such methods, it may readily be determined, for example, that an average of branch productivity measures with base period (t_0) value-of-output weights exceeds the quotient of aggregate output and employment indexes when there is a positive von Bortkiewicz coefficient of correlation between price-weighted output per worker ratios of time period t_1 (i.e., $\Sigma p_0 q_1 / E_1$) and the reciprocals of the branch employment indexes (i.e , E_0/E_1).

[16] N. Jasny, "Soviet Statistics", *Review of Economics and Statistics*, February 1950, p. 92.

[17] See Trotsky, pp. 41-42, for reference to 11.7 percent productivity decline in 1931 and to an official acknowledgment of a production gain far below plan (as employment increased beyond the anticipated level). The official production statistics for 1932 appear since to have been revised upward. In *Red Economics* (ed. by G. Dolbert), New York, 1932, p. 106, N. Basseches also refers to a decline in average output per worker. E. M. Friedman, *Russia in Transition*, New York, 1932, p. 280, cites a Soviet press report to the effect that productivity fell 12.5 percent in the fiscal year 1930. S. Ordzhonikidze, Commissar of Heavy Industry, stated in *The Industrial Development in 1931 and the Tasks for 1932*, Moscow, 1932, p. 31, that productivity rose "but slightly" as production costs increased.

it is a tribute to the Soviet accounting and statistical methods of the time – or to the indifference to report instructions displayed by untrained office personnel at the plants – that productivity should have increased or even remained fairly level in the face of a huge unplanned influx of inexperienced workers into establishments unable to employ them effectively.[18]

It is possible that the industrial productivity index was not computed as a quotient of aggregate measures in the late 1930's. Thus, according to Granovskii and Markus, writing in 1940, the Soviet measure was determined by the "index method" – apparently as an employment-weighted average of productivity relatives for the major industrial branches.[19] But this statement is puzzling, inasmuch as an average with labor weights does not appear to have had any official status until 1943. Nevertheless, since Soviet productivity estimates have typically been published in the form of year-to-year link relatives back to 1928, they may well have been computed in this form (average of branch productivity link relatives) in the first instance.[20] In any case, rough computations for 1940 indicate that the official index for this year lay within the range of the productivity figures for the individual branches.[21]

The advent of war must have disrupted the USSR statistical reporting system badly. Though there are no explicit figures on the productivity change in 1941-42, the assertion of subsequent increases and the reattainment of the prewar level (see Appendix Table A-1) suggests a precipitous decline. Of course, if productivity changes were explicitly measured in the year of invasion, the conventions adopted for dealing with bombed-out plants and those rendered idle by material shortages would have been statistically all-important.

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[18] That the USSR measurement method leads to bizarre results or is inadequately policed is suggested by the remarks of the State Planning Commission, *Summary of the Fulfilment of the First Five Year Plan for the Development of the National Economy of the USSR*, Moscow, 1933, p. 191, on the alleged achievement of a 41 percent increase during the plan period (4-1/4 years): "It must also be taken into account that the growth of productivity of labor is taking place simultaneously with the reduction of the workday from eight to seven hours, under conditions of huge influx of new, untrained workers, the organization of new branches of production and an increased proportion of highly labor absorbing manufactures."

[19] E. L. Granovskii and B. L. Markus, *Ekonomika Sotsialisticheskoi Promyshlennosti* (Economics of Socialist Industry), 1940, pp. 475-79.

[20] It is of interest that the productivity link relatives for industry are not consistent with gross output per worker series published in the same work — e.g., *Sotsialisticheskoye Stroitel'stvo SSSR* (Socialist Construction in USSR), 1936, pp. 3, 38-39.

[21] Based in part on details shown in the 1941 plan.

For a few years, from May 1943 to some time in 1948 or 1949, it appears that two industrial productivity indexes were officially computed – the ratio of aggregate output to employment and an average of branch productivity indexes with current employment weights.[22] The former was supposed to be the standard index. The latter, to be computed concurrently, was, however, considered technically superior by leading Soviet students.[23]

The arguments in favor of the labor-weighted measure were similar to those offered earlier by American agencies expressing a similar technical preference, WPA National Research Project and the US Bureau of Labor Statistics.[24] For one thing, this measure is necessarily an internal mean of productivity indexes of the individual branches, while the ratio of aggregate output to employment could lie outside the range of the branch indexes. If it were possible to weight the individual product quantities in the composite output measure by unit labor requirements instead of prices, the result, when divided by the index of workers, would necessarily be an internal mean. The price-weighted output measure, however, yields a composite productivity estimate which reflects not only changes in productivity in the individual branches, but also in the structure of total output.

Despite its technical virtues, the Soviet labor-weighted productivity average must have proved disappointing in the postwar period, for it was unceremoniously deprived of its privileged status. Evidence to this effect is offered by Savinskii's book, published in its third edition in 1949. After several laudatory pages on this measure, a sudden bald statement declares that the series was discontinued by decree – as though the information was received while the book was in galley.[25]

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[22] *Slovar' Spravochnik*, 1944 ed., pp. 218-19.

[23] See Rotshtein, III, 65-91; Granovskii and Markus, pp. 475-79; Turetskii, "Ekonomika Proizvodstva i Kachestvennye Pokazateli Plana" (Economics of Production and Qualitative Plan Indices), *Planovoye Khozyaistvo* (Planned Economy), 1940, No. 8, pp. 20-21; and Savinskii, pp. 203-08. Rotshtein's remarks suggest that Strumilin was the original sponsor of the labor-weighted productivity average.

[24] See H. Magdoff, I. H. Siegel, and M. B. Davis, *Production, Employment, and Productivity in 59 Manufacturing Industries, 1919-36*, Philadelphia, 1939, I; V. E. Spencer, *Production, Employment, and Productivity in Mineral Extractive Industries, 1880-1938*, Philadelphia, 1940; and U. S. Bureau of Labor Statistics, *Productivity and Unit Labor Cost in Selected Manufacturing Industries: 1919-1940*, Washington 1942.

[25] Savinskii, p. 208.

Another important computational change in productivity apparently occurred in 1949.[26] Beginning 1 January both planning and measurement of production and productivity were to be carried out in terms of current wholesale prices rather than fixed 1926-27 rubles. This change, desirable for rational accounting, may have contributed to attainment of the 1950 productivity goal. Curiously, the postwar planning period was, like the first, characterized by a labor influx in excess of the stated objective. Such misjudgments apparently are tonic to Soviet productivity.

When attempts are made at the international comparison of "real" output, productivity, or output per capita, the obstacles encountered are no less formidable than those which impede the construction of time series. Conceptual difficulties abound when the countries of interest are in different stages of industrial development, have dissimilar production functions and tastes, assign different roles to market and price mechanisms, make goods of unlike kind and quality, and do not trade extensively with each other or with a third nation.[27]

Dollar-ruble conversion ratios for the common valuation of total or per capital output of USSR and US give obscure results at best, whether they happen to be official exchange rates or prewar "equilibrium" rates extrapolated according to the purchasing power parity theory.[28] Any such conversion ratio cannot be assumed equivalent to a "spatial" price index correlative with a "real" output comparison measure, especially if the two countries do not make the same range of goods of similar quality. Furthermore, the derived productivity or per capita output indexes are not necessarily internal means of relatives for the various products even if the compared countries do make the same range of goods. As in

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[26] I. A. Sholomovich, *Analiz Khozyaistvennoi Deyatel'nosti Promyshlennogo Predpriyatia* (Analysis of Economic Activity of the Industrial Enterprise), 1940, p. 29.

[27] For problems encountered in international comparisons, see, for example, United Nations Statistical Office, *National and Per Capita Incomes of Seventy Countries in 1949* (Statistical Papers, E-1), New York, October 1950, pp. 9-12; W. I. Abraham, "The Distribution of World Income," *American Statistician*, April-May 1951, pp. 6-8; S. Kuznets, "National Income and Industrial Structure," *Econometrica*, July 1949, pp. 205-39; L. Metzler, "Exchange Rates and the International Monetary Fund", *International Monetary Policies*, Washington, 1947, pp. 16-28; and M. R. Wyczalkowski, "The Soviet Price System and the Ruble Exchange Rate", *International Monetary Fund Staff Papers*, September 1950, pp. 203-24.

[28] The UN publication (see footnote 27) shows the dollar estimates for 18 countries computed by 3 methods in 1949. The highest estimate exceeds the lowest by at least 40 percent in 13 of the 18 cases.

the analogous case of time series computed from price-weighted aggregate output indexes, the results are influenced by structural differences as well as differences among the individual product relatives.

Attempts at direct comparison of output by the valuation of particular categories of goods in a common currency also meet with indifferent success. As Colin Clark's efforts to construct series (see Chapter III) for USSR suggest, the foreign student cannot hope to obtain data for a sufficiently large or representative sample. Official Soviet international comparisons made in the late 1930's for a number of industrial branches also leave much to be desired.[29] The computations for USSR are not subject to check. Quality differences are not given due recognition. Some of the dollar-ruble conversion rates, as in the case of automobiles,[30] border on the absurd. Because of the great differences in relative-price patterns, comparisons in different currencies would diverge substantially.[31]

For many problems of "operations research," productivity indexes and international comparisons of the kind discussed in this study, whether they refer to labor alone or somehow embrace all factors of production, are less instructive than the computations which could conceivably be made by the application of the Leontief "input-output" or Air Force "linear programming" technique to a detailed, yet manageable matrix of data. Though opportunities to make such computations are limited, the versatility of the tools for the comparison of economies under alternative assumptions should nevertheless be noted. For example, detailed mathematical models provide a theoretical basis for comparing the multiples of a designated set of end products achievable with the given equipment and available resources of USSR and US, or the multiples producible if sufficient time is also allowed for appropriate technological reorganizations. Another significant comparison may relate to the maximum multiples of a plausible complex of military goods derivable in a given period from the present resources of the two countries — due allowance being made for the maintenance of consumption and

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[29] See the volume published under the auspices of the Academy of Sciences (Akademiya Nauk): *Proizvoditel'nost' Truda v Promyshlennosti SSSR* (Labor Productivity in USSR Industry), 1940.

[30] See article by K. I. Klimenko on machine building and metal working industries, *ibid.*, p. 199; and N. Jasny, *The Socialized Agriculture of the USSR: Plans and Performance*, Stanford, 1949, pp. 718-19.

[31] S. Yugenburg, "Uroven' Proizvodstva Mashinostroyeniye SSSR i Krupneishikh Kapitalisticheskikh Stran" (Production Level of Machine Building in USSR and the Most Powerful Capitalist Countries), *Planovoye Khozyaistvo*, 1937, No. 3, pp. 48, 52-54, 62.

physical capital at characteristic levels. Or it may be of interest to determine the resource requirements of each country to secure "certain" military victory with minimum domestic damage through enemy action. Numerous other examples may be invented. The significant fact is that there are many pertinent questions which could be asked concerning comparative productivity, while conventional index techniques give answers to unclear, artificial, or relatively unimportant questions.

Production Measurement[32]

Responsible students of Soviet economic development, inside or outside USSR, have not been able to accept without reservation the official measures of gross output (valovaya produktsiya) which underlie the productivity series for the industrial sector and its components.[33] Under conditions of deliberate industrialization, the quantity series for individual products are widely dispersed, and there is a certain arbitrariness in the relative prices established for any period. Still worse, new products or new models of old products appear in profusion. Obviously, alternative

[32]Although agricultural output statistics as such are not of major interest in this study, we may note in passing that changes in methods of crop estimation and other practices appear to exaggerate absolute production and growth rates. (See *Quarterly Bulletin of Soviet-Russian Economics*, January 1940, pp. 98-99, and various works of N. Jasny: "Labor Productivity in Agriculture," *Journal of Farm Economics*, May 1945, pp. 419-32; *The Socialized Agriculture of the USSR*, pp. 538-50, and 725-46; and *Review of Economics and Statistics*, February 1950, pp. 93-94.) Dobb, who generally takes issue with critical commentators on Soviet achievements in other fields, makes no effort to counter the trenchant observations of Jasny on Soviet agriculture, although he is acquainted with the latter's work (see *Bulletin of the Oxford Institute of Statistics*, June 1946, p. 192); and the latter (with H. Schwartz) has been the target of Soviet vituperation (see *New York Times*, November 26, 1949).

[33]For descriptions of, or critical commentaries on, the Soviet gross output indexes, see: Rotshtein, I (1936), pp. 149-67; Savinskii, pp. 93-100; *Bukhalterskii Uchet: Sbornik Vazhneishikh Rukvodyashikh Materialov* (Bookkeeping Accounts: A Compilation of the Most Important Guiding Materials), 1948, pp. 300-06; *Slovar' Spravochnik*, 1948 ed., pp. 112-16; Turetskii, "O Khozyaistvennom Raschete" (On Economic Accounting), *Planovoye Khozyaistvo*, 1939, No. 1, pp. 122-30, and "Voprosy Planirovaniya Tovarnoi Produktsii" (Questions of Planning Goods Production), *ibid.*, 1939, No. 12, pp. 102-19; A. Gerschenkron, "The Soviet Indices of Industrial Production," *Review of Economic Statistics*, November 1947, pp. 217-26; M. Dobb, "A Comment on Soviet Economic Statistics," *ibid.*, February 1948, pp. 34-38, and "Comment on Soviet Economic Statistics," *Soviet Studies*, June 1949, pp. 18-27; and N. Jasny, *Review of Economics and Statistics*, February 1950, pp. 92-99.

statistical procedures could lead to considerably different results even if there is no mischievous intent. Logical and technical problems of measurement which may be salutarily neglected in stable conditions are too urgent to ignore in the case of a country undergoing a fundamental structural change. Dissatisfaction on the part of Soviet statisticians led to many improvements in the 1930's. Thus, statistics on "finished" goods or "traded" product (tovarnaya produktsiya) in current prices were introduced in 1936 and used in planning in 1940 and subsequently.[34] As has already been noted, a new production measure was adopted for planning and statistical purposes in 1949. There has also been some discussion concerning establishment of a price index permitting derivation of a production index by deflation.[35] But outsiders have no access to these new series.

Certain features of the Soviet gross industrial output index set it apart from the familiar Western-style indexes. It is based, not only on the weighted quantities of completed factory products (including semimanufactures), but also on the value, in "fixed" rubles, of changes in goods in process, internally produced additions to capital equipment, painting and repairs, services furnished "on the side" (e.g., electric current and heat to workers' quarters), contract work, expenses incurred in mastering production of new goods, certain cancelled orders, etc.[36] The quantity statistics are exaggerated by inclusion of some defective goods and by the deterioration, at least during the early years of planning, of the quality of the "same" nominal products.[37] The index also has

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[34] P. Kholodnyi, "Planirovaniye Tovarnoi Produktsii" (Planning of Goods Production), *Planovoye Khozyaistvo*, 1940, No. 4, pp. 48-52; Turetskii, *ibid.*, No. 8, p. 19; Savinskii, pp. 112-13; and *Bukhalterskii Uchet*, pp. 308-12.

[35] Savinskii, pp. 86-88.

[36] For these and other details, see various works cited in footnote 16, like *Bukhalterskii Uchet*, *Slovar' Spravochnik*, Rotshtein (I), and Savinskii.

[37] On quality deterioration, see University of Birmingham Bureau of Research on Russian Economic Conditions, "Remarks on the Five Year Plan: Economic Results for 1931 and Control Figures for 1932," *Memorandum No. 5*, May 1932, p. 11; and "Za Vysokoye Kachestvo Produktsii" (For a High Quality of Product), *Planovoye Khozyaistvo*, 1940, No. 10, pp. 3-11. As for the inclusion of defective goods in the production index, see Kholodnyi, *loc. cit.*, p. 52; Turetskii, *Proizvoditel'nost' Truda i Snizheniye Sebestoimosti v Novoi Pyatiletke* (Productivity of Labor and Cost Reduction in the New Five-Year Plan), p. 18; V. Fedulov, "O Nezavershennom Proizvodstve i Borbe s Brakom" (On Goods in Process and the Struggle against Defective Output), *Planovoye Khozyaistvo*, 1939, No. 12, pp. 120-25; and "The Limits of the Planning System," *Quarterly Bulletin of Soviet-Russian Economics*, December 1940, pp. 41-54. A decree of 10 July 1940, published in *Problemy Ekonomiki*, 1940, No. 8, p. 11, established that failure to meet standards concerning quality and completeness of goods was a "crime against the state tantamount to wrecking;" and that guilty officials were liable to prison terms of 5-8 years.

from time to time included doubtful or forbidden items — like the rehabilitation or reconstruction of plants by factory workers after World War II and the dismantling, packing, and reassembly of evacuated plants by their personnel during the War.[38] Reconversion output, as measured, was probably swollen by the inclusion of the wages of workers kept on the payroll for retraining.[39] The aggregate is also inflated by the inclusion, at least once, of (net) imports of industrial materials in the value of the derived goods — about $3 billion supplied under US Lend-Lease and additional huge amounts of booty, reparations, and shared output of joint corporations established in satellite countries.[40] The opportunities

[38] Presumably, establishment of a separate Construction Commissariat in 1939 (*Izvestiya*, 3 June 1939) should have made it clear that building construction and repair were to be reckoned separately from industrial production. But it was natural for the plant paying the wages for such work in the postwar period to include the activity in industrial output. Savinskii, p. 100, refers to this bad practice, states that building erection and repair should go instead into the construction index, and then offers suggestions for distinguishing between equipment repairs comprising industrial output and those comprising construction. For an illustration of the plant rehabilitation activity of iron and steel workers, see L. M. Herman, "Soviet Iron and Steel Industry," *International Reference Service*, July 1947, pp. 4-5. As for the use of plant workers for evacuation and reassembly, there are many accounts of impressive accomplishments in the literature of the past few years. See A. Kursky, *Russia Has a Plan*, London, 1945, pp. 38-39, and Lokshin, pp. 138-39.

[39] According to S. Kournakoff, "On the Upgrade — and Looking Back," *Soviet Russia Today*, May 1948, p. 30, workers were paid the equivalent of normal wages while being retrained during the transition. "Nobody, of course, is fired during 'retooling'."

[40] See *Twenty-First Report to Congress on Lend-Lease Operations for the Period Ended 30 September 1945*; p. 25; and B. H. Kerblay, *The Economic Relations of the USSR with Foreign Countries during the War and in the Post-War Period* (University of Birmingham Bulletins on Soviet Economic Development, No. 5), March 1951. The role of lend-lease assistance is minimized by N. A. Voznesenskii, who says in *Voennaya Ekonomika SSSR*, pp. 73-74, that Allied deliveries of industrial goods amounted to only about 4 percent of domestic output "over the period of the war economy" (1941-45). Since there were no deliveries in 1941, the denominator may be too broad. Furthermore, the conversion rate used in the ruble valuation of transferred goods may have been singularly inappropriate. Finally, the denominator includes, more than once, at least some of the lend-lease materials included in the numerator.

Lend-lease materials may not only have helped increase the output index in fixed rubles but may have contributed to the large cost and price cuts announced for 1942-44. Before Voznesenskii fixed the line, Turetskii, "Heavy Industry in the War Years", *USSR Information Bulletin*, 8 September 1945, pp. 1-3, pointed to the reductions in various industries, then added, perhaps significantly: "In connection with the Soviet Union's war expenditures, it should be borne in mind that part of its raw materials and foodstuffs were received from its Allies." Noting that Stalin had admitted to Truman the importance of American assistance for victory, he further stated that USSR's "very large war expenditures were chiefly covered by the country's national income."

for duplication during the War are suggested by the fact that our iron and steel shipments added 5 percent to Soviet supplies.[41] Through time, there has also been an increase in Soviet territory and in the coverage of the reporting system, but productivity movements would not necessarily be distorted thereby. There is no doubt that within a typical branch, valovaya produktsiya exceeds tovarnaya produktsiya in comparable prices; and the latter is closer to the Western commodity basis for production measurement.[42]

Much of the criticism of the Soviet index has been directed against the weighting technique and, in the same connection, also against the treatment accorded new models and products. Curiously, the very manner of incorporating new items into the index – directly, rather than through the construction and chaining of links – has not aroused interest although it, too, leads to higher estimates of the rate of growth. As for the weights, it may be noted that the use of the economic year 1926-27 as a base tends to emphasize the importance of goods then scarce and subsequently in urgent demand by the planners. In the case of new products or models, there are no actual 1926-27 weights. Before 1937, the prices of the first year of post-experimental introduction were used as weights instead. With the growing importance of non-standard goods (e.g., the "engineering" industries, like machinery and transportation equipment, increased their representation in the weighted industry aggregate to over 40 percent before the War),[43] the weights actually used corresponded less and less to "fixed" 1926-27 rubles. The recognition of new products and models had a buoyant effect on the index because relative prices of these items were high in comparison with the base period prices of other items. For one thing, the "real cost" of new items is high; and pricing or repricing after 1926-27 took advantage of the inflation engendered by forced industrialization. Other features of the weighting practice were objectionable. For example, establishments were allowed to use their own prices as weights in the first five-year plan; uniform allowable prices were not fixed until the second and third plans.

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[41] D. B. Shimkin, "Steel Behind the Iron Curtain: II," *Iron Age*, 10 August 1950, p. 69.

[42] N. Titov, "Our Collective Agreement," *Soviet Russia Today*, March 1949, p. 15, tells of an "agreement" between workers and management in which the former pledged a 1948 gain of 12.3 percent in gross output but of only 5 percent in commodity output. Reckoning on the basis of gross output, the workers also agreed to increase productivity by 12.9 percent.

[43] *SSSR i Kapitalisticheskiye Strany* (USSR and Capitalist Countries), 1939, p. 4; and A. Baykov, *Industrial Development in the USSR* (Bulletins on Soviet Economic Development, No. 1), May 1949, p. 8.

Not all of the features of the Soviet index which give it an upward impetus can properly be called "biases." Such a designation is applicable only when there are cogent reasons for accepting one type of index or procedure as standard. But there would be no universal agreement among competent authorities in the case of a rapidly industrializing country. Jasny, for example, would seem to be on unsafe ground when he contends that the weights for new items should have been "real" prices – prices "in line" with those prevailing for commodities already made in the base year.[44] (After 1936, such prices were adopted for new items,[45] but the effects of earlier practice were not thereby undone.) Jasny cannot properly say that the weights actually used were "disproportionately high" because other still higher meaningful prices could have been assigned, according to the conception of the index-maker. Thus, if it were decided that the "true" index should have "economic" weights – the lowest 1926-27 hypothetical prices compatible with zero output of the subsequently introduced items and with the actual prices and quantities of other goods made in the base year,[46] – the resulting index would rise more than the official Soviet index yet be "unbiased" if it were the measure sought. Unless there is an agreed-upon criterion, indexes with "economic," "in line," foreign, hypothetical, or other weights are all just as "real." Unfortunately, these indexes would differ considerably, so the "philosophical" question as to what we mean by a production measure appropriate for a rapidly industrializing country cannot be dodged.

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[44] Jasny, *Review of Economics and Statistics*, February 1950, p. 94; and "Intricacies of Russian National Income Indexes," *Journal of Political Economy*, August 1947, p. 305.

[45] Dobb, *Review of Economics and Statistics*, February 1948, pp. 35-36; and *Soviet Studies*, June 1949, pp. 19-22.

[46] This suggestion, an elaboration of a somewhat similar one made by J. R. Hicks in connection with national income valuation, also has its weak points, but it does illuminate some of the difficulties of meaningful measurement in a country undergoing important change. Among the implications are the constancy, in some relevant sense, of planners' tastes through time; the feasibility of making some things in USSR which could not actually have been made there in 1926-27; and complete foreknowledge of what will become feasible and desirable. Of course, if a particular item could not possibly have been made in 1926-27, its lowest price corresponding to zero output in that year was infinite — in which case the already strained index-number technique breaks down altogether. As for new models as distinguished from new goods, it could happen that the post-experimental inflated price exceeds the 1926-27 "economic" price — in which event, there would be a clear upward bias even if the weighting criterion of "economic" price is adopted.

That the problem of measuring Soviet output cannot be resolved in a universally satisfactory manner becomes more evident when alternative methods are contemplated. The usual chain index, a favorite of Western students for comparing dissimilar periods, would give a very conservative estimate of the effect of continuous product innovation. Besides, its level would be influenced materially by alternative decisions concerning the length of links and the identification of products as "new."

A second alternative measure, the adjusted chain index – the links of which are "corrected" for coverage variations by means of a device like the Mills-Fabricant-Devons "value-adequacy ratio"[47] – should show a less conservative rise, but the intended adjustment may itself sometimes distort. Furthermore, it might be noted that the meaning of chain indexes is obscure, that they probably are interpretable at best as approximations to fixed base measures of some sort.

A third alternative technique, deflation, gives only the appearance of a solution for the case of a changing product universe – unless the price or other deflator were designed specifically (which it is not) to yield a desired production index which could not be constructed directly. Thus, it is not enough for a deflator to satisfy a verbal identity; the formula would also have to be algebraically appropriate to define what is meant by a change in physical output under Soviet conditions.

Very similar to deflation is a fourth technique – the adjustment of an employment index, by multiplication, for presumed changes in output per worker. But if the proper production index cannot be specified in advance, as in the case of a change in the product universe, then the correlative productivity concept is undefinable too. Although this approach may seem to be on the ridiculous side, it has been followed by the Federal Reserve Board in making pseudo-output measures for industries converting to war production and back to civilian production.

A fifth alternative, recently proposed for gauging the "bias" of the Soviet measure and overcoming "most of the objections" to it,[48] will actually do neither. A common variety of Western measure applicable to stable conditions, it involves the combination of physical series with net industry weights (roughly, value added) pertaining to a more recent year (1934); it takes no account of the characteristic problem of a changing product universe.

[47] Fabricant, pp. 362 ff.
[48] D. R. Hodgeman, "A New Production Index for Soviet Industry," *Review of Economics and Statistics*, November 1950, pp. 329-38.

A sixth possibility is a Soviet-style index with constant weights of a more recent year than 1926-27. Such an index, depicting Soviet growth from a new perspective point, would require fewer hypothetical weights but still have the defect of grossness. Of course, an index with recent weights can be computed only in retrospect, whereas the index with 1926-27 weights was devised by a government needing a current indicator of the country's forward motion.

There is a seventh alternative — a measure of the output of the basic materials made throughout the period of Soviet power. The first American production measures were of this kind. Such measures tell nothing of the value added subsequently; in different countries, the same materials correspond to different net or gross output totals. For these reasons and others, it seems futile to inquire into the reasonableness, in the light of American experience, of the Soviet ratio of goods derived from iron and steel to the output of basic metal; or to inquire into the reasonableness of the Soviet gross measure for industry on the basis of the movement of a few basic product series.[49] By the same token, other conceivable alternatives to the present Soviet measure, based on the price weights of a more mature country, are of limited relevance though illuminating.

Finally, we wish to call attention to Trotsky's remarks on the Soviet production index,[50] which were published a full decade before the Review of Economic Statistics symposium to which many of our observations in this chapter refer. First, he emphasized the poor quality of products. Second, and more interesting to us, is his observation that the output aggregate is inflated by the inclusion of repair, so that the poorer the product the greater the apparent output. "From the standpoint of economic efficiency", he wrote, "it would be proper to subtract, not add..... It is not always certain what hides behind [the ruble] — the construction of a machine or its premature breakdown." Third, Trotsky noted, like many others since, that the rise in ruble output to 6 times the pre-World War I level corresponds to a rise in the physical output of basic materials of 3 - 3.5 times. But he stated that "the fundamental cause" of the divergence was the creation of new industries unknown in Czarist Russia; while a "supplementary cause" was the "tendentious manipulation of statistics."

[49] In our opinion, Dobb (*Review of Economics and Statistics*, February 1948, pp. 36-37, and *Soviet Studies*, June 1949, p. 231) and Gerschenkron pay insufficient attention to the peculiarly conventional character of temporal comparisons for a changing product universe.

[50] Trotsky, pp. 12-15.

CHAPTER III

TREND OF SOVIET LABOR PRODUCTIVITY

Official Industrial Productivity Claims

We have pieced together a series which should represent fairly accurately the Soviet view of industrial productivity change during the past half century. The publication of series for individual branches was discontinued even before World War II; and these truncated series are still cited in Soviet literature. The postwar record for industry as a whole is restricted to ambiguous year-to-year percentage changes or comparisons with "prewar," presumably 1940. Using the postwar estimates, we have also attempted, on the basis of additional Soviet data, to fill in the record for the war years.

According to Table A-1 in Appendix A, Soviet sources claim an advance in industrial output per worker to almost 5 times the 1928 level by 1950. In the latter year, output per worker was supposed to be about 6.5 times the 1913 average and almost 10 times the 1900 figure. The apparent goal for 1950 man-hour productivity was about 4.5 times the 1928 average and about 7.5 times the 1913 figure.

Such statistics as have been published on the productivity of components of USSR industry in the first decade of planning (see Tables A-3 and A-4) suggest that above-average gains were achieved in ferrous metallurgy, metalworking, machine building, and chemicals. Below-average gains were recorded in clothing and textiles. This divergence was to be expected in view of the concentration on heavy industry during the Soviet era.

Translated into geometric-mean annual percentage rates for significant time intervals, the changes in the official series for industrial output per worker and per man-hour were as follows:

Interval	Rate for output per worker	Rate for output per man-hour
1900-50	4.7	...
1913-50	5.2	5.6 } based on
1928-50	7.5	7.1 } apparent
1928-40	11.3	10.5 1950 goal
1900-13	3.1	...
1928-32	8.1	10.8
1932-37	12.4	12.3
1937-40	13.6	7.2
1940-46	-3.1	...
1946-50	13.2	...

According to this tabular summary, very high rates of productivity advance were claimed for the prewar planning periods and the postwar reconstruction. The 1946-50 rate for output per worker, 13.2 percent, is comparable with the 1937-40 rate of 13.6 percent. Even if the wartime setback is taken into account in our computations, output per worker allegedly advanced at the rate of 7.5 percent per annum during the entire planning era, 1928-50. This rate is far in excess of the long-term output-per-worker rate of about 2 percent for US and the 3 percent rate attained in the Czarist period 1900-13. But, of course, the gradual American development has permitted the continuation of a vigorous tradition of civil liberties, a rising consumption level, and an increase in leisure. Furthermore, the American record could be improved if output were computed by the Soviet method; and the Soviet record would look less spectacular if Western concepts and methods were used. The continuous introduction of new goods and new models, so characteristic of our society, would be tonic to any production or productivity index constructed à la russe. On the other hand, use of the concept of commodity output (tovarnaya produktsiya) and a chain index would lead to much more ordinary rates of development for USSR.

The above table reflects in part the trend toward a longer work year since 1928. During the first five-year plan, output per worker increased less rapidly than output per man-hour as the work day was reduced, but the two rates for 1932-37 were equal, and the rate for output per worker in 1937-40 was almost twice that of output per man-hour.

Some of the movements of the Soviet industrial productivity series deserve comment. First, there is the alleged annual gain of 8 percent in output per worker during the turbulent years of the first plan – a gain despite failures to achieve output goals, widespread charges of "wrecking," inept management (reflected in two major speeches by Stalin in 1931), the official reduction of hours of work, experimentation with the arrangement of the work week, and the tremendous unplanned influx of peasants into the urban labor force.

Second, there is the tremendous average yearly gain of 12-14 percent claimed for output per worker in the second and third planning periods. A substantial advance should still have been registered in these years if Western concepts and methods were employed in measurement. An important factor in the productivity rise as a whole was mere routinization – the realization of gains made possible by technological change as the experience and skill of labor and management increased.

The purported increase in output per worker and per man-hour by more than 1/5 in 1936 is attributed by Soviet writers to Stakhanovism. But this movement initially caused disruption of routine, was even openly resisted by managers and workers, often meant a gain in one operation at the expense of efficiency in others, and could not really have swept the country "like a hurricane." To the extent that the 1935-36 productivity rise was "real," it need not have been caused by "labor enthusiasm" but by other more down-to-earth features of Stakhanovism – like increased labor intensity and pay differentiation – and by better utilization of newly built enterprises.[1]

A third period of interest covers the "Great Patriotic War." If Soviet claims for postwar productivity compared to prewar are considered with statements about general wartime increases, a decline of about 40 percent in output per worker is implied for 1940-41. Voznesenskii concedes only a "temporary" drop in 1942 in output per worker in a few light industries as the interruption of power, fuel, and material supplies caused "prolonged shortages"; and a "temporary" decline in mining, oil, and timber productivity in 1942 due to the influx of physically underqualified workers.[2] Maslova mentions similar "temporary" declines, but says that the decline in oil extraction was not halted until 1944.[3]

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[1] Soviet writers (e.g., Turetskii, *Proizvoditel'nost' Truda*, p. 10) have boasted that, by the end of the second five-year plan, 80 percent of all industrial output was accounted for by new or entirely reconstructed enterprises.
[2] Voznesenskii, Voennaya Ekonomika SSSR, pp. 113-14.
[3] Maslova, *Proizvoditel'nost' Truda*, p. 61.

After 1942, a substantial rise in productivity was reported. Part of this increase was mere recovery of the unannounced decline; part was due to the genuine progress made in the mass production of munitions. In the case of output per worker, a sharp increase in the length of the work week was of decisive importance. Voznesenskii cites reductions in unit man-hour requirements of up to one half for certain munitions between 1941 and 1943 (Table A-6). Although gains in productivity were also claimed for other industries, Maslova mentions a significant development which had an adverse effect on commodity output per worker in civilian and war-important industries — the increase in the ratio of auxiliary workers per basic worker and the increase in personnel per unit of major equipment. This development was attributed to the poor quality of labor replacements. Not only was the situation tolerated during the war, but the unfavorable ratios persisted thereafter.[4]

As for hours of work, compulsory overtime of 3 hours per day was authorized in mid-1941. According to Voznesenskii, average monthly hours per worker increased 22 percent during two years of war while man-hour productivity increased only 7 percent.[5] The increase in hours officially required of workers compared to peacetime was truly remarkable — something like 60 percent more than the prevailing number before adoption of the 8 hour day in mid-1940.

The gains reported in man-hour productivity for munitions, if real, are no more impressive than the gains made in US. They resulted in part from the adoption of line-production methods justified by the volume and standardization of the desired items. In US, there was a decline to only one-third, between 1942 and 1945, in the man-hours required per plane in the airframe industry; to less than one half, in three years ending December 1944, in the labor time required per "liberty" ship; and to about one half, within 10 months, in the man-hours required per "victory" ship or destroyer escort. More spectacular declines were recorded for other items — like the decline to 10 man-hours in US in the assembly of the 40-mm Bofors gun, which required 450 man-hours for assembly in Sweden. It is a striking fact that, despite the multitude of instances of labor saving and despite the absence of enemy harassment and destruction, the course of composite industrial productivity in US during the war is still regarded as an open question by American productivity experts.

[4] Maslova, *Proizvoditel'nost' Truda*, pp. 179-80.
[5] *Voennaya Ekonomika SSSR*, p. 115.

The fourth period of interest is 1946-50, during which worker productivity allegedly reattained the 1940 level (in 1948) and then progressed 37 percent beyond it (the 1950 goal was a 36 percent increase).[6] Curiously, the reported percentage gains for 1949-50 and 1948-49 imply that worker productivity in 1948 was actually 8 percent above 1940. Though such an excess would seem large enough to have merited explicit publicity, it was not mentioned in contemporary accounts. Perhaps, this happy result was obtained through the introduction of the new productivity index. Also noteworthy is the alleged increase in productivity for another interval in which the nonagricultural labor force increased sharply (by one third) and by much more than the plan anticipated. Nothing is known, furthermore, about the statistical treatment of war prisoners and penalized collaborators, whose industrial output (e.g., in mining and lumbering) is doubtless included in the productivity numerator even if their services are excluded from the denominator.

There are some vague remarks in postwar Soviet publications suggesting that worker productivity declined until 1946 or 1947. Reconversion troubles were partly statistical; output per worker tended to be depressed by the reduction in hours of work and the reorientation of production toward goods requiring more labor per 1926-27 ruble. But it also appears that labor was reluctant and had to be stimulated anew with socialist competitions and non-socialist incentives. Thus, the plan was revised to permit production of more consumer goods, purchasing power not derived from current effort (i.e., savings) was reduced by the currency reform of December 1947, and the output standards for progressive piece rates and bonuses were altered.[7]

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[6] Sometimes — e.g., in *Bol'shaya Sovetskaya Entsiklopediya: SSSR* (Great Soviet Encyclopedia: USSR), 1948, p. 1092 — the planned increase of 36 percent in output per worker is interpreted as referring to output per man-hour. This interpretation would imply that planners assumed a return to 1940 average hours by 1950. Actually, the mid-1940 rise in hours of work was written into the Constitution in 1947.

[7] On the postwar productivity problems of USSR, see M. Dobb, "Soviet Post-War Reconstruction," *Science and Society*, Spring 1951, pp. 122-28; H. Schwartz, "Soviet Labor Policy, 1945-1949," *Annals of the American Academy of Political and Social Science*, May 1949, pp. 74-75; and P. A. Khromov, "Proizvoditel'nost' Truda v Promyshlennosti SSSR" (Labor Productivity in USSR Industry), *Voprosy Ekonomiki*, 1948, No. 3, pp. 85-89. Incidentally, General Bedell Smith, ex-ambassador to USSR, believed the currency devaluation to be a cause for demoralization of workers and reduction in their productivity (*New York Times*, 14 November 1949); the Soviet objective, of course, was the opposite, and most Western writers seem to agree that the effect was salutary.

Productivity in Railroad Transportation

Rail transportation is generally considered one of the weaker links of the Soviet economic system. The growth of industry under planning placed a great strain on existing facilities, while the priority accorded industrial expansion in turn restricted the increase of trackage, rolling stock, and other equipment. The productivity series shown in Table A-8, referring to the aggregate freight and passenger traffic per "direct" employee, reflects the tendency to utilize facilities to the utmost.

By the end of the second five year plan, it appears that the maximum gain in productivity obtainable through better loading, longer trains, higher speeds, and shorter turnaround time had already been obtained. In 1937, traffic per direct worker was 2.7 times the 1913 average, but the index has changed little since — except for the wartime decline and subsequent recovery. Between 1932 and 1937, as traffic more than doubled, productivity increased by more than 40 percent.

The 1950 plan figure was only about 8 percent above the 1937 and 1940 levels. But this objective was not reached, according to a jubilant report of an advance of 2.5 percent above the prewar accomplishment.[8] Since hours of work increased by much more than this percentage after 1940, it may be concluded that man-hour productivity was still well below the prewar average in 1950.

It should be observed that productivity in US steam railroad transportation showed remarkable gains during the war, while USSR railroad productivity was already at its peak. Indeed, the prewar planning periods of USSR were analogous to the war periods of advanced capitalist countries normally having margins of "excess capacity." It is natural, therefore, that USSR productivity should have reached a virtual maximum even before the war. From 1939 to 1943, as US revenue traffic more than doubled, output per hourly-basis employee increased 70 percent and output per man-hour 51 percent, according to US Bureau of Labor Statistics. These productivity gains were greater than the USSR advance of 1932-37. The US wartime record for passenger traffic alone is as fantastic as the Soviet claims for its other industries — a rise of revenue passenger miles per road passenger employee to 3.5 times the 1939 level by 1944.

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[8] V. E. Tsaregorodtsev, *SSSR — Velikaya Zheleznodorozhnaya Derzhava* (USSR — A Great Railroad Power), 1951, p. 14, does not mention the failure to fulfill plan, but tells us instead that "hundreds of thousands of railway workers have over-fulfilled the five-year norms of output."

Productivity Estimates of Colin Clark

Of the foreign students of the Soviet economy, the one who seems to have concentrated most on productivity measurement is Colin Clark. We shall consider here some series prepared for his new edition of Conditions of Economic Progress and issued in 1949 in his periodical, Review of Economic Progress. These series differ conceptually from the Soviet series we have already discussed; they all purport to show net product (the equivalent of US Census value added reduced by depreciation, etc.), are valued in "international units" (the purchasing power of $1 in US in 1925-34), and refer to all personnel (not simply "workers").

Clark's version of Soviet industrial productivity growth contrasts sharply with the picture given by official USSR statistics. Between 1913 and 1936, he estimates a gain of about one third in output per person employed in industry and about three fourths in output per man-hour(Table A-13). In the same interval, according to the industrial series constructed by us from official figures (Table A-1), output per worker supposedly trebled and output per man-hour quadrupled. Between 1928 and 1936, net output per person in industry and output per man-hour advanced only about one fifth, according to Clark, while the official statistics claimed that gross output per worker and per man-hour more than doubled. Clark's series show a deterioration during the first plan and recovery during the second; a rise of more than two fifths from 1935 to 1936, about twice as steep as that claimed officially, finally brought productivity above the previous record years of 1928-29.

While the writer doubts the technical adequacy of the Soviet index of gross industrial productivity, his skepticism is sufficiently catholic to embrace Clark's measure, too. Even Jasny's discounted estimates of the Soviet output gain suggest a much greater productivity increase than Clark has computed — unless it is believed that Soviet employment statistics for industry have a downward bias through time (e.g., that they omit an increasing percentage of forced laborers who should have been included).[9] Clark does not disclose the method of construction of the underlying output series for large-scale industry, but it moves very much like a series on "value of

[9] See chart in N. Jasny, "International Organizations and Soviet Statistics," Journal of the *American Statistical Association*, March 1950, p. 53; and *Review of Economic Statistics*, February 1950, p. 94. Jasny's comments on the omission of concentration camp inmates (March 1950, p. 49) probably have little bearing on industrial productivity estimates for the first two plans. D. B. Shimkin, "Russia's Industrial Expansion," *Fortune*, May 1951, p. 110, credits USSR with a man-hour productivity advance of 37 percent in mining and manufacturing between 1928 and 1937, but he gives no hint as to his method of estimation.

industrial production'' (in international units) used by him as an interpolator in the preparation of USSR national income estimates.[10] This interpolator is based on only 12 items, and imputed weights are not used. Iron, steel, coal, electric power, and other items one may expect to find in a measure limited to so few components are not included. New products may well be underrepresented even though four of the series – motor trucks, railway cars, aluminum, and lead – refer to items not made in any appreciable amounts until the late 1930's.[11]

Much better known that Clark's measures of Soviet industrial productivity are his computations of Soviet real national product and productivity. In Table A-5, his series on national output, total and per man-hour, are shown for 1913-40; in Table A-18, his national productivity series are shown for USSR and for other countries for 1900-47. We present no statistics here on Soviet official claims. Although there are statistics on real national product in 1926-27 rubles, the Soviet concept is more restricted than the Western counterpart and the estimates are even more questionable than the figures for industrial output.[12] Furthermore, there are no official data on total labor input or agricultural employment for deriving corresponding productivity estimates.

Clark's series on Soviet real national product (in international units) per man-hour shows remarkably little change and no gain during the planning periods over the 1913 level. Only in 1940, before the war setback, did productivity even barely exceed the 1913 figure. During the first plan, there was a decline of one

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[10] This interpolator and its components are shown in *Review of Economic Progress*, February-March 1949, p. 8. The weights apparently refer to gross, not net, unit value. The absolute level of the interpolator is much lower than that of his net output series for large-scale industry, which is shown in Table A-13; but the latter might still have been derived statistically from the former.

[11] Clark acknowledges omission of "certain basic materials and fuels," but feels that inclusion would have so biased the interpolator upward that it would have been useless for its intended purpose (*Review*, February-March 1949, p. 8). In *Review of Economic Statistics*, November 1947, p. 215, he took a stand against inclusion of coal, steel, power, etc. in an index of capital goods production; such inclusion, he felt, would lead to duplication, so he selected a sample of 9 end products of capital goods industries instead. To this writer, it is not clear that the rejected measure must be less satisfactory than the preferred measure.

[12] See P. Studenski and J. Wyler, "National Income Estimates of Soviet Russia — Their Distinguishing Characteristics and Problems," *American Economic Review*, May 1947, pp. 595-610; and D. Seers, "A Note on Current Marxist Definitions of the National Income," *Oxford Economic Papers*, June 1949, pp. 260-68.

fourth; during the second, the loss was virtually recovered, and then there was slow improvement to the eve of World War II. The 1947 estimate is less than three fourths of the 1940 peak.

Clark's national productivity series seems to suggest that USSR derived little benefit from the transfer of resources from agriculture to industry. Indeed, there is little difference (until 1936) between his absolute levels of industrial and total national productivity. But a major factor in explaining this intriguing result is Clark's omission of "disguised unemployment" (including women) in agriculture. Clark has elsewhere asserted that USSR suffers from the pressure of population on land and will not be able to raise its national productivity substantially because of its agricultural poverty.[13] Our Table A-9 shows that crop yields have indeed not improved, except for cotton, under ths Soviet aegis;[14] and Table A-17 shows that yields of food crops are well below the European average and close to Asian levels. Earlier estimates made by Clark, referring to output "per head of working population," show nonagricultural productivity to be higher than agricultural; an increase in the differential through time; and a rise in national productivity of about 10 percent between 1928 and 1937.[15] Incidentally, Clark's use of US prices may also tend to diminish the gap between agricultural and nonagricultural productivity. Thus, if we apply Clark's labor series to Prokopovicz's sector estimates of Soviet income in 1926-27 rubles, we obtain substantially divergent productivity ratios, and the gap in favor of industry increases over time.[16]

Soviet Productivity Prospects

Our earlier discussion suggests that the application of Western measurement methods to adjusted Soviet data would still reveal definite, though uneven and unspectacular, progress in productivity beyond prerevolutionary levels. The modernization and mechanization of plant and equipment and the adaptation of labor to the more or less satisfactory use of the facilities should suffice to explain the accomplishment in industry. Our discussion also suggests, alternatively, that the application of Soviet methods to US data would

[13] See C. Clark, *Economics of 1960*, London, 1942, p. 5, and *Economic News*, November-December 1948.

[14] Apparent increases in grain yields shown in Table A-9 result from a change in reporting from a "barn" to a "biological" or "on-the-root" basis. Jasny, *The Socialized Agriculture of the USSR*, p. 736, believes the grain figures for recent years should be reduced by 25 percent to show "barn" yields.

[15] C. Clark, *A Critique of Russian Statistics*, London, 1939, pp. 49, 68.

[16] Prokopovicz's sector income estimates are shown in *Quarterly Bulletin of Soviet-Russian Economics*, March 1941, p. 116, and in *Russlands Volkswirtschaft unter den Sowjets*, Zurich, 1944, p. 356.

result in measures which rise more steeply than those now available. What can we say about the future of Soviet industrial productivity, on the assumption that "peace" continues?

In the light of accomplishments to date and the peculiarities of the Soviet system, attainment of an industrial productivity level consistent with full communism would seem impossible and attainment of present American rates would also seem difficult. Furthermore, the productivity advantage enjoyed by US may be maintained or even increased if this country continues to develop under the pressures of cold war. While the recent war seriously interrupted Soviet productivity advance, it set the stage for substantial postwar gains in US. Even in the depressed 1930's man-hour productivity in US increased. The 1929 landmark still cited by Soviet writers thus has to be replaced by a contemporary figure some 50-60 percent higher. Nevertheless, the maintenance of peaceful conditions at home and abroad favors a steady rise in Soviet productivity.

Several factors prejudicial to the true economy of labor may be cited in support of our view of a modest future for Soviet productivity. First, industrialization has been taking place under conditions of population surplus, which would normally mean low wages and "wasteful" use of labor, at least in the early stages. Second, the Soviet insistence on a low living standard and on the universal obligation to work has swelled the labor force beyond what it would otherwise have been for the same physical plant and has diluted its average quality. Third, the very shortage of skilled labor in the first instance has aggravated the scarcity through encouragement of hoarding. Fourth, the virtual ban on discharge of personnel and the freezing of workers in their jobs also encourage poor labor utilization and hoarding. Fifth, the limited mechanization of auxiliary processes and office work have led to acceptance as "socially necessary" of a high proportion of plant personnel not engaged in basic production. Sixth, there is no authoritative agency for discovering general labor surpluses and distributing them across ministerial boundaries, though there is some attempt made to direct skilled workers who are underutilized. Seventh, if mechanization of auxiliary factory operations and office work were achieved, then "disguised unemployment" within industry would simply increase more than ever — unless it were decided to recognize leisure or to redistribute labor deliberately and on a grand scale (including the establishment of huge labor-intensive projects). The recognition of leisure would automatically raise productivity through a sharp reduction in employment. Eighth, there is a tendency toward

excessive integration in the absence of material conditions favorable to specialization of enterprises and subcontracting. Ninth, conservative amortization schedules and intensive use of equipment make early replacement necessary but difficult. Tenth, the elaborate administrative apparatus and myriad techniques for inducing economy in the absence of open markets (like decrees, standard accounts, recurrent reports, inspections, production and financial norms, personnel ceilings, socialist competition, propaganda, publicity, rewards, and penalties) can operate haphazardly at best and can usually be frustrated by experienced managers. Finally, there is no evidence that the principle of individual enthusiasm on which the development of communist productivity levels supposedly depends can be released by Soviet institutions, that this principle can lead to effective self-coordinating Stakhanovite "aggregations" of higher and higher order.

Postwar Soviet literature affords ample evidence of the difficulty of effecting substantial labor savings despite the clear awareness of opportunities. Complaints familiar since before the war are as insistent as ever. Large reserves of idle or insufficiently utilized men and machines remain to be tapped. A "barbarous attitude" toward equipment is too often encountered.[17] Unused capacity, both "planned" and "unplanned," is excessive. The organization of labor is still unsatisfactory: "State plans must be Bolshevik. They must be calculated not on average arithmetical norms achieved in production but on average progressive norms, i.e., the level of advanced workers."[18] It is still argued that payment by quantity is "the most potent means of increasing productivity."[19] There are many complaints about poor management, poor scheduling, unsatisfactory interplant relations, excessive integration, etc. Considerable attention is given to the desirability of mechanizing, loading, transportation, and other auxiliary intraplant activities. The elimination of surplus auxiliary and administrative labor is still declared to be the "most important task" of industry.[20] The war apparently aggravated the already startling disproportions in

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[17] *Pravda*, 7 and 16 February 1951.
[18] Quoted from a resolution of the Council of Ministers concerning the 1947 plan in Arakelian, *Industrial Management in the USSR*, p. 154.
[19] Khromov, *Voprosy Ekonomiki*, 1948, No. 3, p. 88.
[20] See, for example, *Izvestiya*, 9 January 1951, and Maslova, *Proizvoditel'nost' Truda*, p. 177.

the ratio of "non-productive" to "productive" workers.[21] So deeply rooted is the tradition of payroll "inflation" and "purposeless use of labor resources" that the false "theory" behind it has to be attacked – "the erroneous and harmful preaching that any use of labor force in the USSR represents productive labor." Labor waste is attributed not only to the "poor organization and planning of production and sales" but also to "the feeble struggle against the remnants of capitalism."[22] The official Party newspaper declaims against similar evils but still insists that "strict economy is the method of socialist management," that "our socialist economy is by nature the most economical and thrifty of all that have ever existed in the history of mankind."[23]

Progress in the campaign to mechanize auxiliary tasks would substantially increase the productivity potential of Soviet industry, but additional measures would be necessary for the full realization of this potential. Like the more limited proposals to combine jobs and to transfer auxiliary and administrative labor to basic production (popular before the war), mechanization would in the first instance aggravate labor redundancy. The swollen surpluses could, of course, be absorbed gradually if the scale of basic production were continually expanded and the required new workers obtained by internal transfer. The productivity rise would, however, be slow.

Early realization of the full potential productivity gain could not be accomplished within the Soviet framework unless, for example, a powerful labor ministry (which USSR has not had for two decades)

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[21] It is reported in *Pravda*, 11 September 1950, that transportation, repair, and other auxiliary workers in many important iron and steel works comprise 58-77 percent of the worker totals. According to Maslova, *Proizvoditel'nost' Truda*, pp. 179-80, there were 114 auxiliary workers per 100 production workers at Magnitogorsk in 1940 and 175 in 1946; at Kuznetsk combine, the number of auxiliary workers per 100 others advanced from 144 to 181. The postwar ratio for transportation equipment production, 128:100, was even exceeded in the coal, chemical, and textile industries. M. Sonin, *Voprosy Balansa Rabochei Sily* (Questions of the Balance of Manpower), 1949, pp. 43-44, notes the need for redistribution of labor and points out that the Donbas mines conformed to the employment ceiling in 1947, but had more than the planned number of workers above ground and fewer than planned below ground. In heavy machine building, according to I. Yunovich, "Voprosy Organizatsii Truda v Mashinostroyenii" (Questions of Organization of Labor in Machine Building), *Planovoye Khozyaistvo*, 1940, No. 6, p. 33, auxiliary labor comprised 37-50 percent of the worker total. *Trud*, 13 February and 22 August 1951, reported idleness of half of the vehicles and operating equipment and even the substitution of manual machine labor in various industries and places.

[22] Arakelian, p. 142.

[23] *Pravda*, 16 February 1951.

were established with authority to ascertain the existence of labor surpluses, to order regional or interministerial redistribution, and to direct combed out workers to new labor-intensive state projects.[24] There are other ways of realizing the full productivity benefits of auxiliary mechanization. One involves a reversal of present Soviet policy – the reduction of hours of work or the size of the labor force without a diminution of the "wage fund." The second, amounting to a detour toward capitalism, would involve the toleration of discharge of superfluous workers and labor mobility in response to market tensions.

But the remedy for redundancy having most appeal to planners would be slow self-liquidation. This alternative would keep the surpluses available for military use as well as for eventual redistribution. Though it would mean restraint of productivity rise, it would permit a substantial productivity gain in the event of war. In contrast, because auxiliary tasks had generally not been mechanized by World War II, productivity tended to decline as many new workers were required to replace smaller experienced auxiliary crews.

Leisure would be an unlikely solution to the problem of redundancy until a much higher level of material production is achieved. If it were allowed prematurely, as opportunities permitted, the whole course of Soviet development might alter in the undesirable direction of higher consumption and bourgeois liberty. Premature leisure would increase the importance of the home and reduce the importance of the factory (and collective farm) as social units – would mean a higher consumption standard, greater opportunity for the divergence of individual and state objectives, and weakening of state control over labor. Once freedom ceases to mean the Hegelian recognition of necessity, the state would have difficulty carrying out its program of resource allocation. The secret weapon of socialist competition would then be harder to operate, and the drive up what Soviet theorists like

[24]The lack of special machinery for obtaining labor of various skills for large state projects is evident at the present time from an article on the Kuibyshev hydroelectric station by E. Kasimovsky, "The Sources of Labor Power in the USSR for the Great Construction Projects," *USSR Information Bulletin*, May 18, 1951, pp. 304-05. Although applications for transfer may be made by engineers and other skilled workers in industry, no reference is made to the use of state initiative for combing out industrial surpluses. An Edict of 20 October 1940 (quoted in *Izvestiya* of the same date) gave to Commissars the power to compel transfer of engineers, technicians, foremen, and office workers from one enterprise to another within the same commissariat, but made no mention of transfers across commissariat boundaries.

to regard as the superhighway to superproductivity would be stalled. On the other hand, the limitation of leisure cannot guarantee the achievement of superproductivity either; but it does fit into the present agenda and propaganda for achieving full communism and the downfall of capitalism.

CHAPTER IV

INTERNATIONAL PRODUCTIVITY COMPARISONS

Industrial Productivity Comparisons

There is a natural desire to express in a single figure the comparative productivity performance of Soviet and American industry. In the late 1930's, Soviet writers made estimates for manufacturing, mining, and electric power, using official data of countries like US, UK, and Germany in conjunction with their own. These estimates, which are rather crude and not subject to independent check, have inspired generalizations by foreign scholars and journalists. Whatever their quality, the foreign evaluations tend to agree that a wide gap separates the two countries. In this writer's opinion, attainment of the productivity level of Western Europe (already claimed by USSR) is possible for a recently industrializing nation within a relatively short period; but catching up with US is a problem of a different order.

According to the Soviet studies of the late 1930's, USSR output per worker in 1937, calculated in 1926-27 rubles, amounted to 2/5 of the US rate (Table A-12). A slightly better showing was claimed in terms of output per man-hour — 44 percent of the US level.[1] In 1928, USSR worker productivity was supposed to be about 1/6, and man-hour productivity 1/5, of the corresponding US averages. By 1932, both ratios had risen to about 1/4. It was claimed that, between 1928 and 1937, USSR caught up with Germany and Britain in output per worker and per man-hour.

Apart from the problems of comparability of the statistics in quality, scope, and actual time reference, it should be recalled that ruble prices, especially quotations in 1926-27 rubles, tend to favor the Soviet output structure and to show Russia off to greater advantage

[1]For output per man-hour comparisons, see S. Kheinman, "Ob Izlishkakh Rabochei Sily i o Proizvoditel'nosti Truda" (Concerning Excess Labor Force and Labor Productivity), *Problemy Ekonomiki*, 1940, Nos. 11-12, p. 106.

than if the computations were made in dollars or sterling.[2] Furthermore, in view of Lenin's estimate that worker productivity in USSR in 1908 was already about 30 percent of the US figure,[3] the advance to 40 percent by 1937, while US was still experiencing depression, is not a remarkable feat. It should also be noted that US and UK have both advanced beyond 1929 levels, which often are taken as the peak achievements in Soviet computations. Finally, the Soviet estimates are not altogether consistent with those of Rostas, who placed British worker productivity at almost half the US average.[4] If USSR had actually overtaken UK by 1937, then a higher accomplishment should presumably have been claimed in comparison with US.

To reduce the ambiguities of aggregation, we have compiled some Soviet estimates of comparative performance in a number of industrial branches as expressed in "natural" units. Of course, differences in quality and in intrabranch distribution of output still affect the estimates. Soviet writers do not necessarily regard Western output as superior in quality. In 1937, according to Table A-12, both consumer goods and producer goods required more labor per unit of output in USSR than in US. For example, Soviet coal productivity per man shift was less than 1/3 the US estimate; coal output per direct worker was a little over 2/5 the American figure.[5]

Productivity in the Soviet automobile industry was estimated at about 1/8 that of US, but it was claimed that this disparity reflects, in part, the greater degree of Soviet integration of vehicle plants and the greater proportion of trucks in the Soviet output assortment.[6] According to Shimkin's figures and data published in the 1937 US Census of Manufactures, the Productivity rate for USSR would be 1/9 or 1/10 the American vehicle output per worker if primary manufacturers alone were included.[7] (This estimate also

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[2] See S. Vugenburg, *Planovoye Khozyaistvo*, 1937, No. 3, pp. 52-54.
[3] Mentioned by B. L. Markus in Akademiya Nauk, *Proizvoditel'nost' Truda*, p. 31.
[4] L. Rostas, *Comparative Productivity in British and American Industry*, Cambridge (Eng.), 1948, p. 27.
[5] If adjustments are made for definitional differences and account is taken of trends in both countries, it appears that Soviet output per underground worker is now about 1/5 the corresponding US rate.
[6] K. Klimenko, "Proizvoditel'nost' Truda v Mashinostroitel'noi i Metalloobrabatyvayushchei Promyshlennosti" (Labor Productivity in USSR Machine building), in Akademiya Nauk, *Proizvoditel'nost' Truda*, p. 200.
[7] For Soviet output and employment figures, see the first of three articles by D. B. Shimkin on "The Automobile Industry that's behind the Iron Curtain", in *Automotive Industries*, February 1, 1948.

makes no allowance for the difference in proportion of trucks to passenger cars.) Soviet iron ore productivity amounted to 1/4 the US rate, and the ratio for machine building was slightly higher. Soviet pig iron output per blast furnace worker amounted to almost 1/2 the US rate; but US performance may have been estimated on a more comprehensive employment base. Other comparative ratios include 2/5 for chemicals, 1/4 for sugar, and 3/8 for cotton cloth. Table A-12 also shows that Soviet statisticians claimed that the British level for coal had been reached, and that the levels for pig iron and motor vehicles were exceeded. It was also claimed that USSR had surpassed the German rates for pig iron, steel, and motor vehicles.

Now, we turn to foreign opinion. Colin Clark's crude estimates (Table A-13) credit USSR with more than 1/4 the US output per man-hour in 1913, but only about 1/6 in the early 1930's, and less than 1/4 in 1936. In terms of output per worker, the 1913 ratio was also about 1/4 and the 1936 ratio was 1/5.

American estimates which circulated during World War II credited USSR with 36 percent of US output per man-hour in 1935-38 – about the same as for Britain, slightly below the German percentage, but above the Japanese (Table A-14). As for wartime man-hour productivity in munitions making, it was estimated that USSR had attained 39 percent of US level in 1944 – or slightly less than the British rate, about 4/5 of the German figure, but more than twice the Japanese average.

In connection with munitions production, it is also noteworthy that output expanded much more sharply in US than in USSR after the outbreak of war and reached a much higher annual level in the course of the conflict (Appendix Table A-15). Between 1940 and 1944, Soviet munitions output trebled, as did Britain's and Germany's. But, in the same interval, US output increased to 20 times its base output. In real terms (1944 US munitions prices), the Soviet output of munitions was over 5 times the US total in 1940; in 1944, however, US produced 2.6 times as much as USSR. Though a rough rate of five rubles to the dollar was used, these estimates reveal the tremendous difference in potentials for armament production and in the extent of conversion which could be made from "normal" output.

Bettelheim is inclined to accept without criticism the Soviet version of the relative standing in the 1930's.[8] An American

[8] C. Bettelheim, *Esquisse d'un tableau economique de l'Europe*, 1948(?), p. 100.

writer, Mandel, also accepts the Soviet version of comparative performance in 1928 and 1937, suggesting that the postwar (1946) ratio of USSR to US output per worker was already 1/2. This estimate, however, ignores the Soviet wartime setback.[9] Shimkin has recently asserted that Soviet man-hour productivity is no more than 1/4 or 1/5 the American rate.[10] Kershaw, noting that it is "extremely difficult to be precise," suggests a range of 1/4 to 3/4 the US non-agricultural worker productivity.[11] An American engineer who spent much time in the USSR chemical industry has the impression that "each department needs 50 to 100 percent more men than a similar American department."[12] A magazine article written in 1945 referred to Soviet productivity as "shockingly low" – much less than 1/2 the American figure.[13] A more recent journalistic estimate placed the Soviet factory worker's output at less than 1/4 the American.[14]

Agricultural Productivity Comparisons

Though yields per unit of crop land in USSR appear in many instances superior to those of US, unit labor costs are invariably higher. But here again, claimed superiority may stem from the difference in statistical concepts.

Jasny's figures suggest that the Soviet unit labor cost for grain is about 4 or 5 times the American average (Table A-16).[15] The Soviet labor cost for cotton is 3.6 times as high, for sugar beets about 6 times, and for potatoes almost 4 times. USSR farmers spend over 6 times as much labor time for the same quantity of milk and 3 to 6 times as much per head of livestock. Jasny states that, despite limited mechanization, prewar Germany had almost 3 times the Soviet net agricultural output per person.[16]

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[9] W. Mandel, *A Guide to the Soviet Union*, New York, 1946, p. 331.
[10] D. E. Shimkin, "What is Russia's Industrial Strength? II", *Automotive Industries*, 10 August 1950, p. 35, and "Russia's Industrial Expansion", *Fortune*, May 1951, p. 107.
[11] J. A. Kershaw, "The Economic War Potential of the USSR", *American Economic Review*, May 1951, p. 479.
[12] L. Ernst, "Inside a Soviet Industry", *Fortune*, October 1949, p. 142.
[13] "The Russians Can Manage", *Fortune*, January 1945, p. 159.
[14] "Background for War", *Time*, November 27, 1950, p. 22.
[15] See also N. Jasny, "Labor Productivity in Agriculture in USSR and US," *Journal of Farm Economics*, May 1945, pp. 420, 424.
[16] Jasny, *The Socialized Agriculture of the USSR*, p. 446.

According to the United Nations Food and Agriculture Organization (an agency attacked by Jasny for indiscriminate acceptance of Soviet data), USSR seems to have higher land productivity than US in the case of wheat, rye, potatoes, cotton, and tobacco, but does relatively poorly in the case of sugar beets (Table A-17). On the other hand, European yields of all foods have been substantially greater than those of USSR (and of US) — more than double in the case of rice, about two thirds higher for other grains, and about one third higher for potatoes.

The advantage of American over Soviet agriculture is complete, in Jasny's view. The American farmer is better educated, has more mechanical power at his disposal, has better equipment, and has greater incentives than the kolkhoznik. The US agricultural work force has a higher proportion of males. Other factors favoring US productivity are greater natural fertility of the soil and more favorable climate.

National Productivity Comparisons

Productivity measures for the entire economy also show USSR lagging far behind. The Clark series, which omits "disguised unemployment" in Soviet agriculture, indicates that man-hour productivity amounted to more than 1/3 of the US figure in 1900, 1/5 in 1928, less than 1/5 in 1940, and less than 1/8 in 1947 (Table A-18). On the eve of the late war, Soviet real national product per man-hour was supposedly less than 1/3 the British average and over 1/2 the French average. In 1947, these countries still enjoyed substantial leads; USSR productivity had declined to less than 1/4 the British level and to 2/5 of the French estimate.

From United Nations estimates of 1949 national income in US prices, it may be determined that output per person in the Soviet labor force was only 17 percent of the corresponding US figure (Table A-19). The Soviet average for 1949 was only 1/3 Britain's, about 2/3 that for France, and 1/2 that for the Netherlands.

Comparative Output and Consumption per Capita

The gap between US and Soviet per capita output, already large before the war, was further increased by the differential impact of the war on the two nations (Tables A-21 and A-24). In 1940, Soviet coal output per capita of population was only 1/4 that of US. The ratio for crude oil was only 1/8; for electric power, 1/5; for iron ore, less than 1/3; for pig iron, 1/4; for steel, 1/5; and for cement, less than 1/5. By 1948, the oil ratio had fallen to 1/12, the power ratio to 1/7, the pig iron ratio to 1/5, and the steel

ratio to 1/6. Indeed, 1948 per capita output in USSR was below the 1900 US rate, except in the case of two products which became important during the past half century – electric power and crude oil.

The postwar position of US with respect to USSR in ferrous metallurgy is particularly good. In 1948, US accounted for 1/2 the world output of iron ore, pig iron and ferroalloys, and crude steel, while the corresponding shares of USSR were in the neighborhood of 1/10 (Table A-22). Soviet output per capita was not only far below that of US but also fell short of the European average (excluding USSR) – 117 kilograms compared to 171 for iron ore, 73 compared to 90 for pig iron, and 85 compared to 120 for steel.

Steel consumption figures for US and USSR also strikingly reveal the different planes of the two economies (Table A-23). In 1948, the apparent total consumption of steel in USSR was less than 1/4 the US total; in 1913, the ratio already was over 1/6. Of course, there were years in between – e.g., during the great depression – in which the Soviet ratio rose sharply, but then came the war. The 1948 ratio of per capita consumption (1/6) was not much higher than for 1913 (1/8). During 1938, the ratio temporarily increased to 1/2, but receded to 1/3 as US industry recovered in the next year. If the US advantage in steel consumption is to be maintained, the expansion of steel output will have to proceed at a greater rate than in the past two decades. Soviet planners have insisted on reaching steel goals; and, as we noted in Chapter II, they will doubtless continue to stress the development of ferrous metallurgy.

USSR textile consumption has also lagged well behind the European and American standards (Table A-25). In 1938, the amount (weight) of cotton, rayon, and wool textiles available per capita in USSR was less than 1/3 the US average; in 1947-48, the ratio was only about 1/8. Although the Soviet figure was close to the world average in 1938, it declined to 2/3 the world average after the war. It corresponded to 3/5 the European output per capita in 1937 and to 2/5 in 1947-48.

The deterioration of Soviet living standards as a result of the war is also indicated by US Bureau of Labor Statistics estimates of the purchasing power, in terms of food, of hourly wages of industrial workers (Table A-20). In 1937, according to these estimates, the Soviet worker could buy about 1/4 as much food as his American counterpart for an hour of work. In 1949-50, however, the Soviet worker could buy only 1/7 as much. Workers in UK, France, Italy,

and Germany have also maintained a higher standard than Soviet workers, partly as a result of American postwar aid. Even in Italy, where postwar national income per capita fell below that of USSR (see next paragraph), the industrial worker could still buy almost 1/3 more than his Soviet counterpart in 1949-50.

On the eve of World War II, USSR apparently had about 1/3 the American per capita national income (Table A-28). Real consumer expenditures per capita amounted to only 1/5 the US standard, while government outlays per capita for defense, investment, and other purposes amounted to 2/3 the US figure. In 1949, according to UN estimates (Table A-28), the gap between US and Soviet national income per capita, computed in dollars, was higher than before the war. The US figure was almost 5 times the Soviet average. The UK figure was 2.5 times and the French figure 1.5 times (but the Italian figure only 4/5) the Soviet average.

Despite the mechanization of agriculture and industry, Soviet society still has a relatively small energy consumption per capita for productive purposes (Table A-26). This fact, of course, helps explain the great differences observed in real per capita national income. In 1937, the Soviet kilowatt-hour equivalent of energy per worker was only 1/5 that of US; in 1948, the ratio was a little higher. UK had 4 times the Soviet power ratio in 1937 and 2.5 times in 1948; for France, the corresponding multiples were 2 and 1.5. In Italy, however, the power ratio was only 3/4 that of USSR in 1937, and it fell to less than 1/2 by 1948.

Comparative Resources

Not only in present output, consumption, and power use per capita but also in strategic resources does US have an advantage over USSR. Although probable Soviet reserves of iron ore exceed the US total, the US potential reserve (iron-content basis) amounts to about 6 times the Soviet potential (Table A-29). Probable iron reserves per capita in US are slightly higher than in USSR (iron-content basis); the potential reserve per capita is 8 times as high. Other published figures -- apparently computed on a different basis -- show US iron ore reserves to be 3 times the Soviet total. According to the same source (Table A-30), US also enjoys an advantage of 3:1 in total petroleum and zinc reserves, a lesser advantage in copper and coal, parity in the case of bauxite, and a tremendous superiority in the case of lead.

When mechanical energy resources are reduced to coal equivalent, it is found that US has about twice the Soviet energy total (Table A-31). When energy resources are related to land area, the US advantage

rises to 5:1. If the world were divided roughly into Western and Soviet blocs (except for a small undistributed residue), the total coal equivalent of the West amounts to almost 3 times that of the Soviet states. When these figures are adjusted for land area, however, the "density" of energy resources of the West falls below that of the Soviet nations. Superior Western transportation could, of course, counteract this disadvantage provided the energy cost of transfer is not excessive.

It seems unlikely that the advent of atomic power will seriously alter the energy balance between US and USSR. There is reason to believe that USSR is in a favorable position to tap the new power source for industrial purposes at an early date.[17] The need is less urgent in US, where conventional power is plentiful and relatively cheap. Nevertheless, circumstances point to the early solution of the problems of commercial adaptation of atomic energy in our own country.

The USSR-US Productivity Differential

The observed differences between the Soviet and American industrial productivity levels of the late 1930's have been adequately discussed in the prewar Soviet literature. More recent Soviet economic publications and the candid commentary in the Soviet press help us to bring our impressions up to date. Although there have been improvements in Soviet conditions, the major reasons given for the prewar differentials still apply. Indeed, the gap between the USSR and US productivity rates has doubtless widened since the prewar years in favor of US.

Many of the improvements in Soviet industry have already been mentioned. For example, mechanization has continued, and there has been some automatization of auxiliary processes. Discipline became stricter just before the War, and turnover has been controlled by severe penalties and job freeze.

Line assembly methods have been extended,[18] and there has been some rationalization of plant organization (e.g., according to the Agarkov method[19]). Norms and piece rates have been

[17] W. Isard, "Some Economic Implications of Atomic Energy," *Quarterly Journal of Economics*, February 1948, pp. 226-27.
[18] Arakelian, pp. 129 ff.
[19] *Ibid.*, pp. 131 ff.

extended to auxiliary workers,[20] and "average-progressive" norms have become more common. Statistical quality control has recently been introduced.[21]

But the same "reserves" for productivity increase which were mentioned in the prewar period are still stressed. Productivity increase toward the American level is seriously limited by insufficient mechanical energy supply per worker; insufficient mechanization of automatization of auxiliary processes; toleration of excess repair, supply, transport, and similar personnel; stoppages due to equipment breakdowns and interruptions of material supply; excessive vertical integration, including production of components and equipment which could be more efficiently made in specialized plants; and other conditions mentioned in the preceding chapter. If the statistical comparison of USSR and US productivity were broadened to include all personnel rather than the "worker" category, then excess office, administrative, technical, and strictly supervisory personnel would also have to be mentioned in our list.

The critical factor in the elevation of Soviet productivity to something like the American level does not seem to be "labor enthusiasm." There is a limitation in the material conditions of the Soviet economy itself. As we noted in Chapter III, there is a large labor surplus in industry which seems likely to expand indefinitely under present Soviet manpower and investment policies and under present institutional arrangements; and early liquidation of this increasing surplus would seem to require drastic steps in the direction of liberty and leisure for Soviet labor or in the very opposite direction of further coercion. A moderate course of improvisation, rationalized as "creative Marxism," probably will be pursued, and the growth of productivity will at best be slow. A protracted period of peace would in any case be beneficial, permitting the further rise of output of the productivity potential.

Since we have already cited Soviet writers on such matters, we shall confine our attention in the remainder of this chapter to the remarks of other observers. From these remarks, it will be evident again that recognition of the problem of labor surplus has not made for early or easy solution. It is one thing to point out that a Soviet electric power station has 9 times as many

[20] See N. A. Voznesenskii, *The Growing Prosperity of the Soviet Union*, New York, 1941, p. 39; and B. L. Markus in Akademiya Nauk, *Proizvoditel'nost' Truda*, p. 19.

[21] Mentioned by the Minister of Machine Tool and Instrument Construction in an article in *Voprosy Ekonomiki*, No. 8, 1950, p. 113.

workers as an American plant of similar size; it is another matter to reduce the excess. It is one thing to note that a Soviet iron and steel plant requires 2.3 times the personnel to produce 2/3 the output of an American plant; it is another to eliminate surplus auxiliary staff and confine the differential to the small gap found in basic production.[22]

The American engineer cited earlier in this chapter considers the excess of personnel in the Soviet chemicals industry to be due to "inferior quality or absence of automatic controllers for flows, pressures, etc., and of photoelectric and electronic equipment; inferior quality or absence of hand and machine repair tools; shortage of spare parts and materials; and inferior organization." The machine shop staff is large because replacement parts of poor quality have to be made on the premises to keep foreign equipment in working order. Small tools and spare parts are not stocked and not readily available. Engineers have to make do with what they can get or devise.[23]

A delegation of British iron and steel workers to USSR in 1945 concluded that 2/3 as many workers would have been required to man a British plant similar to the one they visited. "In spite of all the propaganda drives, the stories of fabulous increases in production and the claims of Stakhanovite records, we believe the output per man is considerably lower than with us."[24] The British delegation also found maintenance standards low, but they considered the work pace easy, management competent, and labor relations good. It is curious that a "reply" made to this "biased" report by an Australian iron worker who visited USSR by invitation concedes the British delegation's estimate that Soviet productivity is below Britain's: "One of the few parts of the British report with which I fully agree is that in Soviet industry the output per man-hour is less than in England. That is a fact recognized by the Soviet people themselves.... Great Britain has centuries of industrial production behind it, generations of craftsmen have built up a heritage of skill.... I think it will be some years yet before the productivity of the Soviet worker reaches the highest world standards."[25]

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[22] These very familiar examples may be found in Kheinman, *loc. cit.*, p. 107.

[23] L. Ernst, *loc. cit.*, p. 172. Kheinman also observes (*loc. cit.*, p. 111), in discussing the difference in the proportion of repair labor in USSR and US iron and steel plants, that the necessity for making components and other items on the premises is a major reason for the Soviet excess.

[24] Iron and Steel Trades Federation, *The Report of Delegation to the Soviet Union, July-August, 1945*, London, December 1945, pp. 8, 33-34.

[25] E. Thornton, *Soviet Workers and their Unions*, London, 1946, pp. 19-20.

Another evaluation of interest is found in Yugow's wartime book on USSR, one of the few stressing labor redundancy in the Soviet economy. He asserts that the labor shortages are "aggravated... by poor organization and inept utilization of available labor"; and that "millions" could be released to other assignments by mechanization of auxiliary processes and other expedients. He properly emphasizes defects in the organization of work as deterrents to high productivity — "lack of coordination in the work of the supply departments and the assembly sections of the plants, inadequate supply of parts or processed materials, ill-timed carrying out of preparatory or repair work, a break in the technical process, failure to deliver raw materials, tools, and drawings on time."[26]

In conclusion, it would seem that USSR cannot hope to approximate at an early date the present American levels of productivity and output per capita. Any attempt to close the gap rapidly would probably result in serious weakening of state control over the population. Furthermore, American productivity and output per capita must also be expected to rise substantially. Such a rise would seem inevitable, despite the uncertainties of an open-ended society in which individuals are given broad latitude for economic decisions.

The great opportunity for USSR to narrow the differential between its own bloc and the West would seem to lie in areas outside the purview of this study. For example, it could attempt to prevent or disrupt Western unity, demoralize or harass weak friendly nations, and subvert strategic underdeveloped areas. Standing Clausewitz on his head, USSR has already effectively redefined "peace" as the extension of war by diplomacy and limited violence. The promised triumph of socialism over capitalism through superior productivity seems remote. But the danger of a Soviet victory despite inferior productivity cannot be ignored.

[26] Yugow, *Russia's Economic Front*, pp. 179, 188.

APPENDIX A

STATISTICAL TABLES

TABLE TITLES

Number

Soviet Productivity: Trends

Soviet Productivity: Regional Variation

Number

SOVIET PRODUCTIVITY: TRENDS

Tables 1 - 9

Table A-1

GROSS OUTPUT PER WORKER AND PER WORKER MAN-HOUR IN USSR LARGE-SCALE INDUSTRY: 1900-1950[a]

(1928 = 100)

Year	Gross output[b] per worker[c]	Gross output[b] per worker man-hour[b]	Year	Gross output[b] per worker[c]	Gross output[b] per worker man-hour[b]
1900	50.0[t]	n.a.	1935	185.9	214.3
1913	74.5[r]	60.4[p]	1936	225.7	254.4
1920	19.4[e]	19.7[o]	1937	245.7	269.4
1921	29.1[n]	30.3	1938	272.8	n.a.
1922	41.1	39.4	1939	318.3	n.a.
1923	51.0	48.3	1940	360.1[j]	332.2[s]
1924	51.7	48.4	1941	212.5(?)[k]	n.a.
1925	68.8	65.8	1942	252.9(?)	n.a.
1926	81.3	78.5	1943	270.6(?)	n.a.
1927	87.2	84.0	1944	328.7(?)	n.a.
1928	100.0[i]	100.0[p]	1945	300.0(?)	n.a.
1929	112.9	113.6[o]	1946	300.0(?)	n.a.
1930	123.9	154.2	1947	339.0(?)	n.a.
1931	133.3	145.6	1948	389.8[l]	n.a.
1932	136.7	150.7[p]	1949	440.5[m]	n.a.
1933	148.6	166.7	1950	493.3[m]	n.a.
1934	164.5	189.1	1951(Plan)	489.7[o]	453.0[s]

[a]These series are intended to summarize as consistently as possible the Russian claims concerning the course of productivity in "large-scale industry," which throughout the entire period covers over 90 percent of the output of enterprises engaged in manufacturing, mining, electric light and power, and (after 1932) lumber, and fisheries. Originally "large-scale" establishments were defined as meeting the minimum employment or power criterion for inclusion in the 1913 census; but, in recent years, the minimum requirement seems to have been relaxed and finally abandoned in some sectors [*Slovar'-Spravochnik po Sotsial'no-Ekonomicheskoi Statistike* (Dictionary-Handbook for Socio-economic Statistics), 1948, p. 108]. Hence, chronological comparability of scope has not actually been maintained. Unfortunately, no official Russian publication presents any presumably continuous series, and none extends over so long a period.

As already noted, additional activities were introduced in 1933, but this change probably had little effect on productivity. Perhaps more important was the change in scale of industrial activity with the inception of the Five-Year Plans. The result was doubtless an influx of existing establishments into the the "large-scale" category, but the distortion in the productivity series is less serious than that introduced into the underlying production and employment measures. During World War II (1941-45), many of the Soviet plants were destroyed or damaged. Apart from the resulting disruption of chronological continuity, there is the more important question of the scope of published references to Soviet wartime productivity changes. As for the post-war period, only percentage changes have been published; these presumably refer to a broader scope than large-scale industry.

In addition to the problems of comparability over the entire period covered by the table, there are other difficulties in the interpretation of the published figures. Various Soviet publications show different percentage changes between the same dates; later publications show deviations from the more widely advertised accomplishments of specific planning periods. There is a dearth of notes on coverage and technical limitations; the same table may even report production and employment statistics which are not recognizably consistent with companion productivity figures. In general, we have preferred later rather than earlier

sources, and those showing longer rather than shorter segments. An attempt has been made, however, to preserve a few of the familiar landmarks even though the consequence may be other distortions.

[a] As Soviet statisticians and foreign analysts have frequently observed, the measure of gross industrial output has grave shortcomings which also render doubtful the meaning of the derived productivity measures. The usual ambiguities of index numbers are unfortunately compounded for a country industrializing within a relatively short period. Apart from such ambiguities, there is the question of upward bias of the weighted aggregates which Jasny, for example, has estimated at about 100 percent by 1948 (*Review of Economics and Statistics*, February 1950, p. 94). This bias is attributed to departures from the 1926-27 weighting scheme (for new products), inclusion of defective goods, quality deterioration, etc. Some of the conceptual difficulties, like weighting of new products, could be resolved by adoption of a later base period. Among other features which make the present index difficult to interpret are its grossness (the inclusion of output of sequentially related activities at prices which recapitulate prior material costs, etc.) and its mixed scope (the inclusion of certain services having no relation to the normal activities of the establishment, and of capital additions originating within the establishment). See *Slovar Spravochnik*, pp 112-14.

[c] Workers (*rabochiye*) seem to comprise about 80 percent of all industrial employment. They correspond roughly to the US category "wage earners" or "production workers." They are distinguished from the following personnel categories: employees (*sluzhashchiye*), service personnel (*mladshii obsluzhevayushchii personal*), engineering-technical workers (*inzhenerno-tekhnicheskiye rabotniki*). Although Soviet productivity indexes include the salable output of apprentices (*ucheniki*), they probably exclude the employment of apprentices. See I. A. Sholomovich, *Analiz Khozyaistvennoi Deyatel'nosti Promyshlennogo Predpriyativa* (Analysis of Economic Activity of the Industrial Enterprise), 1950, pp 50-51.

[d] The nature of the underlying man-hour series is not clear. Absolute figures, generally referring to daily hours per worker, have not been systematically published since the mid-1930's. Published figures purporting to represent actual hours including overtime have a stability more characteristic of scheduled hours and seem too low in view of the publicity given to feats of overtime and voluntary labor.

[e] Extrapolated on basis of Sh. Ya. Turetskii, *Vnutri-Promyshlennoye Nakopleniye v SSSR* (Intra-industrial Accumulation in the USSR), 1948, p. 30: "From 1900 to 1913, labor productivity in industry rose by only 48 percent." Approximately confirmed by N. S. Maslova, *Proizvoditel'nost' Truda v Promyshlennosti SSSR* (Labor Productivity of Industry in USSR), 1949, p. 17: "For 13 years from 1900 to 1913 yearly output per worker in Russian industry rose by 52 percent."

[f] From *SSSR i Kapitalisticheskiye Strany* (USSR and Capitalist Countries), 1939, p. 75. There is a slight inconsistency in 1913 figures shown in this source on the bases 1913 = 100 and 1928 = 100. The former variant was preferred for showing the percentage change to 1928.

[g] B. L. Markus, *Trud v Sotsialisticheskom Obshchestve* (Labor in a Socialist Society), 1939, p. 104, stated that yearly labor productivity in 1920 was 26 percent of the 1913 level.

[h] Maslova, p. 27, for 1921-27, translated to base 1928 = 100.

[i] *Ibid.*, pp. 42-43, for 1928-39, computed from year-to-year link relatives.

[j] Turetskii, p. 30: "From 1938 to 1940, labor productivity in industry rose 32 percent.....Labor productivity in socialist industry rose more than 3.5 times (over 1928)". The author makes a similar remark about the 1928-40 increase in *Izvestiya*, 29 May 1947. This increase, incidentally, is somewhat smaller than would have been derived if the frequently cited results of the Five-Year Plans were accepted as definitive. Thus, the productivity gains of 41, 82, and 32 percent mentioned for the First, Second, and incomplete (1938-40) Third Five-Year Plans [*Bol'shaya Sovetskaya Entsiklopediya: SSSR* (Great Soviet Encyclopedia: USSR), 1948, p 1091] give a cumulative percentage rise of 276 percent over 1928 instead of 260 percent.

[k] The figures shown for 1941-49 were derived by backward extrapolation from 1950. The wartime figures doubtless refer to a smaller universe than the prewar figures (see footnote a). Moreover, they imply a remarkable productivity decline in 1940-41 despite sharp increases in scheduled hours. In the notes that follow, the sources and methods used in computing the figures for 1941-47 will be indicated.

1941: According to Turetskii, *Proizvoditel'nost' Truda i Snizheniye Sebestoimosti v Novoi Pyatiletke* (Labor Productivity and Reduction of

Production Costs in the New Five-Year Plan), 1947, p. 50, "for the four war years, the average yearly growth of labor productivity was 9 percent. By compound decumulation of the 1945 estimate, we obtain 212.5 for 1941. Our estimate is consistent with the Turetskii's statement that productivity advanced 40 percent during the Great Patriotic War.

1942: N. A. Voznesenskii, *Voennaya Ekonomika SSSR v Period Otechestvennoi Voiny* (The War Economy of USSR during the Great Patriotic War), 1940, p. 113, says that productivity in 1942 was 19 percent above 1941.

1943: Voznesenskii, p. 113, says that 1943 productivity was 7 percent above 1942.

1944: Many Soviet writers report a 40 percent rise in productivity in all industry for a two-year period from early 1942 to early 1944. See F. P. Koshelev, *Proizvoditel'nost' Truda v Novoi Pyatiletke*, 1946, p. 23, which refers to April of both years, and E. Lokshin, *Partiya Bol'shevikov v Bor'be za Industrializatsiyu SSSR*, 1946, p. 111, which refers to May of both years. Another writer, Gatovskii (1945), mentions spring of both years; and Khromov (1945) is still vaguer in specifying the two-year period in question. Since it is reasonable to suppose that the choice of parts of two years is deliberate, a smaller increase, 30 percent, has been assumed in computation of the 1944 relative for this table.

1945: Turetskii, *Proizvoditel'nost'*, p. 51, states that achievement of the 1950 productivity goal of 136 percent of the pre-war (1940) level would require a rise of 50 to 70 percent or more above the 1945 levels for the most important industries. Our use of a rounded figure of 300 for 1945 implies an average increase of 63 percent for all industries. This average seems plausible, especially since the less important industries, ignored in Turetskii's statement, doubtless were at lower levels than the others during the war.

Our estimate for 1945 also implies an increase of 19 percent over 1942. However, Turetskii, *Vnutri-Promyshlennoye*, p. 88, and Lokshin, *Industry in USSR* (1948), p. 144, state that productivity in industry as a whole increased over 40 percent between May 1942 and May 1945. The two percentages may still be consistent, for productivity on a monthly basis could have been at or near a peak in May 1945.

A decline in productivity from 1944 to 1945 is indicated. If assumed real, this decline could easily be accounted for by a partial shift away from war production and a decline in hours of work. Turetskii, *Vnutri-Promyshlennoye*, pp. 377-78, recognized that a shift in composition of output (e.g., from mass-produced tanks to locomotives and tractors, which require more labor per 100 constant rubles of gross product) and reduction in overtime could have a depressing effect on productivity as measured by Soviet statisticians.

1946: According to S. Gurevitch and S. Partigul, *Novyi Pod'em Narodno-Khozyaistva SSSR v Poslevoyennoi Pyatiletke* (New Advance of USSR National Economy in Post-War Five-Year Plan), 1949, p. 45, conversion from war production resulted in a decline in output per worker which was halted in the first quarter of 1946 and reversed in the second quarter. On the other hand, no increase for 1946 over 1945 was claimed.

1947: According to *Pravda*, 18 January 1948, an increase of 13 percent over the preceding year was recorded.

[L] According to *Pravda*, 20 January 1949, productivity in 1948 was 15 percent over the 1947 figure and exceeded the pre-war level. From our computations, a rise of 8 percent emerges.

[M] According to *Pravda*, 18 January 1950, the 1949 gain over 1948 was 13 percent.

[N] According to *Pravda*, 17 April 1951, the 1950 gain over 1940 was 37 percent.

[O] The Plan (see *USSR Information Bulletin*, Special Supplement on Fourth Five-Year Plan, 1946, p. 12) calls for a 36 percent gain in productivity over 1940. This gain is usually interpreted as referring to output per worker and sometimes as referring to output per man-hour (see footnote [n]).

[P] *SSSR i Kap. Strany*, 1939, p. 75, for 1913, 1928, and 1932-37.

[9]Estimates for 1920-27 and for 1929-31 were interpolated by means of an output per man-hour series obtained from B. L. Markus, "The Stakhanov Movement and the Increased Productivity of Labor in the USSR," *International Labor Review*, July 1936, p. 7.

[a]*Bol'shaya Sov. Entsik.: SSSR*, 1948, p. 1092, states that the 1940 figure is 5.5 times, and the 1950 figure 7.5 times, the 1913 level. Incidentally, this source implies that the 1950 planned increase of 36 percent above 1940 refers to output per man-hour. But this implication is unreasonable for it would mean the same average hours per worker in 1950 as in 1940.

Table A-2

VARIANT PRODUCTIVITY INDEXES FOR USSR LARGE-SCALE INDUSTRY: 1913 and 1928-1936[A]

	1913	1928	1929	1930	1931
Output per worker (1928 = 100)					
From Appendix Table A-1	74.5	100.0	112.9	123.9	133.3
Avg. of productivity relatives					
Ruble-weighted[B]	...	100.0	113.2	120.7	129.5
Employment-weighted (fixed weights)[C]	...	100.0	115.7	123.2	129.9
Employment-weighted (changing weights)[D]	...	100.0	115.2	123.7	131.5
Output ÷ "industry"[E] series	72.7	100.0	111.9	121.0	120.3
Output ÷ "labor"[E] series	67.3	100.0	115.9	119.6	118.8
Output per man-hour (1928 = 100)					
From Appendix Table A-1	60.4	100.0	113.6	154.2	145.6
Output ÷ man-hours[F]	60.4	100.0	...	...	...
Gross industrial output[G]					
1926-27 rubles (mill.)	10,251.0[H]	15,818.0	19,923.0	25,837.0	32,263.0
Index (1928 = 100)	64.8	100.0	126.0	163.3	204.0
Employment[E]					
Workers and apprentices (thous.) as reported by					
"Industry" section[E]	2,592.0	2,906.0	3,272.0	3,923.0	4,927.0
Index (1928 = 100)	89.2	100.0	112.6	135.0	169.5
"Labor" section[E]	2,591.8	2,691.0	2,923.3	3,674.9	4,619.1
Index (1928 = 100)	96.3	100.0	108.6	136.6	171.6
Man-hours[F,I]					
Workers & apprentices (bill.)	6.4	5.96	...	...	...
Index (1928 = 100)	107.4	100.0	...	...	...
Yearly hours per worker as reported by					
Trud v SSSR, 1936[M]	...	2,052.0	...	...	...
Markus[N]	2,553.0	1,938.0	1,947.0	1,865.0	1,838.0
Varga[O]	...	...	...	...	...
Man-hours ÷ "industry" series[R]	2,469.0	2,051.0	...	...	...
Man-hours ÷ "labor" series[R]	2,469.0	2,215.0	...	...	...

Table A-2 (cont'd.)

	1932	1933	1934	1935	1936
Output per worker (1928 = 100)					
From Appendix Table A-1	136.7	148.6	164.5	185.9	225.7
Avg. of productivity relatives					
Ruble-weighted[a]	132.6	147.8	163.7	188.0	...
Employment-weighted (fixed weights)[c]	134.9	147.5	161.2	180.4	...
Employment-weighted (changing weights)[b]	137.8	152.2	168.1	191.0	...
Output ÷ "industry"[e] series	116.0	128.5	145.6	180.0	198.4
Output ÷ "labor"[e] series	121.8	138.2	157.9	177.9	207.3
Output per man-hour (1928 = 100)					
From Appendix Table A-1	150.7	166.7	189.1	214.3	254.4
Output ÷ man-hours[f]	129.0	...	161.0	182.0	220.0
Gross industrial output[g]					
1926-27 rubles (mill.)	36,878.0	39,934.0	48,200.0	58,800.0	77,785.0[i]
Index (1928 = 100)	233.1	252.5	304.7	371.7	491.7
Employment[k]					
Workers and apprentices (thous.) as reported by					
"Industry" section[k]	5,841.0	5,710.0	6,081.0	6,000.0[j]	7,200.0[j]
Index (1928 = 100)	201.0	196.5	209.3	206.5	247.8
"Labor" section[k]	5,152.8	4,619.1	5,193.5	5,623.0	6,384.0[k]
Index (1928 = 100)	191.5	182.7	193.0	209.0	237.2
Man-hours[f,l]					
Workers & apprentices (bill.)	10.8	...	11.3	12.3	13.3
Index (1928 = 100)	181.2	...	189.6	204.7	223.2
Yearly hours per worker as reported by					
Trud v SSSR, 1936[m]	...	...	1,853.0	...	...
Markus[n]	1,842.0	1,890.0	1,893.0	1,892.0[o]	1,891.0[p]
Varga[o]	...	...	...	2,100.0	...
Man-hours ÷ "industry" series[q]	1,849.0	...	1,858.0	2,033(?)	1,847(?)
Man-hours ÷ "labor" series[q]	2,096.0	...	2,176.0	2,170.0	2,083.0

[A]This table suggests that, despite some indications to the contrary, Soviet industry productivity indexes (like those shown in Appendix Table A-1) have not been uniformly derived as quotients of aggregate output and labor indexes. Indeed, three differently weighted averages of output per worker relatives lie much closer to the Table A-1 index than the measure derived from the large-scale industry output and employment aggregates. Though E. L. Granovskii and B. L. Markus indicate in *Ekonomika Sotsialisticheskoi Promyshlennosti* (Economics of Socialist Industry), 1940, pp. 475-79, that the Soviet index is computed as an employment-weighted average of productivity relatives for a sample, our calculations show that a ruble-weighted measure is closer than an employment-weighted series. Furthermore, it appears from *Slovar Spravochnik po Sotsial'no-Ekonomicheskoi Statistike* (Dictionary Handbook of USSR Statistics), 1944, pp. 218-219, that an employment-weighted measure was not computed officially until 1943. But, despite the obscurity of the detailed picture, it seems unlikely that a quotient of gross output and employment was used before World War II.

On the other hand, Soviet economists also work with quotients of aggregate output and labor input. Thus, it may be verified by reference to the appendix of the State Planning Commission report, *The Second Five-Year Plan*, 1937, that the planned productivity estimates for industry groups (e.g., the Commissariat of Heavy Industry) were based on quotients of group aggregates — quotients which lie outside (below) the range of the indicated individual productivity relatives. (An opportunity to improve the actual showing of the Soviet economy compared to plan — by computing productivity accomplishment as an average of relatives and the planned productivity increase as a quotient of aggregates — was evidently overlooked.) It may also be noted that E. Varga, in *Two Systems*, 1939, p. 66, presents a labor productivity series derived by division of a gross output index by an "industry" (see footnote[c]) employment series.

[b]Computed as chain index of productivity link relatives for 17 industry groups or branches to 1932 and for 18 thereafter. The weights, representing gross output of 1926-27 in rubles of that fiscal year, were obtained from *Statisticheskii Spravochnik za 1928* (Statistical Handbook for 1928), 1929, pp. 355-75. The series, which may sometimes be based on output in fixed rubles and sometimes on output in physical units, were derived from *Trud v SSSR* (Labor in the USSR), 1936, *passim*.

[c]The series described in footnote [b] were weighted by 1 January 1927 data on workers in the corresponding industry groups or branches. These data were obtained from *Trud v SSSR*, 1936, p. 94; they include apprentices (*ucheniki*).

[d]The series described in footnote b were weighted by averages of successive January 1 data for workers in corresponding industry groups or branches. These data were obtained from *Trud v SSSR*, 1936, p. 94.

[e]Two dissimilar sets of figures pertaining to workers and apprentices are presented in the 1936 volume of *Sotsialisticheskoye Stroitel'stvo SSSR* (Socialist Construction in the USSR). One is presented in Section II, p. 3, in the summary tables referring to large-scale industry through 1934; the other is presented in summary tables (xxvi) based on Section V, which deals with labor statistics through 1935. The divergence is explained as follows in a footnote on p. 394 of the English version of the same book:

I. The Industry section includes Producers and Crafts Cooperatives, which are not taken into account in statistics on labor.

II. Data appearing in the labor section comprise industrial enterprises throughout all branches of industry which conform to the general census of large-scale industry; i.e., enterprises employing 16 or more workers and equipped with mechanical motive power — or 30 workers, if not so equipped.

Data under Industry include, in addition to these, also enterprises in various branches of industry for which specialized censuses have been adopted; mainly:

a. All electric generating stations with a capacity exceeding 15 kilowatts.
b. All brick-making enterprises equipped with continuous furnaces.
c. All glass-making enterprises equipped with tank furnaces.
d. All typographical and printing establishments employing more than 15 workers whether or not equipped with mechanical motive power.
e. All leather plants equipped with more than ten tanning vats or three tanning drums.
f. All flour and grain mills equipped with five or more milling units.
g. All enterprises engaged in the production of wines and nonalcoholic beverages and the beer and yeast industry.

III. The Labor Section includes data relating to independent establishments of the manufacturing industry (of plants and factories) functioning as separate and distinct units; whereas the Industry section comprises in addition to such independent industrial enterprises, also auxiliary, building, construction, transport, and other enterprises and organizations.

The latter do not appear in the statistics on labor as separate and distinct units, but are incorporated in the general figures for labor within the given branch of national economy referred to (agriculture, building, construction, transport, etcetera).

For example: Repair shops for agricultural implements attached to State Farms or Machine Tractor Stations are not given as separate

systematic and planned statistical units, but are incorporated in the general data on labor for State Farms or Machine Tractor Stations as a whole; whereas under industry statistics such establishments of State Farms or Machine Tractor Stations are listed as separate enterprises and are thus indicated in the totals for industry.

IV. In the Labor Section large-scale industry is exclusive of the lumber industry and fisheries.

[f]The man-hours series is shown in *SSSR i Kapitalisticheskiye Strany* (The USSR and Capitalist Countries), 1939, p. 128.

[g]This gross industrial output series, for (census) large-scale industry, is slightly lower than the "all" large-scale industry series. For example, "all" large-scale output amounted to 16.86 bill. 1926-27 rubles in 1928, 38.83 in 1932, and 62.14 in 1935. Because of this definitional distinction (which seems to have disappeared from the Soviet literature) the ratio of large-scale to total industrial output derivable from our large-scale series is smaller than that sometimes shown by Soviet writers. For example, I. Krasnobolov, "Faktory Rosta Narodnogo Dokhoda v Sotsialisticheskom Obshchestve" (Factors of the Growth in National Income Socialist Society), *Problemy Ekonomiki*, 1940, No. 9, p. 62, shows large-scale output to have risen to almost 95 percent of the industrial total by 1937 instead of only 88 percent.

[h]*Sots. Stroi. SSSR*, 1936, xxvi.

[i]Based on *SSSR i Kap. Strany*, 1939, p. 127.

[j]*Ibid.*, p. 5. These figures are assumed to be consistent with the "industry" series for earlier years. They are shown in the cited publication together with "industry" figures for 1928 and 1932. It should be noted, however, that the extended series suggests a decline in employment between 1934 and 1935, which is inconsistent with other Soviet data.

[k]*Ibid.*, p. 140. This figure apparently refers to "all" large-scale industry but is included here in the belief that it only slightly exceeds the desired figure.

[l]Data are also available for "all" large-scale industry man-hours of workers and apprentices (*SSSR i Kap. Strany*, p. 128). Combination with the corresponding gross output measure, discussed in footnote [g], would yield an index of output per man-hour which differs significantly from the series shown in the table — e.g., 143 for 1932 compared to 129, and 181 for 1936 compared to 220.

[m]*Trud v SSSR*, 1936, pp. 96, 98. Computed by us from average standard hours per day and average days worked per year.

[n]B. L. Markus, "The Stakhanov Movement and the Increased Productivity of Labor in the USSR", *International Labor Review*, July 1936, p. 7. Computed by us from average hours per day including overtime and average days worked per year.

[o]Provisional, according to Markus.

[p]Plan estimate, according to Markus.

[q]E. Varga, *Two Systems*, p. 163. Apparently refers to standard hours.

[r]The yearly hours per worker series derived from "industry" employment data are more consistent with the figures published in official Soviet sources.

Table A-3

USSR GROSS OUTPUT PER WORKER IN "CONSTANT" (1926-27) RUBLES; BY INDUSTRY BRANCH; FOR SELECTED YEARS: 1928-38[A]

(1913 = 100)

Branch of Industry	1928	1933	1938
Ferrous metallurgy	100[B]	165[C]	368[C]
Coal[C]	116[E]	136	245
Crude oil[F]	...	...	450[G]
Metalworking[C]	159[E]	226	444
Locomotive and freight-car construction[H]	...	...	411[I]
Agricultural machine construction[J]	...	...	504[I]
Electrical machine construction[K]	...	...	533[I]
Boiler turbine construction[L]	. .	...	480 to 500[I]
Chemicals	80[M]	...	311[D]
Woodworking[D]	...	...	213
Textile[C]	152[E]	180	251
Paper[D]	...	...	332
Printing[D]	...	...	275
Leather[D]	...	...	255
Food, excluding fish[C]	175[E]	193	294
Sugar[N,G]	...	...	241

[A] In many instances, indexes shown on other bases had to be translated by us to base 1913. New products incorporated in the various branch measures after 1926-27 were presumably given weights reflecting the relatively inflated price levels of the years of large-scale introduction.
[B] Akademiya Nauk, *Proizvoditel'nost' Truda v Promyshlennosti SSSR* (Labor Productivity in USSR Industry), 1940, p. 51.
[C] *Sotsialisticheskoye Stroitel'stvo SSSR, 1933-1938* (Socialist Construction in USSR, 1933-1938), 1939, p. 38. Variant estimates are shown for 1938 by N. S. Maslova, *Proizvoditel'nost' Truda v Promyshlennosti SSSR* (Labor Productivity in USSR Industry), 1949, pp. 51-52: ferrous metallurgy, 373; coal, 251; machine building, 516 (an upward revision of the figure cited for metalworking?); textile, 236; and food, 352.
[D] Maslova, pp. 51-52.
[E] Refers to 1929.
[F] Ak. Nauk, p. 41.
[G] Refers to 1937.
[H] Ak. Nauk, p. 184.
[I] Refers to 1936.
[J] Ak. Nauk, p. 191.
[K] *Ibid.*, p. 187.
[L] *Ibid.*, p. 189.
[M] *Ibid.*, p. 238.
[N] *Ibid.*, p. 297.

Table A-4

USSR OUTPUT PER WORKER IN NATURAL UNITS FOR SELECTED YEARS: 1913-37[A]

Product	Units[B]	1913	1928	1932	1937
Pig iron[C]	Tons (per blast-furnace worker)	205	...	240	756
Raw steel[D]	Tons (per open-hearth worker)	...	...	140	400
Rolled steel[E] products, finished	Tons (per rolling-mill worker)	...	...	80	163
Iron ore[F]	Tons	199	283.9	353.4	904.6
Coal[G]	Tons	149	174[M]	189[I]	315
Crude oil[J]	Tons (per drilling and extracting worker)	...	...	...	726[K]
Soda ash[L]	Tons	431	215[M]	...	401[K]
Superphosphate[L] (50 to 70 percent of total output)	Tons	296.8	872.3[M]	...	1,932[K]
Sulphuric acid, monohydrate (50 to 70 percent of total output)	Tons	146	145[M]	...	302[K]
Paper[N]	Tons	5.9	...	...	16.5[O]
Cotton thread[P]	Kilograms	...	...	...	1,175[O]
Cotton cloth	Sq. meters	...	4,938[O,M]	...	6,223[P,O]
Shoes[R]	Pairs	490	700	840	1,073
Sugar beets[S]	Centners	135.7	...	...	331.7
Refined sugar[T]	Centners	201.3	...	...	513.1
Cast iron[U] Machine building branch	Tons (per worker of casting department)	10.75	...	...	25.6[O]
Machine tools and mining, power, and food machinery branches[U]	Tons (per worker of casting department)	...	...	...	13.2 to 17.8[O]
Tractor branch[U]	Tons (per worker of casting department)	...	...	...	35.9[O]
Heavy machinery branch[U]	Tons (per worker of casting department)	...	...	...	33.0[O]
Cast steel, Machine building branch[V]	Tons (per worker of casting department)	6 to 10	...	...	13.2[O]
Malleable cast iron[W]	Tons (per worker of casting department)	...	...	...	9.7[O]
Motor vehicles[X]	Number	...	...	...	3.0
Machine tools[Y]	Number	...	...	...	0.64
Wool cloth[Z]	Sq. meters	...	...	...	1,530.0

[A]Blanks signify unavailability of information in standard reference sources. Some additional entries could probably be derived by computation from data published elsewhere. Productivity ratios of the kind shown here are generally not available after 1937-1938. Some entries refer to other years, which are indicated in footnotes.

[B]All tons are metric tons.

[C]I. Kuzminov, *Stakhanovskoye Dvizheniye — Vysshii Etap Sotsialisticheskogo Sorevnovaniye* (The Stakhanov Movement — The Highest Stage of Socialist Competition), 1940, p. 186. Kuzminov says the figures refer to standardized *(peredel'nyi)* units; but an earlier source, *SSSR i Kapitalisticheskiye Strany* (USSR and Capitalist Countries), 1939, p. 78, states that the 1937 figure (and presumably the others shown here) refers to actual *(v nature)* units.

[D]N. S. Maslova, *Proizvoditel'nost' Truda v Promyshlennosti SSSR* (Labor Productivity in USSR Industry), 1949, p. 45.

[E]Akademiya Nauk, *Proizvoditel'nost' Truda v Promyshlennosti SSSR* (Labor Productivity in USSR Industry), 1940, p. 76.

[F]*Ibid.*, p. 92.

[G]Kuzminov, p. 185.

[H]Refers to 1929.

[I]Refers to 1933.

[J]Ak. Nauk, p. 168.

[K]Refers to 1938.

[L]Ak. Nauk, p. 248.

[M]Refers to 1927-28.

[N]*Dvadtsat' Let Sovetskoi Vlasti* (Twenty Years of Soviet Power), 1937, p. 22.

[O]Refers to 1936.

[P]*Tretii Pyatiletnii Plan dlya Razvitiya Narodno Khozyaistva SSSR, 1938-1942 — Proyekt* (Third Five Year Plan for the Development of the National Economy of USSR, 1938-1942 — Preliminary), 1939, p. 107. Ak. Nauk, p. 286 gives 1939 figures of 1,300 kilograms (cotton thread) and 6,875 square meters (cotton cloth).

[Q]*SSSR i Kap. Str.*, p. 78.

[R]A. M. Gornostai-Pol'skii, *Osnovy Ekonomiki Kozhevenno-Obuvnoi Promyshlennosti* (Basic Economics of the Leather Shoe Industry), 1947, p. 206. Refers to large-scale establishments only and consequently overstates the average productivity in the entire shoe industry. According to *Tretii Pyatiletnii Plan*, p. 107, the 1936 output of shoes per worker, presumably for the entire shoe industry, was 828.

[S]Ak. Nauk, pp. 296, 297.

[T]*Ibid.*, p. 298.

[U]*Ibid.*, p. 182

[V]*Ibid.*, p. 183.

[W]*Ibid.*, p. 193

[X]*Ibid.*, p. 201.

[Y]*Ibid.*,,p. 203, citing L. Ya. Berri in *Planovoye Khozyaistvo* (Planned Economy, 1938, No. 9.

[Z]Ya. Yu. Gamburg, "Sovershenstvuyem Tekhniku Sherstyanoi Promyshlennosti" (We are Perfecting Technology in the Woolen Industry), *Tekstil'naya Promyshlennost'* (Textile Industry), 1947, No. 11, p. 36. Refers to output per worker in 1940.

Table A-5

USSR REAL NET PRODUCT AND PRODUCTIVITY: 1913-40[A]

Year	Real net product (bill. i.u.)[B]	Nonagricultural employment (thous.)	Independent craftsmen, etc. (thous.)	Average hours per year	Man-hours worked			Real product per man-hour (i.u.)[B]
					Urban	Rural[C]	Total	
1913	18.1	7.0	5.0	2,554	30.7	78	109	0.166
1921	8.6	...	...	...	...	..	(.93)	.096
1922	9.6	...	...	...	...	..	(.94)	.102
1923	10.9	5.5	3.0	2,039	17.3	78	95	.115
1924	11.9	6.0	3.0	2,052	18.5	80	98	.122
1925	15.0	6.7	3.0	1,990	19.3	82	101	.148
1926	16.8	8.2	3.0	1,961	22.0	86	108	.155
1927	17.7	8.9	3.0	1,943	23.1	89	112	.158
1928	18.3	9.6	3.0	1,941	24.4	92	116	.158
1929	18.3	10.2	3.0	1,948	25.7	95	121	.151
1930	18.3	12.4	3.0	1,867	28.7	94	123	.149
1931	16.9	16.6	2.8	1,838	35.7	94	130	.130
1932	15.8	20.0	2.6	1,841	42.0	94	136	.116
1933	16.2	19.6	2.3	1,891	41.4	94	135	.120
1934	16.2	21.2	2.1	1,893	44.1	94	138	.118
1935	17.4	22.3	2.1	1,893	48.1	94	142	.123
1936	21.2	23.1	2.1	1,893	47.6	94	142	.149
1937	22.4	24.5	2.1	(1,900)	50.7	94	145	.154
1938	23.1	24.5	2.1	(1,900)	50.7	94	145	.159
1939	25.5	(26.2)	2.1	(1,900)	52.8	94	147	.173
1940	27.6	27.9	2.1	(2,050)	61.5	94	155	.178

[A]Colin Clark, *Review of Economic Progress*, February-March 1949, p. 9. A criticism of Clark's general approach, referring specifically to his earlier net product estimates but also applicable at many points to the series presented here, may be found in M. Dobb, *Soviet Economy and the War* (New York, 1943), pp. 37-42, and in Dobb's comments in *Review of Economics and Statistics*, February 1948, pp. 34-35. Apart from the problem of the adequacy of Clark's sample of products, there is a serious understatement in his 1938 output estimate for motor vehicles, an important component of his meager capital goods sample of nine products.

[B]An international unit is defined by Clark as the quantity of goods and services exchangeable for $1 in US in 1925-34.

[C]Clark's rural man-hours refer to males only; they omit "disguised unemployment", according to *Review*, February-March 1949, pp. 9-10.

Table A-6

MAN-HOUR COST OF SELECTED MILITARY ITEMS IN USSR: 1941-1943[a]

Item	Man-hours per unit (thous.) 1941	1943	Percentage decline
Airplane			
IL-4 (attack bomber)	20.0	12.5	37.5
IL-2 (attack bomber)	9.5	5.9	37.9
PE-2 (reconnaissance dive bomber)	25.3	13.2	47.8
Tank			
T-34 (medium)	8.0	3.7	53.8
KV (heavy)	14.6	7.2	50.7
Artillery			
152mm howitzer	4.5	2.4	46.7
76mm field gun (regimental cannon)	1.2	0.8	33.3
Divisional cannon	2.2	0.6(1944)	72.7
Small arms			
Heavy caliber machine gun	0.642	0.329	48.8
Rifle	0.012	0.009	25.0
1,000 rounds of "TT" small arms ammunition	0.013	0.0108	16.9

[a]N. Voznesenskii, *Voennaya Ekonomika SSSR v Period Otechestvennoi Voiny* (The War Economy of the USSR in the Period of the Great Patriotic War), 1948, pp. 114-15.

Table A-7

COMPARATIVE MOVEMENTS OF WAGES AND PRODUCTIVITY IN USSR: 1928-48

Year	Average pay of:				Output per worker in large-scale industry[a]	Ratio of pay index to productivity index	
	Workers and employees in national economy		Workers in large-scale industry				
	Rubles[b]	1928 = 100	Rubles	1928 = 100	1928 = 100	National economy pay index	Large-scale industry pay index
1928	703	100.0	828[c]	100.0	100.0	1.00	1.00
1929	800	113.8	900	108.7	112.9	1.01	.96
1930	936	133.1	996	120.3	123.9	1.07	.97
1931	1,127	160.3	1,152	139.1	133.3	1.20	1.04
1932	1,427	203.0	1,380	166.7	136.7	1.49	1.22
1933	1,566	222.8	1,512	182.6	148.6	1.50	1.23
1934	1,858	264.3	1,764	213.0	164.5	1.61	1.30
1935	2,269	322.8	2,241[d]	270.7	185.9	1.74	1.46
1936	2,856	406.3	2,700	326.1	225.7	1.80	1.45
1937	3,047	433.4	2,820[e]	340.6	245.7	1.76	1.39
1938	3,467	493.2	...	...	272.8	1.81	...
1940	4,100	583.2	...	...	360.1	1.62	...
1946	6,000	853.5	...	...	278.6	3.06	...
1947	7,100	1,001.0	...	...	314.8	3.18	...
1948	7,400	1,052.6	...	...	362.0	2.91	...

[a] From Table 1.
[b] As compiled from various sources and presented in H. Schwartz, *Russia's Soviet Economy*, 1950, p. 460.
[c] For 1928-34, from *Trud v SSSR* (Labor in the USSR), 1936, p. 96. Monthly averages presented in the original have been multiplied by 12 for purposes of the present table.
[d] For 1935-36, from *Narodno Khozyaistvennyi Plan Soyuza SSR na 1937 god* (USSR National Economic Plan for 1937), 1937, p. 145.
[e] *Tretii Pyatiletnii Plan dlya Razvitiya Narodno Khozyaistva SSSR — Proyekt (1938-1942)* [The Third Five Year Plan for the Development of the National Economy of the USSR — Preliminary (1938-1942)], 1939, p. 200.

Table A-8

USSR RAILROAD TRANSPORT PRODUCTIVITY IN SELECTED YEARS: 1913-1950[a]

Year	Freight traffic[b] (mill. ton-km.)	Passenger traffic[c] (mill. pass. km.)	Composite traffic[d] (unweighted total)	Direct employment[e]	Output per direct employee	
					Composite traffic	Index (1913 = 100)
1913	65,696[f]	25,215[m]	90,911	684,056[s]	132.9	100
1932	169,270[f]	83,748[m]	253,018	1,015,800[t]	249.1	187
1937	354,839[g]	90,900[n]	445,739	1,249,800[u]	356.6	268
1938	370,500[h]	91,700[n]	462,000	1,308,200[v]	353.3	266
1940	415,000[i]	98,000[o]	513,000	1,450,000[w]	353.8	266
1941 (Plan)	441,700[j]	91,000[j]	532,700	1,475,000[x]	361.2	272
1945	314,000[k]	66,200[p]	380,200	1,363,200[y]	278.9[aa]	210
1950	601,160[l]	100,000[q]	701,160	1,933,500[y]	362.6[bb]	273
1950 (Plan)	532,000[l]	98,000[n]	630,000	1,649,000[z]	382.1[cc]	288

[a] Basic data for this table were compiled from original Soviet sources by James H. Blackman, for the Operations Research Office of Johns Hopkins University.
[b] Refers to revenue and non-revenue freight carried in commercial trains; excluded non-revenue freight carried in work trains.
[c] Refers to revenue passenger traffic.
[d] According to Soviet statistical convention, one passenger-kilometer is equivalent to one freight ton-kilometer. According to US practice, the latter would receive relatively greater weight.
[e] Figures cited are for railroad workers engaged in direct railroad operations (*po ekspluatatsiyu*).
[f] A. Yakobi, *Zheleznye Dorogi SSSR v Tsifrakh: Statisticheskii Sbornik* (USSR Railroads in Figures: a Statistical Handbook), 1935, pp. 20-21. Excludes freight originating in territories ceded after World War I.
[g] G. Raikher, "Ratsionalizatsiya Zheleznodoroshnikh Perevozok v Tret'yem Pyatiletii" (Rationalization of Railroad Haulage in the Third Five-Year Plan), *Problemy Ekonomiki* (Problems of Economics), 1940, No. 2, p. 89.
[h] *Sotsialisticheskoye Stroitel'stvo SSSR, 1933-1938* (Socialist Construction in USSR, 1933-1938), 1939, p. 105.

[I] G. Raikher, "Gruzovye Perevozki" (Freight Haulage) in B. Levin, *Osnovnye Voprosy Pyatiletnogo Plana Vosstanovleniya i Razvitiya Zheleznodorozhnogo Transporta na 1946-1950* (Basic Questions of the Five-Year Plan for the Reconstruction and Development of Railroad Transport for 1946-1950), p. 111.

[J] *Gosudarstvennyi Plan Razvitiya Narodnogo Khozyaistva SSSR na 1941 god* (State Plan for the Development of the National Economy of USSR for 1941), 1941, p. 450.

[K] A. V. Gorinov, *Proyektirovaniye Zheleznykh Dorog* (The Projection of Railroads), 1948, p. 30.

[L] *Pravda*, 17 April 1951, states that the 1950 freight turnover (traffic?) goal was exceeded by 13 percent.

[M] Yakobi, pp. 36-37. Excludes passenger traffic originating in territories ceded after World War I.

[N] L. Ya. Vol'fson *et al.*, *Ekonomika Transporta* (Economics of Transportation), 1941, p. 365.

[O] I. V. Kochetov, *Statistika Zheleznodorozhnogo Transporta* (Railroad Transport Statistics), 1941, p. 239.

[P] Levin, p. 138.

[Q] In *Izvestiya*, 30 December 1950, the Deputy Minister of Railroads stated that the 1950 passenger traffic goal was exceeded.

[R] S. A. Andreyev, "Passazhirskiye Perevorki" (Passenger Transport), in Levin, p. 138.

[S] Computed from data in *Sots. Stroit. SSSR, 1933-1938*, p. 105.

[T] *Plan*, 1937, No. 3, p. 40.

[U] Vol'fson *et al.*, p. 533.

[V] S. A. Belyunov, "Finansovoye Itogo Raboty Zheleznikh Dorog za 1938" (Financial Results for the Work of Railroads in 1938), *Sotsialisticheskii Transport* (Socialist Transport), 1939, No. 8, p. 7.

[W] Interpolated between 1938 and 1941 figures.

[X] *Gos. Plan, na 1941*, pp. 514 ff.

[Y] Obtained by division of composite traffic by output per direct employee.

[Z] Based on planned 1950 output per railroad worker.

[AA] Derived by extrapolation from 1950 on basis of planned 37 percent increase between 1945 and 1950 in composite traffic (revenue plus non-revenue) per direct employee (Levin, p. 181). Since this productivity ratio includes non-revenue freight carried in work trains (see footnote [s]), it is not strictly comparable with figures shown for other years, and neither is the derived employment figure.

[BB] V. E. Tsaregorodtsev, *SSSR-Velikaya Zheleznodorozhnaya Derzhava* (USSR—a Great Railroad Power), 1951, p. 14, states that labor productivity in 1950 was 2.5 percent above 1940.

[CC] A. Galitskii, *Planirovaniye Sotsialisticheskogo Transporta* (Planning of Socialist Transport), 1950, p. 152, states that the postwar Five Year Plan calls for a 1950 productivity in railroads of 8 percent over 1940.

Table A-9

YIELDS OF MAJOR CROPS IN USSR: 1909-13 to 1950[a]

(Quintals per hectare)

Year	Grain	Potatoes	Sugar beets	Sun-flower seed	Cotton[b]			Flax fiber	Hay		Tobacco	True hemp
					Total	Irri-gated	Unirri-gated		Wild	Rotation		
1909-13	8.0	76.5	155	7.5	11.7	11.7	...	3.6	...	...	...	...
1925	8.3	76.5	165	7.2	9.5	9.5	...	2.8	...	...	...	...
1926	8.2	82.2	118	6.0	8.5	8.5	...	2.4	...	...	9.5[d]	5.0[d]
1927	7.5	75.1	151	7.6	9.6	9.6	...	2.4	...	...	...	...
1928	7.9	81.8	132	5.4	8.5	8.5	0.5	2.4	13.4	29.1	...	...
1929	7.5	80.2	81	4.9	8.2	8.3	1.4	2.2	11.3	27.3	...	...
1930	8.5	86.3	135	4.8	7.0	7.7	0.6	2.5	11.6	22.7	...	...
1931	6.4	72.7	86	5.5	6.0	6.8	2.2	2.3	9.9	22.9	...	...
1932	6.6	70.6	64	4.3	5.9	6.9	1.6	2.0	9.9	18.5	...	3.4[e]
1933	6.9	87.1	74	6.0	6.4	7.6	0.5	2.3	10.6	21.2	...	...
1934	6.9	83.2	96	5.1	6.0	7.3	0.7	2.5	10.2	17.9	...	...
1935	7.4	94.6	132	5.8	8.8	10.3	2.7	2.6	10.6	19.4	...	...
1936	6.2	68.0	134	4.7	11.8	14.7	3.7	2.7	...	...	...	...
1937	9.2	95.6	183	6.4	12.2	14.5	4.5	2.7	...	...	...	3.9
1938	7.4	57.0	141	5.3	12.1	14.9	3.6	2.9	...	...	...	...
1939	8.3	...	177	...	...	...	...	...	...	...	...	...
1940	10.8[c]	...	...	...	13.0	15.1	...	...	...	...	10.0	2.0
1942(Plan)	13.0	125.0	250	9.0	15.1	19.0	6.0	4.6	...	...	...	...
1945	7.8[c]	...	...	...	9.5[f]	...	...	...	...	...	...	3.1
1946	7.0[c]	...	...	...	11.7[f]	...	...	2.18	...	...	...	3.3
1950	12.2[g]	...	...	...	14.4[g]	...	...	2.3(?)[g]	...	...	...	...
1950(Plan)	12.0[c]	...	190	10.0	18.4	19.9	5.0	4.0	...	...	...	...

[a]Except when otherwise indicated, the data in this table are derived from N. Jasny, *The Socialized Agriculture of the USSR: Plans and Performance*, 1949, pp. 572, 585, 615, 616, 791, 795, and Food and Agriculture Organization, *World Fiber Survey*, August 1947, pp. 58, 123, 126, 129. Figures after 1939 may be generally overstated, according to Jasny, since they are computed on a biological, rather than harvested, basis. See Jasny, pp. 725-48.

[b]The figures cited for total, irrigated, and unirrigated cotton (Jasny, p. 795) apparently refer to seed cotton (unginned).

[c]V. Katkoff, "Soviet Grain Production: 1940-1950", *Land Economics*, August 1950, p. 221. Computed by division of total grain production by total area under grain cultivation. From data presented by the author, one can similarly compute grain yields in quintals per hectare for the following years: 1941, 9.6; 1942, 7.5; 1943, 7.5; 1944, 8.8; 1947, 10.3; 1948, 10.8. The cited yields are in biological or "on-the-root" terms and consequently larger than the figures presented by Jasny.

[d]Calculated from biological-yield data presented in *Pravda*, 17 April 1951.

[e]Corresponds, according to Jasny, p. 550, to about 9.6 quintals on barn-yield basis.

[f]The figures cited for total cotton in *World Fiber Survey*, p. 58, apparently refer to lint cotton. They have been converted to seed cotton equivalent on the assumption that one ton of lint cotton = 3.125 tons of seed cotton.

[g]Refers to 1925-28 average.

[h]Refers to 1931-33 average.

SOVIET PRODUCTIVITY: REGIONAL VARIATION

Tables 10 - 11

Table A-10

OUTPUT PER WORKER IN SELECTED USSR FERROUS METALLURGY PLANTS: 1938[A]

Plant	Pig iron (met. tons)	Index (USSR = 100)	Steel ingots (met. tons)	Index (USSR = 100)	Rolled steel (met. tons)	Index (USSR = 100)
USSR (1937)	756	100	400	100	163	100
Magnitogorsk (Stalin)	2,523	338	928	232	480	294
Kuznetsk (Stalin)	1,735	243	813	203	436	267
Kirov	2,024	268	530	133	362	222
Azovstal	1,611	213	610	153	...	...
Krivoi Rog	1,605	212	...	...	...	...
Voikov	1,251	165	...	...	407	250
Voroshilov	1,049	139	311	78	194	119
Dzerzhinskii	707	94	485	121	270	166
Petrovskii	677	90	380	95	266	163
Ordzhonikidze (Yenakievo)	626	83	388	97	219	134
Kramatorsk	580	77	336	84	201	123
Frunze	538	71	345	86	112	69
DZMO	499	66	189	47	...	...
Almazyanskii	420	56	...	...	...	...
Komintern	...	...	432	108	...	...
Sulin	235(1935)	31	213	53	269	165

[4]Akademiya Nauk, *Proizvoditel'nost'Truda v Promyshlennosti SSSR* (Labor Productivity in USSR Industry), 1940, pp. 72, 75, 77. I. P. Bardin and N. P. Bannyi, *Chernaya Metallurgiya v Novoi Pyatiletke* (Ferrous Metallurgy in the New Five Year Plan), 1947, p. 166, present the following 1939 figures on output per worker for selected plants:

Plant	Pig iron	Index (USSR, 1937 = 100)	Steel	Index (USSR, 1937 = 100)
Magnitogorsk	2,840	376	1,168	292
Kuznetsk	2,324	307	1,389	347
Krivoi Rog	1,733	229	...	...
Zaporozhstal	1,579	209	1,074	269
Azovstal	1,642	217	664	166
Kirov	2,102	278	523	131
Dzerzhinskii	785	104	529	132
Petrovskii	799	106	299	75
Kramatorsk	725	96	293	73
Ordzhonikidze (Yenakievo)	707	94	400	100
Frunze	636	84	403	101

R. Livshitz, "O Rayonnykh Razlichiyakh v Proizvoditel'nosti Truda i Sebestoimosti Produktsii Promyshlennosti SSSR" (On Regional Differences in Labor Productivity and Production Cost of USSR Industry), *Voprosy Ekonomiki* (Questions of Economics), No. 6, 1950, p. 36, notes the continuing wide variation in 1948 in output per blast furnace worker in ferrous metallurgy plants (Magnitogorsk = 100):

	1940	1948
Magnitogorsk	100.0	100.0
Kuznetsk	84.9	89.8
Krivoi Rog	56.7	...
Azovstal	46.6	36.8
Kirov	69.9	42.2
Dzerzhinskii	25.3	25.5
Petrovskii	25.1	20.3

Table A-11

REGIONAL OUTPUT PER WORKER IN SELECTED USSR EXTRACTIVE INDUSTRIES: 1937 and 1938[A]

Place	Iron ore, 1937	
	Met. tons per man-year	Index (USSR = 100)
USSR	904.6	100
Magnitogorsk	3,460.0	382
Other Urals	341.0	38
Krivoi Rog	971.0	107
Central European Regions	460.0	51

Place	Coal, 1938	
	Met. tons per mo. per "exploitation" worker	Index (USSR = 100)
USSR	26.25	100
Donetz	24.69	94
Moscow	27.73	106
Kuznetsk	38.40	146
Karaganda	34.28	131

Place	Crude oil and gas, 1938	
	Met. tons per man-year	Index (USSR = 100)
USSR	1,484.0	100
Baku (Azerbaidzhan)	1,675.3	113
East (Second Baku)	1,548.0	104
Maikop	1,157.0	78
Grozmyi	968.0	65
Emba	718.0	48

[A]Akademiya Nauk, *Proizvoditel'nost' Truda v Promyshlennosti SSSR* (Labor Productivity in USSR Industry), 1940, pp. 94, 110, 152.

INTERNATIONAL COMPARISONS: PRODUCTIVITY

Tables 12 - 20

Table A-12

INTERNATIONAL COMPARISONS OF OUTPUT PER WORKER IN NATURAL UNITS FOR 1937 AS SHOWN IN SOVIET SOURCES[a]

Product	Units[b]	USSR	US	Germany	Great Britain	France	USSR as percent of US
Coal	Tons (per "exploitation" worker)	315.0[c]	730.0[d]	420.0[e]	314.0[e]	195.0[f]	43.2
Crude oil[g]	Tons (per man-shift)[b]	1.2	4.1	1.5	1.2	...	29.3
	Tons (per drilling and extracting worker)	726.0[h]	1,088.0	...	...	...	66.7
Iron ore[i]	Tons	904.6	3,500.0	360.0	1,544.0	1,360.0	25.8
Pig iron	Tons (per blast-furnace worker)	756.0[j]	1,620.0[k]	504.0[f]	579.3[k]	...	46.7
Raw steel	Tons (per open-hearth worker)	400.0[l]	...	406.0[f]	...	...	...
Rolled steel products	Tons (per rolling-mill worker)	163.0[m]	...	123.0[n,o]	...	...	...
Castings, Machine Building branch[p,q]	Tons (per worker in casting dept.)	23.0	...	21.1	...	...	...
Steel castings[s]	Tons (per worker in casting dept.)	13.2[t]	28.1[t]	...	...	...	47.0
Malleable cast iron[s]	Tons (per worker in casting dept.)	9.7[t]	22.9[t]	...	...	...	42.4
Cast iron[s]	Tons (per worker in casting dept.)	25.6[t]	45.0[t]	...	...	...	56.9
Motor vehicles	Number	3.0[s]	23.7[s,o]	1¼ to 2[r,u]	...	...	12.7
Machine tools[v]	Number	0.64	2.3[o]	...	...	...	27.8
Soda ash[w]	Tons (per m.h.)	0.09[n]	0.22[x]	...	...	...	41.0
Sulphuric acid[s,o]	Tons (per direct worker)	262.0	...	363.0	...	...	...
	Tons (per direct m.h.)	0.38[o]	0.91	...	...	...	42.0
Cotton cloth[z]	Sq. m. (per worker, excl. those in finishing)	6,875.0[y]	18,100.0	...	9,150.0	...	38.0
Cotton thread[z]	Kg. (per worker, excl. those in finishing)	1,300.0[y]	2,680.0	...	1,770.0	...	48.5
Shoes[b]	Pairs	828.0[o]	1,807.0[o]	980.0[aa]	1,056.0[bb]	...	45.8
Sugar[cc]	Centners	331.7	1,255.0	...	...	...	26.4

[A]The figures shown here for countries other than USSR are unverified Soviet computations or gleanings from foreign census reports and trade journals. The figures refer only to roughly comparable items which may differ significantly in quality and composition. Most of the estimates for the US relate to years other than 1937 (like 1929), but the result may often be a fairer picture of annual output per US worker. On the other hand, the Russians could favor themselves in the computations; and they do avoid output per man-hour comparisons (man-hour productivity in the US commonly rose during the depressed 1930's).

In addition to comparisons in natural units, Soviet researchers have developed international estimates of industry output per worker in "constant" rubles. The currency conversion rates are of doubtful validity; and the composition of output, moreover, varies from country to country. The following figures from E. Vasil'yev and Kh. Koval'zon, *Za dostoinuyu sotsialisticheskogo obshchestva proizvoditel'nosti truda* (For Productivity of Labor Worthy of a Socialist Society), *Planovoye Khozyaistvo* (Planned Economy), No. 3, 1939, p. 154, purport to show USSR output per worker in rubles as a percentage of productivity in US, UK, and Germany:

Year	US	UK	Germany
1928	16.2	55.3	44.6
1932	26.2	70.7	60.5
1937	40.5	103.1	97.0

[B]Unless otherwise specified, tons relate to metric tons and the figures show annual output per worker. The unit descriptions for Russian figures may not be exact for non-Soviet figures.
[C]I. Kuzminov, *Stakhanovskoye Dvizheniye—Vysshii Etap Sotsialisticheskogo Sorevnovaniya* (The Stakhanov Movement—The Highest Stage of Socialist Competition), 1940, p. 185.
[D]*Tretii Pyatiletnyi Plan dlya Razvitiya Narodno Khozyaistva SSSR, 1938-1942—Proyekt* (Third Five-Year Plan for the Development of the National Economy of USSR, 1938-1942—Preliminary), 1939, p. 107.
[E]Akademiya Nauk, *Proizvoditel'nost' Truda v Promyshlennosti SSSR* (Labor Productivity of Industry in USSR), 1940, p. 133.
[F]A. P. Lyapin, *Trud v Strane Sotsializma* (Labor in the Land of Socialism), 1947, p. 35.
[G]Ak. Nauk, p. 168.
[H]Refers to 1938.
[I]Ak. Nauk, p. 99.
[J]Kuzminov, p. 186.
[K]Ak. Nauk, p. 79.
[L]N. S. Maslova, *Proizvoditel'nost' Truda v Promyshlennosti SSSR* (Labor Productivity of Industry in USSR), 1949, p. 45.
[M]Ak. Nauk, p. 76.
[N]*SSSR i Kapitalisticheskiye Strany* (USSR and Capitalist Countries), 1939, p. 78.
[O]Refers to 1929.
[P]Ak. Nauk, p. 197.
[Q]Refers to 1936.
[R]Ak. Nauk, p. 195.
[S]*Ibid.*, p. 200. A lower estimate for USSR is indicated by D. B. Shimkin, "The Automobile Industry that's behind the Iron Curtain", *Automotive Industries*, Feb. 1, 1948, p. 47.
[T]*Ibid.*, p. 201.
[U]Refers to 1930-1935 average.
[V]*Ibid.*, p. 203.
[W]*Ibid.*, p. 253-54.
[X]Probably refers to 1933.
[Y]Refers to 1939.

[z] Ak. Nauk, p. 286. The Soviet source states that the figures cited for US and USSR for cotton cloth are obtained by division of output by the number of workers occupied in this branch (excluding workers in finishing operations). Alternative figures referring to output per worker in spinning and weaving departments, respectively, are cited (pp. 286-87) from an article by P. Khromov in *Problemy Ekonomiki* (Problems of Economics), 1939, No. 7: for US (1929), cotton cloth, 27,670 sq. m., and cotton thread, 7,150 kg.; for USSR (1936), cotton cloth, 10,670 sq. m., and cotton thread, 2,850 kg.

[aa] Refers to 1935.

[ab] Refers to 1930.

[ac] Ak. Nauk, p. 314. On p. 315, the following estimates of tons of sugar beets per processing man-hour are also given: for US (1935), 0.41 and, for the campaign period, 0.66; for USSR (1937), 0.11 and, for the campaign period, 0.25.

Table A-13

REAL NET INCOME PRODUCED PER EMPLOYED PERSON AND PER MAN-HOUR IN MANUFACTURING IN USSR AND US: 1913-1936[a]

(International units)[b]

Year	USSR Output per		US Output per	
	Employed Person	Man-Hour	Employed Person	Man-Hour
1913	317	0.124	1,345	0.465
1921	43	.021	1,432	.601
1922	98	.048	1,672	.651
1923	156	.076	1,643	.640
1924	196	.095	1,632	.641
1925	238	.120	1,726	.686
1926	257	.131	1,774	.708
1927	303	.156	1,771	.711
1928	340	.176	1,783	.715
1929	357	.183	1,918	.763
1930	299	.160	1,737	.765
1931	230	.125	1,630	.774
1932	200	.109	1,246	.686
1933	232	.123	1,349	.711
1934	265	.140	1,427	.789
1935	282	.149	1,741	.899
1936	408	.215	2,000	.975

[a] As estimated by Colin Clark in *Review of Economic Progress*, September 1949, p. 1, for USSR and August, 1949, p. 5, for US. The underlying employment figures for both countries include the equivalent of "wage earners" and "salaried workers." The USSR output figures refer to large-scale industry.

[b] An international unit is defined by Clark as the quantity of goods and services exchangeable for $1 in US in 1925-34.

Table A-14

PREWAR AND WARTIME OUTPUT PER MAN-HOUR OF BELLIGERENTS[a]

(US = 100)

Country	Prewar (1935-38) Manufacturing	Wartime (1944) Munitions Production
US	100	100
Canada	71	57
Great Britain	36	41
USSR	36	39
Germany	41	48
Japan	25	17

[a]R. W. Goldsmith, "The Power of Victory: Munitions Output in World War II," *Military Affairs*, Spring, 1946, p. 79. The prewar figures were originally disseminated in War Production Board Release TP-178. Goldsmith uses a 1:5 dollar-ruble ratio in converting USSR wartime production.

Table A-15

COMBAT MUNITIONS PRODUCTION OF MAJOR BELLIGERENTS: 1938-1944[a]

Country	1938	1939	1940	1941	1942	1943	1944
				(1944 = 100)			
US	2	2	5	11	47	91	100
Canada	0	2	6	27	73	102	100
Great Britain	4	10	34	59	83	100	100
USSR	12	20	30	53	71	87	100
Germany	16	20	35	35	51	80	100
Japan	8	10	16	32	49	72	100
			(Bill. doll., US 1944 munitions prices)				
US	1.5[b]	1.5	4.5	20	38	42	
Canada	0[b]	0	0.5	1	1.5	1.5	
Great Britain	2.5[b]	3.5	6.5	9	11	11	
USSR	8[b]	5	8.5	11.5	14	16	
Germany	12[b]	6	6	8.5	13.5	17	
Japan	2[b]	1	2	3	4.5	6	

[a]R. W. Goldsmith, "The Power of Victory: Munitions Output in World War II," *Military Affairs*, Spring, 1946, pp. 72, 75. Excludes merchant vessels, motor vehicles, miscellaneous military stores. All figures are approximate. The USSR index is based on published figures for total defense expenditures and scattered information on non-munitions expenditures. A "slight downward trend in munitions prices" was assumed (p. 72). It was also assumed, for purposes of conversion to US dollars, that the armament ruble was worth 20 cents.
[b]Refers to 1935-39 average.

Table A-16

UNIT LABOR INPUT FOR SPECIFIED CROPS AND LIVESTOCK ON SELECTED USSR COLLECTIVE FARMS AND ON AVERAGE US FARMS[A]

(Man-days per acre or per head of livestock per year, except as noted)

Item	USSR	US	USSR as percent of US
Crops			
Fall-sown small grains	4.74	...	...
"Early" spring grains (wheat, barley, oats)	3.95	...	...
Millet	4.96	...	...
Wheat	...	0.87[B]	...
Rye	...	0.99[B]	...
Barley	...	0.96[B]	...
Oats	...	0.90[B]	...
Corn	6.26	...	...
Harvested from standing stalks	...	2.42[C]	...
Cut, shocked, and husked	...	3.63[C]	...
Cotton	33.10	9.10	364
Sugar beets	53.38	9.20	580
Potatoes, white	26.74	6.80	393
Livestock			
Cows	46.00	14.00	329
Milk, per 100 pounds	1.89	.30	630
Heifers and young bullocks	24.00	...	...
Calves	23.00	...	...
Beef cows	...	2.30	...
Adult hogs	22.00	...	...
Shoats	17.00	...	...
Piglets	11.10	...	...
Hogs, per 100 pounds liveweight	...	0.39	...
Sheep	4.00	0 62[D]	645
Lambs	3.00	...	...

[A]Transcribed (except for last column) from N. Jasny, *The Socialized Agriculture of the USSR: Plans and Performance*, 1949, p. 443. The table was also used in an earlier study by the same author, "Labor Productivity in Agriculture in USSR and USA", *Journal of Farm Economics*, May 1945, pp. 421-25. The figures for USSR are from *Proizvoditel'nost' i Ispol'zovaniye Truda v Kolkhozakh vo Vtoroi Pyatiletke* (Productivity and Utilization of Labor in Collective Farms in the Second Five Year Plan), 1939. The figures for US are from M. R. Cooper *et al.*, *Labor Requirements for Crops and Livestock* (US Department of Agriculture, 1943); this source gives figures in hours, which were converted to a day basis on the assumption of a 10-hour day.

[B]Excludes threshing labor supplied by owners of stationary threshing machines.

[C]Assumes same pre-harvest labor for both methods of harvesting.

[D]Includes care of lambs until weaning time.

Table A-17

YIELDS OF MAJOR CROPS IN USSR AND ELSEWHERE: 1934-38 and 1948[a]

(Quintals per hectare)

Crop	World	Europe	Asia	US	USSR
Wheat	10.1	14.2	9.6	8.7	9.3
	11.1	13.6	9.7	12.1	...
Rye	13.1	14.2	9.6	7.7	9.9
	12.4	13.4	10.8	7.9	...
Barley	11.6	15.3	11.1	11.6	9.6
	11.9	15.1	10.8	14.2	...
Oats	11.9	15.8	8.8	9.9	10.0
	13.3	15.0	8.7	13.3	...
Maize	13.0	14.7	11.5	14.0	10.7
	18.0	14.5	11.6	26.8	...
Rice	17.7	51.8	17.7	24.7	21.4
	16.8	39.6	16.8	23.5	...
Potatoes	117.0	134.0	71.0	78.0	86.0
	127.0	141.0	76.0	143.0	...
Sugar beets	220.0	275.0	148.0	252.0	140.0
	130.0	249.0	97.0	304.0	...
Cotton (lint)	1.9	2.2	1.4	2.4	3.2
	2.4	1.6	1.4	3.5	3.75[b]
Cottonseed	3.9	4.7	3.0	4.3	6.4
	...	3.1	2.9	5.8	...
Linseed	4.5	5.2	3.2	4.2	3.2
	...	6.0	3.1	7.0	...
Sunflower	6.1	6.4	...	8.8[c]	5.9[c]
	...	6.5	...	...	...
Tobacco	9.6[d]	11.2	9.7	9.7	11.3
	10.4	9.7	9.7	14.3	...
Flax fiber	3.0	5.1	2.4	3.0[f]	2.7
	...	4.1	1.1	3.8	2.18[b]

[a]Derived from Food and Agriculture Organization, *Yearbook of Food and Agricultural Statistics: 1949*, I, pp. 31, 32, 35, 37, 39, 42, 48, 53, 57, 75, 77, 83, 103, 106, 108; and from *World Fiber Survey*, August 1947, pp. 118, 123. Unless otherwise stated, the first row of figures for each crop refers to the period 1934-38, and the second row refers to the single year 1948. Jasny has raised questions concerning the validity of Soviet agriculture yield and output figures which are reported on a biological rather than harvested basis; he doubts the statistics reported to Food and Agriculture Organization and other international bodies. See *The Socialized Agriculture of the USSR: Plans and Performance*, 1949, pp. 725-48, and "International Organizations and Soviet Statistics," *Journal of the American Statistical Association*, March 1950, pp. 48-64.

[b]Refers to 1946.

[c]Refers to 1938.

[d]Average of three years within period 1934-38.

[e]Excludes USSR.

[f]Refers to 1936-39.

Table A-18

REAL NATIONAL PRODUCT PER MAN-HOUR IN USSR AND OTHER COUNTRIES: 1900-1947[a]

(International units)[b]

Year	USSR	US	Great Britain	France
1900	0.15	0.42	0.30	0.19
1913	.17	.55	.37	...
1921	.10	.67	...	.26
1928	.16	.80	.49	.34
1929	.15	.78	.52	.32
1930	.15	.77	.51	.31
1931	.13	.76	.51	.32
1932	.12	.75	.51	.32
1933	.12	.72	.51	.32
1934	.12	.80	.52	.30
1935	.12	.83	.56	.30
1936	.15	.86	.55	.31
1937	.15	.92	.55	.37
1938	.16	1.01	.57	.36
1939	.17	1.00	.58	.38
1940	.18	1.00	.57	.34
1947	.14	1.19	.59	.35

[a] As estimated by Colin Clark in *Review of Economic Progress*, April 1949, p. 2. The series for USSR shows not only remarkably little change through time but differs surprisingly little in level from the Clark series for net productivity in large-scale industry. Other unofficial net product series —like those of S. N. Prokopovich in *Quarterly Bulletin of Soviet Russian Economics*, March 1941, p. 116, or *Russlands Volkswirtschaft unter den Sowjets*, Zurich, 1944, p. 356, expressed in 1926-27 prices — would show a productivity differential favoring industry in 1913 (Clark does not) and widening thereafter.

[b] An international unit is defined by Clark as the quantity of goods and services exchangeable for $1 in US in 1925-34.

Table A-19

TOTAL AND PER LABOR FORCE PARTICIPANT NATIONAL INCOME IN SELECTED COUNTRIES: 1949

(1949 US prices)

Income		Per labor force participant		Estimated labor force (thous.)[B]
Country	Total (mill. doll.)[A]	Dollars	Index US = 100	
US	216,831	3,479	100	62,327
USSR	59,500	598	17	99,500[C]
Canada	11,797	2,284	66	5,164
New Zealand	1,610 (1949/50)	2,144	62	751
Sweden	5,426	1,740	50	3,118
UK	38,922	1,678	48	23,194
Australia	5,374 (1948/49)	1,610	46	3,337
Netherlands	5,000	1,250	36	3,999
France	19,857	914	26	21,424
Czechoslovakia	4,625	771	22	5,996
Germany (Western zone)	15,300	748	22	20,462
Japan	8,260	231	7	35,686

[A]United Nations Statistical Office, *National and Per Capita Incomes of Seventy Countries in 1949 Expressed in United States Dollars*, New York, October 1950. Figures refer to national income at factor cost adjusted insofar as possible for international comparability.

[B]Derived from material contained in United Nations Statistical Office, *Statistical Yearbook: 1949-50*, New York, 1950, and various official sources for US, Canada, and Great Britain.

[C]Estimated as roughly one-half of 1949 USSR population.

Table A-20

PREWAR AND POSTWAR RELATIVE PURCHASING POWER OF HOURLY EARNINGS IN TERMS OF FOOD IN SELECTED COUNTRIES[a]

(US = 100)

Country	Date of reference		Relative purchasing power: US weights	Relative purchasing power: Foreign weights	Relative purchasing power: Geometric mean	Hourly earnings[b]	Food prices[b]
USSR	July	1936	22	26	24	48	204
	April	1949	12	14	13	40	306
	April	1950	13	16	14	51	364
UK	October	1938	47	46	46	41	88
	May	1949	66	74	71	39	55
	April	1950	59	65	62	27	43
Germany[c]	Average	1938	48	54	51	51	101
	March	1949	35	30	32	26	79
	March	1950	38	37	38	21	55
France	Average	1938	71	65	68	49	72
	April	1949	37	37	37	22	60
	April	1950	32	29	31	21	70
Italy	Average	1938	26	27	26	20	78
	March	1949	24	25	24	20	84
	April	1950	24	24	24	19	79
Czechoslovakia[d]	December	1937	36	32	34	23	68
	December	1948	52	44	48	27	57
			16	13	14		190
	December	1949	49	43	46	33	72
			25	21	23		144
Hungary	April	1937	28	30	29	15	51
	January	1949	35	31	33	20	61
	May	1950	29	25	27	24	89

[a] I. B. Kravis, "Work Time Required to Buy Food, 1937-50," *Monthly Labor Review*, February 1951, p. 147-48. The earnings are hourly averages for industrial workers; the food prices for each country refer to more or less comparable items consumed by US and foreign workers.

[b] Converted to US prices on basis of official rates prevailing at indicated dates, except for France (free rates for 1949 and 1950).

[c] March 1949 figures refer to Bizone Germany, and March 1950 figures refer to West Germany.

[d] For 1937, the calculations were made on the basis of the minimum hourly wage rate in Prague. The first row of figures for 1948 is based on official food prices, and the second row on black-market prices. The first row for 1949 is based on ration prices, and the second row on free-market prices.

INTERNATIONAL COMPARISONS:

PER CAPITA OUTPUT, CONSUMPTION, AND REAL NATIONAL INCOME

Tables 21 - 28

Table A-21

OUTPUT PER CAPITA OF SELECTED PRODUCTS IN USSR: 1940-1948[A]

Product	Units	1940	1947	1948
Coal (incl. lignite)	lbs.	1,918	2,106	2,368
Crude oil	bbls.	1.18	.97	1.09
Electric power	kwh.	253	281	321
Iron ore	lbs.	344	279	331
Pig iron	lbs.	172	132	158
Raw steel	lbs.	212	155	196
Rolled steel	lbs.	152	112	141
Sawn lumber	cu. ft.	6.6	2.5	3.9
Paper	lbs.	9.4	7.7	9.1
Cement	lbs.	67	56	76
Window glass	sq. ft.	2.5	2.4	2.9
Grains and legumes (barn crop)	lbs.	1,098	859	882
Sugar	lbs.	27.1	15.8	18.1
Cotton (ginned)	lbs.	7.5	6.0	6.8
Cotton cloth	sq. ft.	226	146	178
Wool cloth	sq. ft.	6.8	5.5	6.9
Linen cloth	sq. ft.	15.2	...	11.0
Silk cloth	sq. ft.	3.7	3.7	4.9
Shoes (leather only)	pairs	1.0	...	0.7

[A]Computed from output estimates derived from various Soviet publications and from population estimates of Warren W. Eason, The Johns Hopkins University Operations Research Office.

Table A-22

TOTAL AND PER CAPITA WORLD PRODUCTION OF IRON ORE, PIG IRON, AND STEEL: 1948[a]

Country	Iron ore		Pig iron and ferroalloys		Crude steel		Per capita (kg.)		
	Mill. met. tons	Percent of world	Mill. met. tons	Percent of world	Mill. met. tons	Percent of world	Iron ore	Pig iron	Steel
World	210.00	100.00	113.00	100.00	152.00	100.00	89	48	65
US	102.97	49.0	56.00	49.6	80.41	52.9	602	382	549
USSR	22.50	10.7	14.00	12.4	16.50	10.9	117	73	85
North America (excl. Latin America	105.47	50.2	58.15	51.5	83.31	54.8	660	364	521
Latin America	3.54	1.7	0.84	0.7	0.96	0.6	23	5	6
Europe (excl. USSR)	66.32	31.6	34.91	31.0	46.36	30.5	171	90	120
Asia (excl. USSR)	4.15	2.0	2.38	2.1	3.09	2.0	3	2	2
Africa	5.59	2.7	0.64	0.6	0.60	0.4	29	3	3
Oceania	2.20	1.0	1.26	1.1	1.19	0.8	285	163	154

[a]U. N. Department of Economic Affairs, *World Iron Ore Resources and Their Utilization*, Lake Success, 1950, p. 69.

Table A-23

TOTAL AND PER CAPITA STEEL CONSUMPTION OF US AND USSR: 1913-1948[A]

Year	US		USSR		USSR as percent of US	
	Apparent consumption[B] (thous. met. tons)	Consumption per capita (kg.)	Apparent consumption[B] (thous. met. tons)	Consumption per capita (kg.)	Apparent consumption[B]	Consumption per capita
1913	28,000	291	5,096	38.0	18.2	13.1
1925	43,300	374	2,189	15.5	5.1	4.1
1926	46,100	391	3,234	22.3	7.0	5.7
1927	43,200	360	3,727	25.0	8.6	6.9
1928	49,200	406	4,446	28.9	9.0	7.1
1929	53,100	435	5,377	34.0	10.1	7.8
1930	38,400	313	6,649	41.6	17.3	13.3
1931	25,100	203	7,402	45.4	29.5	22.4
1932	13,600	108	7,121	42.9	52.4	39.7
1933	22,700	181	7,365	43.6	32.4	24.1
1934	25,200	199	10,144	59.3	40.3	29.8
1935	33,400	263	12,843	75.1	38.5	28.6
1936	46,500	363	16,620	97.2	35.7	26.8
1937	47,900	371	17,992	104.6	37.6	28.2
1938	26,600	205	18,093	105.2	68.0	51.3
1939	44,700	342	18,836	109.5	42.1	32.0
1945	66,900	474	11,200	58.6	16.7	12.4
1946	54,700	385	12,400	64.2	22.7	16.7
1947	68,600	477	13,500	70.8	20.1	14.8
1948	75,200	518	17,000	86.3	22.6	16.7

[A]United Nations Dept. of Economic Affairs, *European Steel Trends in the Setting of the World Market*, Geneva, 1949, p. 136.
[B]Crude steel equivalent of crude-steel production plus imports of steel products less exports of steel products.

Table A-24

OUTPUT PER CAPITA OF SELECTED COMMODITIES IN US AND USSR: 1940 and 1948[A]

Commodity	Units	USSR		US			USSR as percent of US		
		1940	1948	1900	1940	1948	1940	1948	1948 USSR/1900 US
Coal	lbs.	1,918	2,368	5,875	7,764	8,860	25	27	40
Crude oil	bbls.	1.18	1.09	0.84	10.3	13.7	11	8	130
Electric power	kwh.	253	321	79	1,363	2,292	19	14	405
Iron ore	lbs.	344	331	811	1,250	1,544	28	21	41
Pig iron	lbs.	172	158	406	719	840	24	19	39
Raw steel	lbs.	212	196	269	1,014	1,204	21	16	73
Rolled steel	lbs.	152	141	249	736	942	21	15	57
Cement	lbs.	67	76	86	379	534	18	14	88

[A]Soviet output figures culled from various publications; US figures from *Annual Supplement of the Survey of Current Business: 1949*, *Statistical Abstract of the United States: 1949*, and *Historical Statistics of the United States, 1789-1945*.

Table A-25

PER CAPITA AVAILABILITY OF COTTON, RAYON AND WOOL TEXTILES IN SELECTED COUNTRIES: 1938-1948[A]

(Kilograms)

Country	1938	Index US = 100	1947	Index US = 100	1948	Index US = 100
World	3.9	32	3.5	19	3.7	20
US	12.1	100	18.8	100	18.9	100
USSR	3.7	31	2.3	12	2.5	13
North America	12.0	99	18.4	98	18.3	97
Latin America	3.7	31	3.6	19	3.6	19
Europe	6.3	52	5.5	29	5.8	31
Belgium	9.3	77	10.9	58	11.3	60
France	7.0	58	8.1	43	9.0	48
Germany	8.2	68	2.5	13	3.7	20
Italy	4.2	35	5.7	30	4.4	23
Netherlands	8.2	68	7.6	40	8.7	46
Sweden	9.0	74	12.5	66	11.5	61
UK	12.4	102	10.3	55	10.9	58
Bulgaria	4.5	37	2.6	14	2.9	15
Czechoslovakia	5.1	42	6.3	34	6.6	35
Finland	6.9	57	4.8	26	4.2	22
Hungary	3.8	31	2.1	11	2.9	15
Poland	2.8	23	3.3	18	4.0	21
Rumania	2.6	21	1.7	9	2.0	11
Yugoslavia	3.3	27	2.6	14	2.4	13
Asia	2.3	19	1.5	8	1.6	8
China	1.7	14	1.4	7	1.4	7
India-Pakistan	2.2	18	1.9	10	2.1	11
Japan	9.1	75	1.6	9	1.5	8
Africa	1.5	12	1.3	7	1.3	7
Oceania	6.6	55	6.6	35	7.7	41

[A]Food and Agriculture Organization, *The State of Food and Agriculture: A Survey of World Conditions and Prospects*, 1949, p. 100.

Table A-26

PER CAPITA CONSUMPTION OF ENERGY FOR PRODUCTIVE PURPOSES IN SELECTED COUNTRIES: 1937 and 1948

(Kilowatt-hour electricity equivalent)[A]

Country	1937	Index US = 100	1948	Index US = 100
US	7,072	100	10,662	100
USSR	1,385	20	2,359	22
UK	5,523	78	5,890	55
Canada	5,351	76	8,717	82
Belgium (and Luxembourg)	4,962	70	5,616	53
Germany	3,448	49	2,403[B]	23
Sweden	3,442	49	4,112	39
Australia	2,882	41	3,943	37
France	2,809	40	3,217	30
New Zealand	2,142	30	4,239	40
Argentina	1,447	20	1,696	16
Japan	1,277	18	915	9
Italy	1,097	16	1,068	10
Mexico	678	10	1,076	10
Brazil	506	7	517	5
Czechoslovakia	2,495	35	3,679	35
Poland[C]	995	14	2,816	26
Yugoslavia	468	7	476	4

[A]Based on US Department of State, *Energy Resources of the World*, June 1949, and United Nations Statistical Office, *Monthly Bulletin of Statistics*.
[B]Mid-1949 population estimate utilized for per capita computation.
[C]1937 figure includes Danzig; 1948 figure conforms to post-war boundaries.

Table A-27

TOTAL AND PER CAPITA NET NATIONAL PRODUCT IN USSR (1940) and US (1941-1942)[a]

(1940 US market prices)

	Total (bill. doll.)			Per capita of population (doll.)		
	USSR: 1940	US		USSR: 1940	US	
		1941	1942		1941	1942
Net product	$41.5	$103.3	$120.6	$258	$776	$887
Consumer expenditures[b,c]	19.9	73.8	71.7	114	555	532
Government outlays and net investment	25.2	29.5	48.9	144	221	355
War expenditures	11.3	10.1	39.6	65	75	293
Other current expenditures	8.2	10.6	9.3	47	80	62
Net investment (non-war)	5.7	8.8	...	32	66	...

[a] J. Wyler, "The National Income of Soviet Russia," *Social Research*, December 1946, p. 517. Wyler also shows (p. 512) USSR per capita consumer expenditures of $108 for 1928, $102 for 1934, and $133 for 1937; and government outlays and net investment per capita of $28, $62, and $96 for the same years.

[b] Includes imputed income of farmers and social-welfare expenditures of enterprises and trade unions.

[c] Wyler's estimates of per capita consumer expenditures, $555 for US (1941) and $144 for USSR (1941), are roughly consistent with Baran's estimates of per capita "current civilian outlay" for 1940, $600 for US and $153 for USSR, shown in "National Income and Product of the USSR in 1940", *Review of Economic Statistics*, November 1947, p. 231.

Table A-28

TOTAL AND PER CAPITA NATIONAL INCOME IN SELECTED COUNTRIES: 1949[a]

(1949 US prices)[b]

Country	Total Income (mill. doll.)	Per Capita (doll.)	Index US = 100
US	216,831	1,453	100
USSR	59,500	308[c]	21
Canada	11,797	870	60
UK	38,922	773	53
France	19,857	482	33
Germany (Western zone)	15,300	320	22
Italy	10,800	235	16
Japan	8,260	100	7
Czechoslovakia	4,625	371	26
Poland	7,344	300	21
Hungary	2,315	269	19
China	12,384	27	2
Yugoslavia	2,343	146	10
India	19,572	57	4
Soviet bloc[d]	86,168	123	8
Non-Soviet world	426,933	309	21
Western bloc[e]	332,016	826	57

[a]United Nations Statistical Office, *National and Per Capita Incomes of Seventy Countries in 1949 Expressed in United States Dollars*, New York, October 1950. Figures refer to national income at factor cost adjusted insofar as possible for international comparability.
[b]Computed from pre-war exchange rates adjusted by means of price indexes.
[c]Based on mid-1946 population. If estimated mid-1949 population of about 198 million were used, the per capita income would be reduced to about $300.
[d]USSR, China, Poland, Czechoslovakia, Hungary.
[e]US, Canada, Benelux, Denmark, France, West Germany, Iceland, Italy, Norway, UK, Greece, Turkey.

INTERNATIONAL COMPARISONS: RESOURCES

Tables 29 - 31

Table A-29

WORLD RESERVES OF IRON ORE[a]

Country	Probable reserves[b]			Potential reserves[c]			Per capita iron content		Est. pop. (mill.) March 1948
	Mill. met. tons	Approx. percent iron	Approx. iron content (mill. met. tons)	Mill. met. tons	Approx. percent iron	Approx. iron content (mill. met. tons)	Probable met. tons	Potential met. tons	
World	53,918	50	26,719	293,391	44	128,838	11.4	54.8	2,350.89
US	3,800	45	1,710	70,800	36	25,488	11.7	173.9	146.57
USSR	4,504	45	2,027	10,862	40	4,345	10.5	22.5	193.00[d]
in Europe	3,133	45	1,410	7,124	40	2,850	...	...	...
in Asia	1,371	45	617	3,738	40	1,495	...	...	...
North America	5,737	46	2,640	75,155	37	27,709	16.5	173.3	159.86
Latin America	10,088	57	5,763	36,319	47	17,090	37.0	109.7	155.72
Europe (excl. USSR)	13,694	41	5,562	25,146	37	9,333	14.4	24.1	387.37
Asia (excl. USSR)	12,367	56	6,988	26,117	49	13,294	5.6	10.3	1,248.92
China	1,800	45	810	2,700	45	1,215	1.7	2.6	463.49
Africa	7,315	49	3,609	119,427	48	57,221	18.6	295.2	193.83
Oceania	213	61	130	365	59	216	10.7	17.7	12.19

[a]United Nations Dept. of Economic Affairs, *World Iron Ore Resources and their Utilization*, Lake Success, 1950, pp. 66-67.
[b]Reserves for which a reliable calculation has been made of the extent of deposits, based on actual investigation.
[c]Probable reserves and other deposits which can be approximately estimated.
[d]Estimate for 1946.

Table A-30

WORLD RESERVES OF SELECTED MINERALS[a]

(Percent of world total)

Mineral	US	USSR	Other
Coal	45	27	28
Petroleum	31	11[b]	58[c]
Iron ore	34	11	55
Copper	22	16	62[d]
Lead	35	2	63[e]
Zinc	34	12	54[f]
Bauxite	3	3	94[g]

[a] *Economic Almanac for 1950*, p. 180. Derived from US Bureau of Mines and *Oil Weekly* compilations. The petroleum data refer to 1947; the data for other minerals also refer to post-World War II period.
[b] Excludes Sakhalin.
[c] Kuwait, Iran, Iraq and Saudi Arabia account for 40 percent of the world total. Venezuela accounts for 11.
[d] Chile accounts for 26 percent and Rhodesia for 19.
[e] Australia accounts for 19 percent of the world total, and so does Canada.
[f] Australia accounts for 10 percent and Canada 11.
[g] China accounts for 14 percent, Hungary for 14, Africa (French West Africa, Gold Coast, and Nyasaland) for 22, and Latin America (British Guiana, Surinam and Brazil) and Jamaica for 22.

Table A-31

WORLD RESOURCES OF MECHANICAL ENERGY[a]

(Bituminous-coal equivalent)

Country	Coal	Oil	Water power[b]	Total	Area (thous. sq. kilometers)	Tons per Sq. Kilometer	
	(bill. tons, coal equivalent)					Number	US = 100
World[c]	7,245.5(?)	39.1	1,373.2	8,670.3(?)	132,360	65,505.3(?)	20.4(?)
US	2,378.2	12.4	123.1	2,513.7	7,839	320,665.1	100.0
USSR	1,240.0	5.1	68.6	1,313.7	21,177	62,033.6	19.3
North America	2,859.7	13.6	213.9	3,087.1	22,400[c]	137,927.9	43.0
Canada	471.5	.2	52.7	524.4	9,542	54,956.4	17.1
Mexico	...	.6	17.6	18.2	1,969	9,220.9	2.9
South America	3.1	5.5	158.2	166.9	18,141	9,199.1	2.9
Argentina	...	.4	14.7	15.1	2,793	5,750.1	1.8
Brazil	...	...	73.3	73.3	8,511	8,606.5	2.7
Europe (excl. USSR)	653.7	.5	145.3	799.5	5,425	147,382.5	46.0
Belgium	11.0	...	...	11.0	30	366,666.7	114.3
UK and Eire	174.6	...	2.5	177.0	313	565,647.0	176.4
Bulgaria	.4	...	3.5	3.9	103	38,031.0	11.9
Czechoslovakia	30.0	.002	2.9	32.9	140	235,229.3	73.4
Finland	...	...	5.3	5.3	388	13,592.8	4.2
France	17.6	.01	15.8	33.5	551	60,747.7	18.9
Germany (1936)	302.2	.09	5.9	308.2	470	655,681.9	204.5
Hungary	.8	.03	.5	1.4	93	14,590.3	4.6
Italy	.2	...	11.1	11.3	310	36,517.4	11.4
Netherlands	4.5	...	.05	4.5	34	133,052.9	41.5
Poland	93.2	.08	4.1	97.4	388	250,980.7	78.3
Rumania	1.2	.3	4.7	6.1	295	20,822.0	6.5
Yugoslavia	2.6	...	8.8	11.4	248	45,802.4	14.3

Table A-31 (cont'd)

Country	Coal	Oil	Water power[a]	Total	Area (thous. sq. kilometers)	Tons per Sq. Kilometer	
	(bill. tons, coal equivalent)					Number	US = 100
Asia (excl. USSR)	2,142.8(?)	13.4	191.2	2,347.5(?)	24,342	96,440.1(?)	30.1(?)
China proper	2,100.2(?)	...	58.6	2,158.9(?)	8,755	246,583 (?)	76.9(?)
India	20.6	.04	79.1	99.8	4,684	21,296.8	6.6
Japan	16.4	.05	25.2	41.7	382	109,052.4	34.0
Africa	206.7	.1	558.8	765.0	29,930	25,559.8	8.0
Oceania	139.4	.9	50.2	190.5	10,945	17,064.1	5.3
Australia	139.4	...	1.8	141.2	7,604	18,563.7	5.8
New Zealand	...	...	7.3	7.3	268	27,332.1	8.5
Undistributed	...	.02	...	.02	...	...	...
Summary by Blocs							
1. Based on above table							
Western Bloc[c]				4,712.7	96,543	48,814.5	
Soviet Bloc[f]				3,620.3(?)	31,509	114,897.3(?)	
Unallocable[e]				337.3	4,308	78,296.1	
2. More plausible alternative[n]							
Western Bloc[c]				4,712.7	96,543	48,814.5	
Soviet Bloc[f]				1,730.0	31,509	54,365.4	
Unallocable[e]				337.3	4,309	78,296.1	

[A]Adapted from A. P. Usher, "The Resource Requirements of an Industrial Economy": *Journal of Economic History*, Supplement VII (1947), pp. 40-43. Many of the countries listed in the original table are not shown here separately. No date of reference is specified by Usher, but most of the estimates are doubtless based on pre-World War II surveys.

The energy figures for many countries are suspect; or, at least, not all are equally accurate measures of potential resources uniformly defined. The Chinese coal figure, amounting to 30 percent of the stated world total, seems disproportionately high and at variance with other available estimates. The USSR resource total includes remotely exploitable reserves not included in the US total. Consequently, the comparison between the Western and Soviet blocs is distorted in favor of the latter. An alternative comparison based on the assumption that Usher's Chinese coal figure is a tremendous overstatement, is also shown (see footnote h).

[B]Computed on basis of coal saving if water power were utilized according to best known technique.

[C]Excludes Antarctica.

[D]Misprinted as 122,400 in original table.

[E]Includes North and South America, Africa, Oceania, Western Europe (excluding Austria and Germany), and Asia (excluding China, Indochina, and Burma).

[F]Includes USSR, China, and Soviet satellites in Europe (excluding Austria and Germany).

[G]Includes Austria, Germany, Yugoslavia, and parts of Asia (Indochina, Burma, etc.), but excludes "undistributed".

[H]Recomputed from above table on assumption that a more correct Chinese coal figure is about one-tenth the figure shown. The basis for this assumption is supplied by US Department of State, *Energy Resources of the World*, June 1949, pp. 52-53. According to this source, Asia accounted in 1937 for about 296.9 bill. metric tons, or 5.3 percent of the world total of 5,576.2; and China (excluding Manchuria and Jehol) accounted for 233.8 or 4.2 percent of the world total. In general, the Usher and State Department tables are fairly consistent; the most significant discrepancy concerns China. According to another source, *The 1950 Bituminous Coal Annual* (Washington, 1950), p. 48, "China, Manchuria" accounts for 276 bill. metric tons, or 4.0 percent of the total probable world coal reserves.

APPENDIX B

SOVIET LABOR LAW CHRONOLOGY

APPENDIX B

SOVIET LABOR LAW CHRONOLOGY: 1918-1947*

1918	1918 Labor Code: Eight-hour day; universal labor conscription; limitations on right of worker to transfer from job; establishment of labor mobilization offices.
1922	1922 Labor Code: Abandonment of labor conscription; 8-hour day reimposed; protection of women and adolescents; generous social-insurance system; contractual relationship reintroduced in the labor market; right of collective bargaining recognized.
1927	Last reference to general minimum wage rates for industry.
1929	Continuous workweek introduced. Mobilization of peasants for road work.
1929-31	Length of workday reduced from 8 to 7 hours; to 6 hours for heavy or dangerous work.
1930	Unemployment compensation abolished and workers directed to jobs. Right of Commissariat to transfer qualified personnel to "most important" branches of industry. Mandatory hiring of labor through "labor exchanges."
1931	Continuous workweek gradually abandoned. Contracts with collective farms to obtain supplies of seasonal factory labor. Enterprises permitted to hire directly rather than through the labor exchange.
1932	Anti-labor-turnover laws: failure to appear at work for one day punishable by mandatory dismissal, loss of ration card, deprivation of factory owned housing, etc. Reintroduction of prerevolutionary internal passport system.

1933 Creation of "director's fund" for workers' welfare, plant improvement etc.
People's Commissariat of Labor fused with the Central Council of Trade Unions; lapse of conventional trade union functions, such as collective bargaining over wages and hours.
Graduates of technical and factory apprentice schools subject to from 3 - 5 years of labor in their specialty.

1934 Revision of 1922 Labor Code to eliminate minimum wage.

1935 Final abandonment of collective contracts in industry.

1936 Seven-hour day incorporated in new Constitution of USSR; "rights" and "duties" of workers defined.

1938 Rigid disciplinary laws against tardiness and idling.
Social insurance benefits tied to seniority and past conduct.

1939 Issuance of labor books in accordance with 1938 law.
More than twenty-minute lateness for work subject to mandatory dismissal.

1940 Status of foreman raised; pay, rights, and responsibilities increased.
Increase in hours of work with adoption of 8-hour day and 6-day week and two-shift system.
Freezing of worker at place of employment; unauthorized quitting and absenteeism (including lateness over twenty minutes or tardiness three times in one month) penalized by imprisonment on the job at reduced wages. Increased penalties against branches of labor discipline; petty crimes on job punishable by imprisonment.
Managerial responsibility for poor quality output.
Compulsory recruitment of youth for industrial training and employment (State Labor Reserves System).
Right of Commissariat to transfer skilled workers and specialists.

1941 Compulsory overtime (at extra pay) up to three hours a day with certain exceptions. Annual leave suspended.
Unconditional conscription of all workers and employees in war production. Increased penalties for "desertion."
Suspension of "director's fund."

1942	Universal labor conscription. Draft of invalids. Money credits for accrued annual leave.
1943	Workers on railroads, in other utilities, in merchant marine, etc. militarized.
1945	Annual leave restored.
1946	Reintroduction of "director's fund."
1947	Collective agreements resumed, but wage rates not subject to collective bargaining. Eight-hour day written into Constitution of USSR.

*Based on V. Gsovski, *Soviet Civil Law*, Ann Arbor, 1949, 2 vols., and "Elements of Soviet Labor Law," *Monthly Labor Review*, March 1951, pp. 257-62, and April 1951, pp. 385-90; and M. Miller, *Labour in the USSR*, London, 1942.

APPENDIX C

SOVIET SOCIALIST COMPETITION CHRONOLOGY

APPENDIX C

SOVIET SOCIALIST COMPETITION CHRONOLOGY: 1919-1949*

1919 First subbotnik (voluntary unpaid work), hailed as first evidence of a "socialist" attitude toward work.

1920 Forms and methods of subbotnik work outlined by Central Committee of the Communist Party.

1923 First "production conference" (worker-management discussion of factory operating methods).

1926 First udarnaya brigada or "shock brigade," composed of workers (udarniki) putting forth extra effort.

1927 First "general production inspection."

1928 Creation of the "order of the Red Banner of Labor."

1929 First socialist competition agreement.
Mass organization of "Socialist competitions."
Conference of shock brigades.

1930 First shock brigade made up of members of different sections of a plant.
Introduction of "social towing" (interplant assistance during socialist competition).
Adoption of idea of "counter promfinplans" (alternative plans submitted by plant personnel, invariably resulting in higher goals).
Introduction of "rationalizing proposals" (worker suggestions for improving plant performance).
All-union day of the shock worker (October 1) proclaimed by trade unions.

1931 "Struggle for quality" campaign.
Introduction of business-accounting brigade of workers to check on efficiency in use of materials, etc.
Introduction of tekhpromfinplan (technical-industrial-financial plan) to raise output and labor productivity and decrease costs of production by better utilization of resources.

1932 The "Izotov movement" (dissemination of production skills of experienced shock workers among new workers).

1933 Widespread adoption of the sotstekhekzamen (socialist technical examination for testing workers' knowledge).

1934 The otlichnik (examplary worker) movement. The introduction of differential valuation of output according to quality.

1935 The Stakhanovite movement for high output, high quality, and efficiency.
Creation of a new labor medal, "Badge of Honor."

1936 Diffusion of Stakhanovite methods and establishment of Stakhanovite records.
The "Lunin movement" in railroad transport (engine drivers make own repairs).

1937 Creation of Stakhanovite brigades and larger aggregates.
Introduction of rapid metal-cutting technique in machine building.
Introduction of cyclical work schedules and control by charts.

1938 Creation of additional labor awards: "Hero of Socialist Labor," "For Labor Valor," "For Labor Distinction."

1939 The multiple-lathe and combined-trades movement (operation of more than one machine, and use of more than one skill).
Stakhanovite "patronage" over lagging workers; setting up of Stakhanovite schools.
New "struggle for quality" campaign.
Campaign to lengthen the life of equipment in railroad industry.

1940 The "Semivolos method" of multiple-stope boring in mining.

1941 The 200 percent and 300 percent movements for overfulfillment of norms.

1942-43 1,000 percent movement.
"All for the Front" competitions.
Creation of "front brigades" with slogan "In labor as in battle."
Launching of "Agarkov movement" with the slogan "Not by numbers but by know-how," to overfulfill plan with smaller staffs.

1944-45 Socialist competition by trades.

1945 Creation of medal "For valorous labor in the Great Fatherland War, 1941-45."
All-Union competitions in honor of victory.
Stakhanovite plans for lowering pf production costs.
Socialist competition to prepare railroad and river transport for winter.
Competition in construction industry.

1946 Competitions to overfulfill new Five Year Plan.
Award of Stalin prizes to innovators.
Award of Red banners to plants winning All-Union socialist competitions.
Movement for better utilization of coal-mining machinery and for more rapid drilling.
Stakhanovite labor organization introduced into construction work.

1947 Organization of "collective Stakhanovite work" in industry.
Reintroduction of collective contracts (abandoned in 1930's), stipulating terms of socialist competition and of labor-management relations not involving wages and hours.
Introduction of new plans for reducing labor expenditure on goods.
Stakhanovism introduced among engineering-technical personnel.
"Complex brigades" formed for purpose of perfecting technology.
Socialist competitions initiated in mining (rapid drilling).
Movement to attain 1950 norms in 1947.
New type Stakhanovite schools — "reciprocal training."
Adoption of industrial methods of repair and upkeep of locomotives and rolling stock by engine-drivers.
First complex brigade of innovators and rationalizers.

Socialist competition among drivers to operate trucks 100,000 kilometers without capital repair.
Stakhanovite struggle against production losses.
Campaign to complete the Plan in four years.
Active aid of scientists in attainment of Stakhanovite tekhpromfinplan.

1948 First "integrated brigade" for extraction of crude oil and underground repair of pit-holes.
Campaign to operate enterprises without need for government subsidies.
Stakhanovite plan for complex mechanization of production.
Campaign "for the honor of the factory label."
Competition for rapid smelting, economy of materials, and better utilization of equipment in steel mills.
Competition to fulfill the Plan in three and one half years.
Movement for above-plan socialist accumulation by decreasing costs of production.
Movement to halt equipment failure.
Adoption of hourly graph-charts at the work bench.
Stakhanovite schools for training in multiple skills.
Patronage of engineers and technicians over workers.
Campaigns for more rapid metal-cutting and operation of spindles.
Campaign for personal accounting of material savings.

1949 Campaign for more rapid turnover of capital.
Initiation of "brigades of examplary quality."
Mass inspection of storage operations with view to improvement.
Campaign for extra output without additional capital.
Campaign for plant departments of high quality output and highly productive equipment.
Campaign for shortening the production cycle.

*Based primarily on I. Changli, *Organizatsiya Sotsialisticheskogo Sorevnovaniya na Predpriyatii* (Organization of Socialist Competition in Plants), 1949, pp. 56-70.