



The Maddison Project

Great War, Civil War, and Recovery: Russia's
National Income, 1913 to 1928, Appendix

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Great War, Civil War, and Recovery: Russia's National Income, 1913 to 1928

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Abstract: The last remaining gap in the national accounts of Russia and the USSR in the twentieth century, 1913 to 1928, includes the Great War, the Civil War, and postwar recovery. Filling this gap, we find that the Russian economy did somewhat better in the Great War than was previously thought; in the Civil War it did correspondingly worse; war losses persisted into peacetime, and were not fully restored under the New Economic Policy. We compare this experience across regions and over time. The Great War and Civil War produced the deepest economic trauma of Russia's troubled twentieth century.

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Russia's National Income: Appendix

Past Estimates

The Russian literature starts from Sergei N. Prokopovich.¹ His estimates of Russian Empire GDP by sector of origin in 1913, based on changes in industry and agriculture over the war years, shown in Table A1, formed the starting point for all future scholars.

Soviet statisticians and economists were mainly interested in estimating the depth of the wartime crisis and the rate of recovery from it. There were a number of attempts to produce national income calculations for particular years. L. N. Litoshenko, who elaborated on 1922/23 and 1923/24 (Table A2), was the only one to work from “social tables,” aggregating the personal incomes of socially defined sub-groups of the population deriving incomes from the sphere of material production – industry, agriculture, construction, and intermediate transport and distribution.²

Other scholars worked on a sector-of-origin basis, as we do, but generally restricting their scope to industry and agriculture alone. Thus, B. A. Gukhman produced an estimate for 1922/23 (Table A3), based on the material production of industry and agriculture.³ The practice of basing national income estimates for our period on industry and agriculture alone continued through the Soviet period. Various Soviet-era estimates on this basis are shown side by side in Table A4.

There were also important sectoral investigations in the 1920s such as that of N. Ia. Vorob'ev, who contributed a study of large-scale industry during the Great War, based on the 1918 industrial census.⁴ Two others were suppressed at the time but survived to be published many years later: a general index of large-scale industry over the forty years from 1887 to 1927 by L. B. Kafengaus and a study of agriculture by Litoshenko.⁵

In the early years of Soviet rule, national accountants were actively engaged into data gathering issues as well as into their analysis, running to many statistical volumes published by the Soviet central statistical agency (TsSU) and the production branch ministries (VSNKh, responsible for industry, and others). The TsSU, with its local branches, was the leading organization responsible for data collection. Established in 1918, it combined two main lines of pre-revolutionary statistics – the Central Statistical Committee attached to the Ministry of Internal Affairs, and the local *zemstvo* statistical agencies – into a unified hierarchy. In the early years of Soviet rule the TsSU was a relatively independent organization dominated by pre-revolutionary specialists; up to 1925, in particular, it was headed by a prominent *zemstvo* statistician, P. I. Popov. Early Soviet statistical volumes described the data-gathering methodologies and explicitly discussed data limitations where appropriate. Both Russian and Western scholars view

¹ Prokopovich, *Voina*; Prokopovich, *Opyt*.

² Litoshenko, *Natsional'nyi dokhod*; Litoshenko, “National Income.”

³ Gukhman, “Dinamika”; Gukhman, *Produksiia*.

⁴ Vorob'ev, “Izmeneniia.”

⁵ Kafengaus, *Evoliutsiia*; Litoshenko, *Sotsializatsiia*

the official statistics of the 1920s, especially from the first half of the decade, as of generally high quality.⁶

The emergence of Stalin's dictatorship in 1929 reduced dramatically the number of statistical publications and put a stop to independent studies on this theme. With one outstanding exception, Soviet specialists turned away from the problem of national income to the mobilization of industry and labor.⁷

The exception was Al'bert Vainshtein, who resumed his work on the topic after returning from more than twenty years in the Gulag and internal exile. Starting from Russia's national wealth in 1914, Vainshtein used his knowledge as an insider to explore the quality of Russian Empire statistics and review previous attempts on Russian and Soviet national income.⁸ He proposed adjustments for border changes from the Russian Empire to the Soviet Union, and offered corrections of the population and livestock figures. The population correction was further investigated by later demographers such as R. I. Sifman.⁹

Reviving the subject after the Soviet collapse, A. V. Poletaev provided a systematic review of this literature and, with M. I. Savel'eva, compared the crisis of the early 1920s with that of the early 1990s.¹⁰

The Western literature starts again from Prokopovich who, exiled from Russia, made his estimates available in English.¹¹ Thereafter, western scholars have divided their attention between the periods before and after 1917. As for the earlier period, the performance of the Russian economy in World War I has been surveyed by Peter Gatrell and Mark Harrison.¹² Table A5 shows Gatrell's revised estimate of the trend in Russia's national income, based on production in the material production sectors, through 1917. For the period after 1917, worthy of note is the estimate provided by Warren Nutter for three production sectors in 1920 and 1928 relative to 1913 (Table A6).¹³

Population

Our population estimates fall into two subperiods, 1913 to 1918 and 1920 to 1928. For 1919, which cannot be separately reconstructed, we interpolate between 1918 and 1920.

⁶ See Wheatcroft and Davies, "Crooked Mirror."

⁷ Sidorov, *Ekonomicheskoe polozhenie*, illustrates this at its best.

⁸ Vainshtein, *Narodnoe bogatstvo*; Vainshtein, *Narodnyi dokhod*.

⁹ Sifman, "Dinamika."

¹⁰ Poletaev, "Ekonomicheskie krizisy"; Poletaev and Savel'eva, "Sravnitel'nyi analiz."

¹¹ Prokopovich, "National Income."

¹² Gatrell and Harrison, "Russian and Soviet Economy"; Gatrell, "Poor Russia."

¹³ Nutter, "Effects."

1913 to 1918

Table A7 reports official figures for the population of the Russian Empire and its main subregions from 1913 through 1916. Table A8 reports our reconstruction of the figures and their extrapolation through 1918.

Table A8 is divided horizontally into two panels, showing the territories of the Russian empire (excluding Poland and Finland) and the interwar Soviet Union respectively. In the upper panel official figures (column A, drawn from Table A7), provide the starting point. Reading across, the first adjustment (column D) is for internal migration.

The Imperial registration of births and deaths was of sufficiently high quality, but officials failed to account correctly for rural-urban migration. They double counted migrants, once in the place of origin and again at their destinations. A census could correct for this mistake, but the only Empire census was conducted in 1897. The double counting accumulated each year from that time. In column C we adjust the 1914 population for this error, following R. I. Sifman who, starting from the 1897 population figure, accounts annually for fertility, mortality, and net migration over the next two decades.¹⁴ A. L. Vainshtein previously reviewed various attempts to estimate the true numbers.¹⁵ Sifman's adjustment is close to the mid-point of the range of these corrections. In contrast to Sifman, other authors rarely reported details of their correction procedures. E. Z. Volkov's is the most transparent, but does not account for net external migration and does not correct official figures of the population of the Empire's periphery.¹⁶ S. N. Prokopovich's downward adjustment is too large, because he applied it to the entire country, including Siberia where there was no double-counting.¹⁷

To estimate annual figures for 1913 and 1915 to 1918, we apply A. Ia. Boiarskii's net growth rate to the 1914 population figure and adjust for cumulative war losses and net migration on the basis of Volkov (columns E, F and G respectively).¹⁸ Boiarskii calculated the rate of natural increase for the Soviet interwar territory only; we assume that the two territories followed the same path. Column J reports the results.

In working on this basis, we reject two other options. One would be to continue with the official figures, corrected à la Sifman. Given the government's wartime difficulties, including the loss of some territories and the irregular information from the rest, the figures are just too unreliable. Another option would be to use Volkov's population estimates. But these rely too heavily on the 1916 and 1917 agricultural censuses, which covered only the rural population, requiring many assumptions and adjustments to arrive at the total population. So, we reject this too. We do make use of Volkov's data for migration of refugees and military losses, which appear to be well founded. A separate argument for our methodology is that at least it is free of rural-urban migration bias, since it accounts for wartime migration flows directly.

¹⁴ Sifman, *Dinamika*.

¹⁵ Vainshtein, *Narodnoe bogatstvo*.

¹⁶ Volkov, *Dinamika*.

¹⁷ Prokopovich, *Opyt ischisleniia*.

¹⁸ Boiarskii, "K voprosu"; Volkov, *Dinamika*.

Table A8 (columns K, L, and M) reports our estimations for the territory under direct control of the tsarist government. Starting from the Empire territory, we subtract the population on the periphery occupied by the Central Powers, adding back the inward flow of refugees from these territories.

The lower panel of Table A8 shows our adjustments to Soviet interwar territory. Again, we start from the official Empire population of 1914. We first subtract official populations of the territories of the future independent states (column B), summing figures for the provinces that left the empire in whole (Note 1) and, weighted appropriately from Vainshtein, in part (Note 2). An “official” figure for the 1914 population within 1922 Soviet borders results (column C).

We then repeat the correction for double counting (column D) and extrapolate for the natural increase (column E). We estimate military deaths (column F) from the Empire figure, excluding deaths of soldiers mobilized from the western provinces. Volkov put the share of soldiers from the future Soviet territory at 81.4 percent of the total mobilized into the army, and we apply the same share to all military deaths. For net migration (column G), we adjust the number of Russian prisoners-of-war in the same proportion, then add the number of incoming refugees from the western provinces based on Volkov. Accounting for refugees changes the sign of net migration from negative to positive.

We add the populations of Khiva and Bukhara (column H), which joined the Soviet Union in 1924 and 1925. Their combined populations in 1914 were about 2.3 million.¹⁹ We extrapolate this figure to subsequent years on the growth of the population in the rest of the country.

The final result (column J) is the population on Soviet interwar territory from 1913 to 1918. We are unable to go beyond 1918 because the data on migration in 1918 and 1919 are substantially incomplete.²⁰ The net migration in these years was large and negative because many refugees and prisoners of the war left Soviet territory.

1920 to 1928

The Soviet 1926 population, based on the census conducted in December of that year, is the most reliable figure in our data. It is free of the double-counting of rural-urban migrants in the Imperial statistics. Demographers agree that this was one of the best Soviet censuses, requiring little correction. E. M. Andreev, L. E. Darskii, and T. L. Kharkova. (hereinafter ADK) adjust it upward by about 1 percent for the underreporting of Muslim females in Azerbaidzhan and Central Asia and of infants.²¹ We accept this revision, and we generally follow the ADK reconstruction of population for 1923 to 1928.

For 1920 through 1922, ADK offer three variants based on high, low, and medium mortality rate in the famine of 1921/22. They express no preference between the three, noting that the question awaited further investigation. We adopt their “high” mortality series on the basis of Serguei Adamets, who conducted a study on mortality during the Civil War and famine. Adamets did not reconstruct the population himself. He calculated

¹⁹ Wheatcroft and Davies, “Population.”

²⁰ Volkov, *Dinamika*.

²¹ Andreev, Darskii, and Kharkova, *Naselenie*.

a mortality index in two variants: from available data for particular regions, and from mortality tables, simulated using the age compositions of 1926 and 1910 respectively.²² His regional mortality index is supportive of the “high” ADK mortality assumptions. His simulated mortality tables produce an even higher estimate of 17 million excess deaths between 1918 and 1922. But this relies on many fragile assumptions, and we find it implausible.

We apply one correction to ADK ourselves. This concerns the figure for 1920, which we inflate by 1.8 million. This corrects a misprint in the source that ADK cite for the White emigration.²³

Births, deaths, and migration, 1914 to 1923

Table A9 summarizes our reconciliation of population totals before and after the years of foreign and civil warfare with estimated births, deaths, and migration.

Our starting point is the 3.8 million net increase found by subtracting the population of 1913 (working forward from the 1897 census) from that of 1924 (working backwards from the 1926 census), as explained above. We project normal losses on the base of average mortality in the years before and after the decade. Subtracting normal from total mortality leaves 13 million excess deaths.

On this basis, thus the total number of births over the decade exceeded the total number of deaths by 2.16 millions. Since this falls short of the net increase in the population, we estimate net migration as the residual. The inflow of refugees from the Western provinces of the Empire before 1918 exceeded the combined sum of the return migration after this year and the White emigration by 1.67 million people. Because the White emigration was about 2 million people it follows that, of the inward refugees, 3.67 million resettled in the USSR. This result is consistent with the findings of Volkov and Gatrell, who report 9.7 million as the gross number of inward refugees, and 4.75 million as the number that were registered as having subsequently left Soviet territory; an unknown fraction of the remaining 4.95 million also left without being registered.²⁴

Production by Sector of Origin

Table A10 is based on Malcolm Falkus’s estimate of the shares of the main sectors in the net income of the Russian economy in 1913 within both Empire and Soviet borders.²⁵ To reach his findings Falkus began from Prokopovich but found many difficulties with the latter’s original estimates. To correct them he relied extensively – correctly in our view – on B. A. Gukhman.

In Falkus’s work, national income was limited to material production. Material production comprises commodity production, construction, and intermediate services

²² Adamets, *Guerre civile*.

²³ In his text Maksudov, *Poteri*, p. 185, puts the White emigration between 1920 and 1922 at two million but in the relevant table (p. 202) he reports the annual figures (in millions) as 0.9, -1, and -0.1; the first figure is missing a minus sign. ADK reproduce this misprint (*Naselenie*, p. 14).

²⁴ Volkov, *Dinamika*; Gatrell, *Whole Empire*.

²⁵ Falkus, “Russia's National Income.”

such as transport and trade. Final services are missing, and must be added for national income on a goods-and-services basis.

The upper part of Table A10 belongs to Falkus; in the lower part, we adjust from material production to net national income by adding final services. For Russian Empire territory, we find final services as the residual that is left when the net material product (18.5 billion rubles, found by Falkus) is deducted from the net national product (20.3 billion rubles, found by Gregory). The 1.8 billion ruble gap amounts to 8.8 per cent of the Gregory total.

Within final services, we identify value added by military services as the cost of soldiers' maintenance in 1913, marked up by 50 per cent as an arbitrary allowance for the contribution of defense capital services. We deduct this from the final services residual to leave civilian final services.

How reliable is our estimate of the importance of civilian final services in 1913? The two aggregates that mainly form it were estimated independently, the net material product from the output side, and the net national product from the expenditure side, so there is plenty of scope for measurement error in determining the size of the gap between them. Employment data for 1913 provide a rough check. According to a Soviet handbook, trade and other civilian services (including medicine, science, culture, and state administration) accounted for 14 per cent of total employment in 1913.²⁶ Our equivalent is found in Table A10 from the shares of trade and final civilian services under Soviet territory, which sum to 16.3 per cent. The fit is not exact, but it is close. A closer fit would not change our final results, moreover. This is because we have no independent measure of the changing output of civilian final services over time. Our only option is to allow it to follow the weighted average of the civilian series that are measured. Changing its weight would make no difference.

As described in the table, we adjust final services to Soviet territory in proportion to the adjustment of the net material product found by Falkus.

For subsequent years we estimate the real national income by sector of origin. Tables A11, A13, A16, A17, and A20 summarize the production branch data that we actually use. Our figures for agriculture (Table A11) and large-scale industry (Table A13) are based on series for agricultural and industrial commodities production in physical units, found in Tables A22 and A23 to A36 respectively.

Agriculture was the largest sector of the economy. It accounted for nearly half of all economic activity in 1913 and 1928, and more than half of employment. Our figures are the result of painstaking reconstruction of agricultural production, region by region and commodity by commodity; more detail is given below. In Table A12 we compare our index with alternative Soviet-era index numbers collected by A. V. Poletaev.²⁷ Figure A1 plots the aggregate indexes.

For the mid and late 1920s, we come into agreement with the contemporaneous Gosplan index. For the war period, especially for 1916 and 1918 to 1920, our estimates fall well below the alternatives. It is difficult to identify the sources of disagreement because Soviet-era indexes after the late 1920s were typically published without detailed methodological explanation. The difference is probably not in the original sources, set out and discussed below, because they and we use the same. More likely,

²⁶ USSR, *Narodnoe khoziaistvo ... 1922-1972*, p. 343.

²⁷ Poletaev, "Ekonomicheskie krizisy."

the gap arises from the correction factors that we apply to the low-quality wartime data – particularly to grains. These are discussed in more detail below, and Table A21 provides a full list of those used in our estimates.

For industry, data are of better quality.²⁸ We start with large-scale (“census”) production on Soviet territory. From Tables A23 to A36 we take 78 annual series of industrial products from L. B. Kafengaus and official figures for 1928.²⁹ Of the 78 series, many of them incomplete, we actually make use of 60. For some of these, units are not specified or are apparently misspecified in the source. Our methodology for aggregating them is fortunately unit-free, and this saves some data that we would otherwise be unable to exploit.

The industrial classification in use before the Revolution divided industry into 11 branches; the only one on which we have no data, electricity production, was of minor importance at this time. Within each branch, each product series enters with equal weight. At the branch level in 1913 we construct value-added weights from the 1918 industrial census, which includes retrospective figures from 1913 onwards. A special study on the 1918 census gave it high marks for quality and argued that its results could be extrapolated to the whole country despite limited coverage (only 31 provinces).³⁰ Applying value-added weights to each branch index, we obtain an index for large-scale industry (Table A13).

Our methodology makes no allowance for quality changes within our period. Prokopovich made the assumption that between 1913 and 1928 the average quality of Soviet industrial products declined by about one fifth.³¹ Quality change cannot have been all one way; the typical airplane of the late 1920s, for example, flew higher and faster for longer than before the war, but we do not allow for this either. Despite such omissions, our index numbers fit within the range proposed by S. G. Wheatcroft, R. W., Davies, and J. M. Cooper, based on deflated nominal values of gross output for 1926/27 and 1927/28: 2-6 per cent and then 18-23 per cent higher than in 1913.³²

We combine our index of large-scale industry with the only available measure of small-scale production, a Soviet official index (Table A14), using the associated 1913 weights of large and small industry to aggregate them. The nature of small-scale production made accounting for small industry very difficult, before and after the Revolution. One might argue that the Bolshevik anti-market policy gave craftsmen additional incentives to conceal their activities from the state after the Revolution, creating a problem of growing underreporting of small production. The only available check, based on employment data, does not support this view, however. Davies concluded: “The best estimate of the number of persons engaged in small-scale industry in terms of full-time equivalents is ... 2-2¼ millions in 1913 and 1½ millions or more in 1926/27”: in other words, small industry employment in 1926/27 was most likely 66 to

²⁸ Davies, “Industry.”

²⁹ Kafengaus, *Evoliutsiia*; USSR, *Kontrol'nye tsifry*.

³⁰ Drobizhev, Sokolov, and Ustinov. *Rabochii klass*, p. 43.

³¹ Prokopovich, *National Income*.

³² Wheatcroft, Davies, and Cooper, “Soviet Industrialization,” p. 267.

75 percent of the 1913 level.³³ The Soviet official measure puts small industry output in 1926/27 at 100 percent of 1913. Thus, it is unlikely that, by relying on the latter, we have understated the contribution of small industry in the 1920s. Finally, the weight of small industry in total industrial production is itself small (6.5 percent), so an error is unlikely to have noticeable aggregate effects.

Again, we compare our figures with those of others. Tables A14 and A15 report a range of alternatives, and Figure A2 plots the aggregate index numbers.

For construction (Table A16) we rely on the production of building materials (cement, red bricks, window glass, and sawn timber). Effectively, we assume that the production of these materials equaled their intermediate consumption in the construction industry, and that the construction industry's ratio of intermediate consumption to value added remained unchanged over the period. A test of this approach would be to estimate the employment trend in this sector and compare it to that of measured output. The main difficulty is that employment in the construction sector is, in the words of Davies, "extremely uncertain territory." The problem lies in coming up with a figure for 1913, which requires extrapolation from the 1897 census. Davies concluded: "It seems likely that the right comparison is ... between Gukhman's 965,000 for 1913 and the census figure of 542,000 in December 1926," i.e. a decline by 44 percent.³⁴ Our production series suggest a smaller output decline, by 15 percent up to 1926/27 year. There is a gap, but it is favorable to the performance of the Soviet economy. Moreover, the gap is not large, given the heroic guesswork underlying Gukhman's figure for 1913.

Turning to transport (Table A17), railways are relatively well served by official statistics. We use the dataset assembled by John Westwood in ton- and passenger-kilometers for both Empire and Soviet territory.³⁵ Westwood also provides data on waterway freight traffic for widely separated benchmark years; since this element is too large to be omitted, we interpolate missing observations as best we can. Highway traffic was surely important too, but was almost entirely unmeasured. We have data only for mechanical road traffic which, although growing rapidly, remained insignificant in volume until after our period.

The coverage of trade and civilian services (Tables A18 and A19) is limited to employment in 1920 and the postwar years. Even employment series are lacking for the pre-Soviet period. We report these figures but we are unable to use them.

We measure military services by employment. Table A20 shows two series for defense employment; Series A is that provided by the authoritative Correlates of War international historical database, but we believe Series B improves on this significantly from Russian sources. We infer annual averages from the monthly data. For later years we use official Soviet annual averages. The great expansion of the Russian army and navy in 1914 to 1916 is the most notable feature of Table A20. Even at its 1920 peak, the Red Army was less than half the maximum size of the Imperial army.

It is necessary, but not easy, to account for military services of the anti-Bolshevik forces in 1918 to 1920. The sizes of the White armies are known approximately. S. V.

³³ Davies, "Introduction," pp. 45-46.

³⁴ *Ibid.*, p. 46.

³⁵ Westwood, "Transport."

Volkov reports figures for various armies for irregular benchmark dates.³⁶ According to him, there were almost no White forces during the first half of 1918; by the end of the year the largest White army, that of Kolchak, had about 50 thousand soldiers. The Kolchak army peaked at 436 thousand in June 1919, and the Denikin army stood at about 250 thousand in July 1919. But their month-on-month variation was also large, by 25 to 80 thousand for the Kolchak forces and 30 to 82 thousand for the Denikin army. On the basis of these numbers we also make a token allowance for national insurgent forces in the Ukraine, the Caucasus, and Central Asia.

Agriculture

Table A21 reports the corrections we apply to the original agricultural data as published at the time, and Table A22 presents our final corrected series.

The basic source for pre-revolutionary figures on Russian agriculture is an official summary of Russian economic development during World War I.³⁷ Figures for 1913 and 1914 cover the whole empire, but there are omissions for particular regions – mainly those that were occupied by Germany – and for particular products in the later years.³⁸ We interpolate missing figures from trends in neighboring regions. To move from Imperial to Soviet territory, we use regional information from this volume and from the Imperial yearbooks for 1913 and 1915. In moving to Soviet frontiers we added the cotton production of Khiva and Bukhara.

Livestock figures are of worse quality than the arable data. For 1916 there are no livestock figures at all for the Asiatic part of the empire; the European part is represented by data for 48 out of 53 provinces. These omissions were interpolated using data on the regional distribution of livestock across the Empire in previous years. We use the same regional information to estimate figures for Soviet territory.

The agricultural data of lowest quality are those for 1918 and 1919. For grains, potatoes, and flax fibers, figures exist only for particular districts of 34 Russian provinces. These report average yields per unit of area in 1918 and 1919, and cropped areas in 1917 and 1919. For these regions, cropped areas multiplied by yields give output (for 1918 we use the average of areas cropped in 1917 and 1919). We extend the regional figures to the entire Empire and Soviet territories on the basis of these districts' share in national output figures of 1917.

For livestock, too, figures exist only for the same districts of the 34 regions. Because national livestock figures in 1917 are not known, we have difficulty extending the regional figures to the country as a whole. As an approximation, we use the average of the regional shares of grains, potatoes, and flax fibers.

³⁶ Volkov, *Beloe dvizhenie*.

³⁷ RSFSR, *Narodnoe khoziaistvo* (1922).

³⁸ For 1915 there are no data on grain production for 6 out of 53 regions in the European part of the Russian Empire, and 3 out of 24 regions in the Asiatic part. In 1916 we miss 5 European and 13 Asiatic regions, and in 1917 we miss 2 and 5. On potatoes in 1916 there are no data for the Baltic region, Belorussia, the Middle Volga, South Steppe, and Steppe regions, Turkestan, Transcaucasia, and Siberia and in 1917 for the Steppe region and Turkestan.

Territorial adjustments are not the only obstacle to comparability of agricultural statistics before and after the Revolution. In addition, there was widespread underreporting. To compensate for this, we apply various corrections to the pre-revolutionary statistics, as shown in Table A21. These, especially those applied to grains, are the most likely source of the divergence between our own aggregate series and the estimates of the 1920s, mentioned above.

We start with grains, to which we apply two correction factors. Many contemporary statisticians and economists believed that peasants tended to underreport yields and sown areas, particularly before the Revolution. From the mid-1920s, Gosplan statisticians applied a 1.19 correction factor to scale up the pre-revolutionary grain harvest retrospectively.³⁹ While the intrinsic validity of this correction is debatable, it continues to be required for comparability between grain statistics gathered before and after the Revolution. We apply it therefore to our series for 1913 to 1917.

In the early 1920s, however, Soviet statisticians applied a smaller correction factor, namely 10-12%. They applied this both to the pre-revolutionary grain statistics and to the contemporary Soviet figures, in the belief that the pre-revolutionary problem of underreporting had been carried over into the Soviet registration system. Thus, grain figures for 1918 and 1919 appeared in the 1921 source that we use, already multiplied by 1.11 (not 1.19). For consistency with the grain figures of the later 1920s, multiplied by 1.19 (not 1.11), therefore, we apply a further adjustment factor of 1.072 (1.19 divided by 1.11). We do not adjust the 1920 figure because, at the time it was published in 1924, Soviet statistics had already switched to a 1.19 correction.

The further problem of wartime underreporting deserves special mention. Under the policy of compulsory grain requisitions from 1918 to 1920, peasants had stronger incentives to conceal harvests than in peacetime. Contemporary statisticians were well aware of the issue and introduced further corrections for it from the early 1920s. These corrections are already in our data. The original TsSU correction factor was 1.25, which was the product of multiplying the 10-12 percent adjustment for peacetime underreporting, discussed above, and a further 10-15 percent correction for wartime underreporting of yields.⁴⁰

Alternative views from the 1920s, reviewed by V. V. Kabanov, suggested larger corrections of wartime yields, in a range that varied up to 40 percent. In the early 1920s, TsSU did not support such larger adjustments.⁴¹ At this time TsSU remained a relatively independent organization, with highly qualified statisticians still in charge. In the late 1920s, however, higher agricultural figures for 1918 and 1919 began to appear in official publications. It is likely that these responded to political requirements of the time, rather than changes in expert assessment. The official line blamed the grain procurement difficulties on the peasants' concealment of harvests and hoarding of stocks, and applied the same logic to the grain figures of 1918 and 1919.

To summarize, we reject the further upward correction of the figures published in the early 1920s as driven by ideology rather than scholarship. In fact, larger adjustments

³⁹ Wheatcroft and Davies, "Agriculture."

⁴⁰ RSFSR, *Statisticheskii ezhegodnik 1918-1920*.

⁴¹ Kabanov, *Krest'ianskoe khoziaistvo*.

would imply the concealment not only of yields but also of areas under crops. The latter is less likely because cropped areas were more easily observable.

We further correct the potato harvests reported for the same years. At this time official figures included only field-grown potatoes, omitting those grown on the side in “subsidiary” farming in both town and country. Wheatcroft and Davies cite Gukhman’s estimate of the 1913 potato harvest for a correction factor of 1.283, which we use to scale the figures up.⁴²

Finally, livestock-breeding accounted for almost one third of agricultural production in 1913. The 1916 agricultural census revealed underreporting of livestock on a large scale. This was brought to light by Vainshtein; before his work, no corrections were made.⁴³ We follow him in multiplying livestock figures for 1913 to 1915 by factors of 1.198 for horses; 1.415 for cattle; and 1.896 for pigs. The correction factor we apply to sheep and goats (1.504) is the arithmetic mean of the three Vainshtein correction factors for other livestock.

Comparative and Long-Run Data

Finally, Tables A37 to A39 report the comparative and long run data underlying Figures 5 to 7 and Table 7 in the text.

⁴² Wheatcroft and Davies, “Agriculture”; Gukhman, *Produktsiia* (1e).

⁴³ Vainshtein, *Narodnoe bogatstvo*.

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Tables

Table A1. Prokopovich's national income: Russia, 1914/15 to 1917/18, percent of 1913/14

	Agri- culture	Industry	National income
1914/15	100.5%	100.0%	100.0%
1915/16	98.3%	92.6%	96.5%
1916/17	90.7%	70.9%	84.5%
1917/18	93.2%	50.0%	80.0%

Source: Prokopovich, "Voina," p. 173.

Table A2. Litoshenko's national income (by social group): USSR, 1922/23 and 1923/24 in budget rubles

	Peasants	Manual and non- manual workers	Taxpayers		Other urban citizens	Total
			Basic rate	Higher rate		
<i>1922/23</i>						
Thousands	111,624	12,050	3,761	1,202	4,867	133,504
Annual income in rubles:						
Average	49.26	96.08	172.1	555	62.24	62
Total, mn	5,498	1,153	654	666	305	8,276
<i>1923/24</i>						
Thousands	113,856	124,84	3,438	1,274	5,102	136,154
Annual income in rubles:						
Average	50.38	126.8	172.1	612	73.12	66.5
Total, mn	5,736	1,574	598	780	373	9,061

Source: Litoshenko, *Natsional'nyi dokhod*, p. 47.

Table A3. Gukhman's net national income produced in industry and agriculture: USSR, 1913 and 1922/1923 in current and 1913 rubles

	Agri- culture	Industry					Total	Total
		Large- scale	Small-scale:			Total		
			Urban	Rural	Total			
<i>In 1913 prices:</i>								
1913	8,620	2,657	430	326	756	3,413	12,033	
1922/23	6,257	821	114	176	290	1,111	7,368	
<i>In current prices:</i>								
1922/23	4,676	1,100	148	232	380	1,480	6,156	

Source: Gukhman, *Produktsiia* (2e), p. 51.

Table A4. Various Soviet estimates of national income produced in agriculture and industry (percent of 1913)

	Groman 1927 (A)	Varzar 1929 (B)	Gosplan 1929 (C)	TsUNKhU 1939 (D)	TsSU 1957 (E)
1913	100	100	100	100	100
1914	96	91	99	...	...
1915	103	89	102	...	...
1916	103	82	103	...	...
1917	83	72	85	76	75
1918	61	...	71	...	...
1919	52	...	54	...	...
1920	47	...	49	40	40
1921	45	...	47	38	38
1922	61	...	44	...	57
1923	73	...	59	...	...
1924	87	...	67	...	...
1925	102	...	77	80	80
1926	...	...	97	103	103
1927	...	...	105	110	110
1928	...	...	111	119	119

Sources. A. Groman, *Narodnoe khoziaistvo*, p. 47.

B, C, D, and E. Compiled by Poletaev, "Ekonomicheskie krisizy," unpublished appendix). TsUNKhu (Central Administration for National Economic Accounts) was the acronym for the Soviet official statistical agency from 1930 to 1940; before and after these dates it was known as TsSU (Central Statistical Administration).

Table A5. Gatrell's national income: Russia, 1914 to 1917, percent of 1913

	Industry		Agri- culture	Forestry	Trade	Transport	Con- struction	Weighted total
	Large scale	Small scale						
1914	101%	98%	100%	79%	84%	73%	96%	95%
1915	111%	78%	110%	59%	68%	71%	100%	96%
1916	104%	88%	90%	31%	50%	43%	81%	80%
1917	76%	78%	87%	18%	37%	29%	68%	68%

Source: Gatrell, "Poor Russia," p. 241.

Table A6. Nutter's production indexes: USSR, 1920 and 1928, per cent of 1913

	Agri- culture	Industry	Transport
1920	64%	20%	22%
1928	118%	102%	106%

Source: Nutter, "Effects," p. 165.

Table A7. Official population of the Russian Empire in thousands, 1913 to 1916

The Russian Empire, exc. Finland and Poland									
	European Russia (51 provinces)	Caucasus	Siberia	Steppe and Central Asia	Subtotal	Poland	Russian Empire, exc. Finland	Finland	The Russian Empire
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(J)
1913	125,684	12,513	9,788	10,957	158,942	11,961	170,903	3,197	174,100
1914	128,864	12,922	10,001	11,104	162,890	12,248	175,138	3,241	178,379
1915	131,797	13,229	10,378	11,254	166,658	...		3,277	...
1916	133,552	13,422	10,558	11,758	169,290	...		3,315	...

Sources: 1913: Russia, *Statisticheskii ezhegodnik ... 1913 g.*, pp. 33-57

1914: Russia, *Statisticheskii ezhegodnik ... 1914 g.*, 33-57.

1915: Russia, *Statisticheskii ezhegodnik ... 1915 g.*, 33-57.

1916: Russia, *Statisticheskii ezhegodnik ... 1916 g.*, 25-50.

Notes:

Column E is the sum of A to D; G is E plus F; J is G plus H.

Table A8. Population adjustments and corrections in thousands, 1913 to 1918

	Official figures			Adjusted figures								
	Empire exc. Poland and Finland, (A)	Territory lost, 1918/22 (B)	USSR in 1922 borders (C)	Less double counting (D)	Extrapolated from Boiarskii (E)	Cumulative military losses from Volkov (F)	Cumulative net inflow from Volkov (G)	Territory gained, 1924/25 (H)	Present population (J)	Less regions occupied by Central Powers in 1915 (K)	Plus refugees from these (L)	Population under Imperial government control (M)
<i>Russian Empire exc. Finland and Poland</i>												
1913	158942	...	...	-8551	150391	...	...	...	150391	...	...	...
1914	162890	...	...	-8763	154127	-255	-166	...	154127	...	...	...
1915	...	...	...	...	156670	-951	-981	...	156249	...	...	156249
1916	...	...	...	...	157782	-1675	-1568	...	155851	-11752	893	144991
1917	...	...	...	...	158050	-1998	-1553	...	154807	-11772	2413	145449
1918	...	...	...	...	157608	...	...	...	154057	-11739	2778	145096
<i>Soviet interwar territory</i>												
1913	158942	-20522	138420	-7447	130973	...	...	2259	133232	...	...	...
1914	162890	-21204	141686	-7623	134063	-208	794	2300	136363	...	...	...
1915	...	...	...	...	136275	-774	2685	2342	139203	...	...	...
1916	...	...	...	...	137243	-1364	5188	2385	141539	...	...	...
1917	...	...	...	...	137476	-1626	6647	2429	143729	...	...	...
1918	...	...	...	...	137091	...	...	2473	144585	...	...	...

Sources: A. Table A7, column E.

B. The sum of totals living in provinces that left the Empire in whole (from Note 1, below) or part (from Note 2).

C. The sum of A and B.

D. Column A (for the Russian Empire territory) or C (for Soviet interwar territory) is deflated by 5.38 percent to correct for prewar double-counting on the authority of Sifman, *Dinamika*, as described in the text.

E. Figures for 1913 and 1914 are the same as in column A. Figures for 1915 onward are calculated by applying net reproduction rates from Boiarskii, "K voprosu," to the population in the previous year.

F. Calculated from Volkov, *Dinamika*, pp. 54-68, as the sum of military losses of all kinds.

G. Calculated from Volkov, *Dinamika*, pp. 69-77, as the net inflow of migrants, refugees, and prisoners of war.

H. Khiva and Bukhara: Population of 1914 is from Vainshtein, *Narodnoe bogatstvo*, p. 453, and for adjacent years is assumed to have been growing at 1.83% annually, the average net reproduction rate in Turkestan for 1900-1913, from Volkov, *Dinamika*, p.40.

J. The sum of E through H.

K. In 1915 the Central Powers occupied the provinces of Kurliand, Kovno, Vilnius, Grodno, Rovno (50%), Minsk (50%), and Kholm. Official figures (as Table A7) for the populations of these provinces in 1914 (as Notes 1 and 2) are extrapolated (as column E) through 1918.

L. War refugees from the occupied regions (as column G) added to the population under Imperial government control.

M. The sum of J through L.

Table A8, Note 1. Populations of provinces leaving the Russian Empire in whole, in thousands

	Bessarabia	Vilno	Grodno	Kovno	Kurliland	Lifliand	Podolsk	Kholm	Estliand	Kars	Total
1913	2588	2020	2020	1842	783	1493	3955	1068	492	390	16652
1914	2657	2076	2048	1857	798	1744	4057	1088	507	396	17229
1915	2687	2083	2094	1871	812	1779	4128	1088	513	355	17409
1916	2699	2083	2094	1871	812	1795	4191	1088	517	410	17561

Table A8, Note 2. Populations of provinces leaving the Russian Empire in part, in thousands

	Volyn	Minsk	Vitebsk	Pskov	Batumi	Total
<i>Population living within Empire borders:</i>						
1913	4071	2979	1896	1407	171	...
1914	4189	3036	1953	1425	183	...
1915	4242	3071	1985	1447	186	...
1916	4253	3095	1995	1466	188	...
<i>Of which, living outside future Soviet borders:</i>						
Per cent	50%	33%	33%	10%	50%	...
1913	2035	983	626	141	86	3870
1914	2095	1002	645	143	92	3975
1915	2121	1013	655	145	93	4027
1916	2127	1021	658	147	94	4047

Sources: Provincial populations: as Table A7. To fill in observations missing from some columns, numbers (shown in italics) are copied from higher rows.

Proportions living outside future Soviet borders are from Vainshtein, *Narodnoe bogatstvo*, p. 455. Also left outside future Soviet borders were "insignificantly small" numbers of the residents of the Petrograd, Arkhangelsk, and Erivan provinces.

Table A9. Population changes, 1914 to 1924: Soviet interwar territory, in thousands

	Popul- ation Jan. 1 (A)	Crude birth rate (B)	Crude death rate		Estimated births (E)	Estimated deaths (F)	Normal deaths (G)	World War I military deaths (H)
			Option 1 (C)	Option 2 (D)				
1914	136363	0.0437	0.0272	0.0272	5959	-3709	-3590	-208
1915	139203	0.0359	0.0288	0.0288	4997	-4009	-3665	-566
1916	141539	0.0271	0.0254	0.0254	3836	-3595	-3726	-590
1917	143729	0.0263	0.0291	0.0291	3780	-4183	-3784	-262
1918	144585	0.0347	0.0281	0.0302	5017	-4063	-3806	...
1919	142829	0.0317	0.0394	0.0640	4528	-5627	-3760	...
1920	141072	0.0372	0.0484	0.0561	5248	-6828	-3714	...
1921	139068	0.0423	0.0448	0.0414	5883	-6230	-3661	...
1922	137684	0.0432	0.0430	0.0471	5948	-5920	-3625	...
1923	137827	0.0505	0.0305	0.0287	6960	-4204	-3628	...
1924	140196	0.0472	0.0285	0.0224	6617	-3996	-3691	...

Balance over decade, Jan. 1, 1914, to Dec. 31, 1923, in thousands

Births	52,156
Deaths	-49,994
Normal deaths	-36,958
Excess deaths	-13,037
World War I military deaths	-1,626
Other excess deaths	-11,411
Net migration (calculated as a residual)	-1,671

Sources: A. Table 3, column B.

B. 1913-1919, Boiarskii, "K voprosu"; 1920-1924, mean fertility series from Andreev, Darskii, and Khar'kova, *Naselenie*.

C. 1913-1917, Boiarskii, "K voprosu"; 1918-1919, regional mortality series from Adamets, *Guerre civile*; 1920-1924, high mortality series from Andreev, Darskii, and Khar'kova, *Naselenie*.

D. 1913-1917, Boiarskii, "K voprosu"; 1918-1924, simulated mortality series from Adamets, *Guerre civile*.

E. Col. A multiplied by col. B.

F. Col. A multiplied by col. C.

G. Col. A multiplied by average mortality in 1914 and 1924 from cols C and D.

H. Volkov, *Dinamika*, pp. 54-68.

Table A10. National income by sector of origin, 1913: Russian and Soviet borders and million rubles

	Russian Empire exc. Finland		Soviet territory	
	Million Rubles	Percent	Million Rubles	Percent
<i>Agriculture</i>	8,969.5	44.3%	7,291.6	44.4%
Forestry	1,067.0	5.3%	812.0	4.9%
Fishing and hunting	257.9	1.3%	244.2	1.5%
Industry, large	3,022.6	14.9%	2,407.5	14.6%
Industry, small	1,311.1	6.5%	981.0	6.0%
Construction	1,035.0	5.1%	878.0	5.3%
Transport	1,051.9	5.2%	832.7	5.1%
Communications	120.9	0.6%	97.3	0.6%
Trade	1,639.7	8.1%	1,442.3	8.8%
Net material product	18,475.6	91.2%	14,986.6	91.2%
Final services	1,790.4	8.8%	1,452.3	8.8%
Of which:				
Civilian services	1,527.9	7.5%	1,239.4	7.5%
Military services	262.5	1.3%	212.9	1.3%
Net national income	2,0266	100%	1,6439	100%
Corrected mid-year population, mn	163.7	...	134.8	...
National income per head, rubles	123.8	...	122.0	...

Source. Rows down to "Net material product" are from Falkus, "Russia's National Income," p. 55.

Other rows:

Russian Empire territory: Final services are calculated as the residual when the net material product is deducted from net national income. Military services are soldiers' maintenance, 175 million rubles in 1913, from Gregory, *Russian National Income*, p. 247, marked up 50 per cent to account for the contribution of defense capital services. Final services, less military services, gives final civilian services.

Soviet territory: final services, civilian and military, are adjusted from Russian Empire territory in the same proportion as the net material product. Net national income is then the sum of the net material product and final services.

Populations of January 1, corrected for double counting are from Table 2, adjusted to mid-year as Table 3.

National income per head is national income divided by corrected mid-year population.

Table A11. Agriculture, 1913 to 1928: percent of 1913

	Livestock						Industrial crops		
	Grains	Potatoes	Horses	Cattle	Sheep and goats	Pigs	Flax	Cotton	Total
<i>Russian Empire exc. Finland and Poland</i>									
<i>Weight:</i>	48.3%	15.6%	7.0%	7.0%	7.0%	7.0%	4.0%	4.0%	100.0%
1913	100%	100%	100%	100%	100%	100%	100%	100%	100.0%
1914	83%	105%	104%	102%	98%	106%	67%	110%	92.2%
1915	94%	89%	98%	97%	102%	92%	59%	128%	94.1%
1916	80%	59%	92%	88%	116%	80%	58%	107%	80.9%
1917	82%	80%	82%	77%	92%	78%	53%	57%	79.3%
1918	54%	71%	79%	69%	81%	61%	49%	60%	61.9%
1919	45%	74%	76%	62%	70%	45%	37%	31%	53.9%
<i>Russian Empire territory (exc. Finland and Poland) under government control</i>									
1913	100%	100%	100%	100%	100%	100%	100%	100%	100.0%
1914	83%	105%	104%	102%	98%	106%	67%	110%	92.2%
1915	87%	82%	95%	93%	100%	83%	55%	128%	88.1%
1916	72%	50%	91%	86%	114%	76%	55%	107%	74.8%
1917	74%	75%	76%	72%	85%	72%	43%	57%	73.0%
<i>Soviet interwar territory</i>									
<i>Weight:</i>	50.3%	12.9%	7.1%	7.1%	7.1%	7.1%	4.2%	4.2%	100.0%
1913	100%	100%	100%	100%	100%	100%	100%	100%	100.0%
1914	83%	106%	104%	100%	98%	107%	67%	120%	92.0%
1915	93%	95%	99%	97%	103%	90%	57%	140%	95.0%
1916	79%	55%	88%	82%	82%	95%	58%	114%	78.5%
1917	81%	85%	79%	77%	87%	86%	58%	61%	80.1%
1918	53%	79%	76%	69%	77%	68%	40%	51%	61.2%
1919	44%	83%	74%	62%	67%	50%	30%	27%	53.2%
1920	38%	81%	71%	64%	50%	72%	28%	20%	50.1%
1921	31%	83%	65%	60%	49%	61%	31%	15%	45.0%
1922	53%	89%	53%	54%	39%	37%	34%	31%	53.9%
1923	52%	129%	56%	63%	56%	44%	33%	60%	62.1%
1924	58%	141%	70%	94%	97%	94%	46%	148%	80.8%
1925	82%	151%	74%	99%	113%	92%	40%	242%	99.2%
1926	86%	168%	81%	105%	120%	89%	34%	240%	104.4%
1927	81%	161%	86%	108%	130%	110%	31%	308%	106.4%
1928	80%	156%	90%	110%	135%	123%	39%	382%	110.8%

Sources. For quantities see Table A22.

Weights in agricultural gross value of output at 1913 prices are taken from Gukhman, *Produksiia* (1e), pp. 130-135. Value-added weights, available from Vainshtein, *Narodnoe bogatstvo*, only for 1910 and for European Russia, do not differ greatly. There are no figures for the cotton harvest from 1918 to 1923. Numbers are interpolated on the weighted sum of other rows, adjusted for the marked difference of trend between benchmark years.

Table A12. Agriculture, 1913 to 1928, alternative estimates: Soviet territory, percent of 1913

	Groman	Gosplan	TsSU (1960)		Varzar	TsSU (1987)	
	(1927)	(1929)	Total	Crops	(1929)	Grains	Meat
	Total	Total	Total	Crops	Grains	Grains	Meat
1913	100	100	100	100	100	100	100
1914	99	98	...	...	82	...	...
1915	103	101	...	...	82	...	...
1916	98	99	...	...	70	...	...
1917	93	92	88	81	68	71	105
1918	85	91	...	...	68	65	102
1919	75	76	...	...	68	66	100
1920	61	69	67	64	46	59	63
1921	52	64	60	55	38	47	80
1922	71	54	75	75	49	66	54
1923	76	74	86	84	61	74	63
1924	82	80	90	82	56	67	83
1925	97	84	112	107	80	95	93
1926	...	101	118	114	85	100	102
1927	...	107	121	113	...	95	110
1928	...	106	124	117	...	96	120

Source. Groman, *Narodnoe khoziaistvo*, p. 47; Poletaev, "Ekonomicheskie krizisy," pp. 186-256.

Table A13. Large-scale industry by sector: Soviet territory, per cent of 1913

	Stone and glass	Mining	MBMW	Wood- working	Chemicals	Food, drink, and narcotics	Leather and fur	Cotton textiles	Woolen textiles	Flax and hemp textiles	Paper and printing	Total
<i>Number of series:</i>	3	15	7	1	16	10	2	2	2	1	1	60
<i>Weight:</i>	3.9%	29.9%	13.2%	2.7%	6.2%	21.5%	1.4%	13.1%	3.1%	1.9%	3.2%	100.0%
1913	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100.0%
1914	107%	93%	144%	85%	106%	111%	108%	100%	98%	125%	89%	106.3%
1915	78%	80%	216%	64%	105%	110%	99%	110%	101%	132%	75%	110.9%
1916	61%	82%	141%	49%	111%	83%	111%	110%	97%	115%	51%	94.2%
1917	40%	60%	146%	47%	85%	64%	93%	63%	70%	80%	29%	73.3%
1918	11%	23%	31%	23%	29%	39%	69%	41%	54%	42%	12%	31.4%
1919	5%	18%	18%	17%	18%	21%	35%	6%	21%	23%	6%	16.6%
1920	5%	17%	22%	12%	18%	26%	21%	5%	17%	25%	5%	17.5%
1921	4%	28%	7%	14%	24%	12%	37%	6%	12%	12%	4%	16.0%
1922	9%	25%	17%	26%	23%	21%	57%	20%	27%	50%	8%	22.1%
1922/23	14%	29%	31%	39%	42%	31%	86%	27%	35%	55%	25%	31.0%
1923/24	21%	39%	32%	47%	55%	40%	159%	36%	41%	73%	33%	40.4%
1924/25	38%	51%	74%	69%	82%	58%	209%	66%	60%	89%	53%	62.7%
1925/26	65%	74%	120%	84%	119%	87%	205%	85%	72%	124%	69%	89.4%
1926/27	81%	89%	150%	95%	124%	88%	102%	99%	89%	126%	99%	101.4%
1927/28	99%	91%	153%	105%	174%	123%	314%	110%	109%	116%	93%	118.4%

Sources: For quantities, see Tables A23 to A36. Weights in industry gross value added at 1913 prices are from USSR, *Sbornik ... 1918-1923 gg.*, p. 198).

Table A14. Industry gross value of output, 1913 to 1927/28, alternative estimates: Soviet Union, billion prewar rubles

	Large-scale			Small-scale
	(A)	(B)	(C)	(D)
1913	5.62	...	6.39	2.04
1914	5.69	...	6.43	2.00
1915	6.39	...	7.06	1.60
1916	6.83	...	7.42	1.80
1917	4.34	...	4.78	1.60
1918	1.91	1.85	2.16	1.50
1919	1.45	0.96	0.95	1.00
1920	0.98	0.82	0.82	0.90
1921	1.49	1.17	1.08	1.00
1922	1.95	1.52	1.44	1.10
1922/23	2.54	2.17	2.13	1.20
1923/24	...	2.59	2.59	1.46
1924/25	...	4.14	3.96	1.69
1925/26	...	6.02	5.72	1.86
1926/27	...	6.89	6.72	2.04
1927/28	...	8.43	...	...

Sources: A. Gukhman, *Produksiia* (2e), p. 114.

B. USSR, *Statisticheskii spravochnik ... 1928*, pp. 302-311.

C and D. Akademii nauk, *Sovetskoe narodnoe khoziaistvo ... 1921-25*, citing *Planovoe khoziaistvo* 1929, no. 5, p. 191.

Table A15. Industry gross value of output, 1913 to 1927/28, alternative estimates: Soviet Union, percent of 1913

	Large scale industry				All industry			
	Gosplan (1929)	TsUNKhU (1939)	TsSU (1957)	Maevskii (1957)	Gosplan (1929)	TsSU (1964)	Nutter (1962)	
Prices	1926/27	1926/27	1926/27	1926/27	1913	1926/27	1913	1928
1913	100	100	100	100	100	100	100	100
1914	101	101	...	102	100	...	110	113
1915	110	114	...	118	103	...	107	109
1916	116	122	...	120	109	...	111	112
1917	75	63	63	85	76	71	92	92
1918	34	35	...	...	43	...	40	43
1919	15	26	...	...	23	...	24	21
1920	13	14	14	...	20	22	22	19
1921	17	20	21	...	25	31	24	21
1922	23	26	...	...	30	41	34	34
1923	33	39	...	...	40	...	43	43
1924	41	46	46	...	48	51	53	52
1925	62	76	75	...	67	73	73	75
1926	90	108	108	...	90	98	91	91
1927	105	124	122	...	104	111	101	98
1928	127	154	152	...	120	132	103	100

Source. Poletaev, "Ekonomicheskie krizisy," pp. 186-256).

Table A16. Construction materials: Soviet territory, per cent of 1913

	Cement	Red bricks	Window glass	Sawn timber	Total
1913	100%	100%	100%	100%	100.0%
1914	119%	110%	93%	85%	101.5%
1915	93%	64%	77%	64%	74.6%
1916	88%	43%	53%	49%	58.3%
1917	58%	31%	30%	47%	41.8%
1918	6%	15%	13%	23%	14.3%
1919	...	9%	7%	17%	10.9%
1920	2%	9%	5%	12%	7.1%
1921	4%	4%	4%	14%	6.9%
1922	10%	6%	10%	26%	12.9%
1922/23	15%	10%	18%	39%	20.3%
1923/24	24%	14%	24%	47%	27.5%
1924/25	48%	23%	43%	69%	45.7%
1925/26	88%	47%	61%	84%	69.9%
1926/27	108%	65%	70%	95%	84.7%
1927/28	126%	82%	88%	105%	100.3%

Source. Calculated from Tables A24 and A28. The total is the unweighted mean of the component series in each year.

Table A17. Rail and water transport, 1913 to 1927/28: physical units and percent

	Railways			Water-ways	Rail and waterways, total	
	Freight	Pass-engers	Convent-ional*		Ton/km	% of
	<i>Ton/km billion</i>	<i>Person /km, bn</i>	<i>Ton/km billion</i>	<i>Ton/km billion</i>	<i>Ton/km billion</i>	<i>1913</i>
<i>Russian Empire exc. Finland and Poland</i>						
1913	76.8	29.7	106.5	...	...	100.0%
1914	74.7	38.5	113.2	...	...	106.3%
1915	83.0	53.2	136.2	...	...	127.9%
1916	96.1	49.5	145.7	...	...	136.8%
1917	63.0	22.0	85.0	...	...	79.8%
<i>Soviet interwar territory</i>						
1913	65.7	25.2	90.9	29.0	119.9	100.0%
1914	61.1	32.7	93.8	...	...	103.2%
1915	73.6	45.2	118.8	...	...	130.6%
1916	88.7	42.1	130.8	...	...	143.8%
1917	61.1	18.7	79.8	15.0	94.8	79.0%
1918	13.8	8.2	22.0	3.3	25.2	21.0%
1919	17.5	10.4	27.9	4.2	32.0	26.7%
1920	11.4	6.7	18.1	2.7	20.8	17.4%
1921	14.0	8.3	22.3	3.3	25.6	21.3%
1922	18.0	10.6	28.6	4.3	32.9	27.4%
1922/23	23.5	13.9	37.4	5.6	43.0	35.8%
1923/24	33.7	15.4	49.1	8.0	57.1	47.6%
1924/25	47.4	19.0	66.4	8.6	75.0	62.5%
1925/26	68.9	23.4	92.3	12.5	104.8	87.4%
1926/27	81.7	22.1	103.8	14.8	118.6	98.9%
1927/28	88.2	23.6	111.8	16.0	127.8	106.6%

Note:

* Conventional ton/kilometres sum freight and passenger traffic, converting one passenger/kilometre to one ton/kilometre of freight.

Sources. Russian Empire: All figures are from Westwood, "Transport," pp. 305, 309, except 1916. For 1916 we interpolate railway freight on the figure for Soviet territory, taking into account the divergent trends of Russian and Soviet railway freight in 1917 relative to 1915. The figure for passenger transport is then interpolated on freight transport, again adjusting for the different trends of freight and passenger transport across adjacent years.

Soviet territory: Figures for 1913 in real terms, again from Westwood, "Transport," pp. 305, 309, are extrapolated through subsequent years as follows. For railway freight we use index numbers from an unpublished appendix to Poletaev, "Ekonomicheskie krizisy," that closely match series reported by Westwood. For railway passenger transport we use 1913-based index numbers reported by Poletaev for 1922 through 1928; for the intervening years, we interpolate up to 1917 on passenger transport in the Russian Empire and, from 1918 to 1921, on freight transport, taking into account the divergent trends of freight and passenger transport from 1917

to 1922/23. We ignore the index number for passenger traffic in 1917 cited by Poletaev which, translated into real terms, gives a figure for Soviet territory as large as that for the entire Russian Empire. For water transport we have figures in real terms only for 1913, 1917, 1923/24, and 1927/28. We interpolate missing years on railway freight transport, again adjusting for the different trends across benchmark years.

Table A18. Trade, 1923/24 to 1927/28: Soviet Union, persons employed

	Persons
	000
1922/23	286
1923/24	279
1924/25	420
1925/26	532
1926/27	582
1927/28	599

Sources. 1922/23: Vovsi, *Trud*, p. 8, from a census of 1923.

1923/24-1927/28: USSR, *Statisticheskii spravochnik ... 1928*.

Table A19. Civilian services, 1923/24 to 1927/28: Soviet Union, persons employed

	Finance	Govern- ment	Edu- cation	Medical services	Commu- nications	Domestic service
	000	000	000	000	000	000
1920	...	...	...	111	...	...
1921	...	...	...	103	...	...
1922	...	...	...	117	...	...
1922/23	31	923	421	179	92	0
1923/24	48	947	484	244	76	133
1924/25	66	1004	551	271	82	193
1925/26	82	1127	603	324	94	253
1926/27	85	1164	714	365	95	317
1927/28	86	1135	781	405	95	317

Sources. 1920-1923: Employment in medical services is based on USSR, *Itogi ... 1917-1927*, pp. 104-5.

1922/23: Vovsi, *Trud*, p. 9.

1923-1927: USSR, *Statisticheskii spravochnik ... 1928*.

Table A20. Military services, 1913 to 1927/28: persons employed

	Armed forces of Russia and USSR		Anti- Bolshevik forces	Total
	(A)	(B)	(C)	(D)
	000	000	000	000
<i>Russian Empire exc. Finland and Poland</i>				
1913	1,286	1,423	...	1,423
1914	1,321	2,405	...	2,405
1915	5,500	6,425	...	6,425
1916	10,900	9,108	...	9,108
1917	9,050	7,992	...	7,992
<i>Soviet interwar territory</i>				
1913	...	1,239	...	1,239
1918	...	313	50	363
1919	1,550	1,867	300	2,167
1920	3,050	4,139	75	4,214
1921	5,500	3,113	...	3,113
1922	3,600	1,590	...	1,590
1922/23	2,100	703	...	703
1923/24	562	562	...	562
1924/25	562	562	...	562
1925/26	562	562	...	562
1926/27	562	562	...	562
1927/28	562	562	...	562

Sources. A. The National Material Capabilities data set (v. 4.0) available from correlatesofwar.org, described by Singer, "Reconstructing."

B. 1913-1917: Calculated from Golovin, *Voennye usiliia*, pp. 166, 186. The figure given for Soviet territory in 1913 under column (B) is notional, and represents the Russian Empire figure for the same year adjusted in proportion to the official population figures for the two territories shown in Table 2. Figures for 1918 to 1921 are calculated from Kariaeva, *Direktivy*, pp. 15-227, and those for 1922 to 1927 are from USSR, *Itogi ...1917-1927*.

C. An arbitrary allowance.

D. The sum of B and C.

Table A21. Correction factors for agriculture

	Period	Factor
Grains	1913-1917	1.19
Grains	1918-1919	1.072
Potatoes	1913-1919	1.283
Horses	1913-1919	1.199
Cattle	1913-1919	1.416
Pigs	1913-1919	1.897
Sheep and goats	1913-1919	1.504

Sources. For discussion of the underreporting of agricultural production in peacetime and wartime, see the text. Correction factors are applied to grains on the authority of Wheatcroft, "Agriculture," and Wheatcroft and Davies, "Agriculture"; to potatoes following Gukhman, *Produktsiia* (1e), cited by Wheatcroft and Davies, "Agriculture"; and to horses, cattle, and pigs following Vainshtein, *Narodnoe bogatstvo*. The correction factor for sheep and goats is the arithmetic mean of the three Vainshtein correction factors for other livestock.

Table A22. Agriculture, 1913 to 1928: physical units

	Livestock										
	Grains	Potatoes	Horses	Cattle	Sheep and goats		Industrial crops				
					Pigs	Flax fibre	Hemp fibre	Flax seed	Hemp seed	Cotton	
<i>Tons</i> <i>000</i>	<i>Tons</i> <i>000</i>	<i>Head</i> <i>000</i>	<i>Head</i> <i>000</i>	<i>Head</i> <i>000</i>	<i>Head</i> <i>000</i>	<i>Tons</i> <i>000</i>	<i>Tons</i> <i>000</i>	<i>Tons</i> <i>000</i>	<i>Tons</i> <i>000</i>	<i>Tons</i> <i>000</i>	
<i>Weights</i>	51.0%	14.0%	7.0%	7.0%	7.0%	7.0%	3.5%	...	...	...	3.5%
<i>Russian Empire exc. Finland and Poland</i>											
1913	99,176	32,699	39,099	69,495	110,034	25,948	861	...	...	...	199
1914	82,155	34,225	40,606	70,831	107,821	27,581	579	...	...	...	218
1915	93,212	28,958	38,344	67,462	112,540	23,790	512	...	...	...	255
1916	79,406	19,431	36,100	61,092	127,281	20,832	498	...	...	...	212
1917	80,912	26,091	31,978	53,541	101,166	20,141	460	...	...	...	113
1918	53,437	23,109	30,911	48,245	89,312	15,958	420	...	...	...	120
1919	44,654	24,246	29,844	42,948	77,459	11,774	315	...	...	...	62
<i>Russian Empire territory (exc. Finland and Poland) under government control</i>											
1913	99,176	32,699	39,099	69,495	110,034	25,948	861	...	...	...	199
1914	82,155	34,225	40,606	70,831	107,821	27,581	579	...	...	...	218
1915	86,002	26,714	37,299	64,803	110,398	21,526	475	...	...	...	255
1916	71,413	16,276	35,458	59,856	125,797	19,672	471	...	...	...	212
1917	73,873	24,391	29,724	49,768	94,036	18,722	368	...	...	...	113

Table A22 (continued)

	Livestock						Industrial crops				
	Grains	Potatoes	Horses	Cattle	Sheep and goats	Pigs	flax fibre	hemp fibre	flax seed	hemp seed	cotton
<i>Soviet interwar territory</i>											
1913	88,934	25,640	35,638	61,096	101,526	20,546	928	...	...	...	233
1914	73,428	27,112	36,969	61,359	99,209	22,009	618	...	...	...	279
1915	82,919	24,404	35,207	59,151	105,047	18,423	533	...	...	...	326
1916	69,920	14,045	31,506	49,966	83,176	19,587	537	307	563	289	265
1917	72,054	21,752	28,078	47,012	88,829	17,685	539	...	...	...	141
1918	46,920	20,291	27,141	42,361	78,421	14,011	369	...	...	...	120
1919	39,209	21,289	26,205	37,711	68,013	10,338	277	...	...	...	62
1920	34,111	20,863	25,412	39,101	51,030	14,830	263	257	...	...	46
1921	27,668	21,343	23,331	36,818	49,721	12,491	286	216	...	...	34
1922	46,971	22,889	18,875	33,031	40,022	7,637	319	291	279	257	72
1923	45,895	33,089	20,035	38,567	56,745	9,105	305	316	312	313	140
1924	51,581	36,237	24,980	57,690	98,389	19,254	430	321	303	268	346
1925	72,657	38,606	26,440	60,781	114,502	18,946	367	483	576	548	565
1926	76,562	42,969	28,772	64,074	121,671	18,249	315	431	536	529	559
1927	71,719	41,218	30,727	66,203	131,768	22,552	292	511	518	596	718
1928	71,542	39,904	32,207	67,124	137,138	25,367	365	489	563	534	891

Note: All figures in the original sources cited below have been multiplied by the correction coefficients in Table A21, for reasons given in the text.

Sources.

Russian Empire territory exc. Finland and Poland:

1913-1917: Grains, potatoes, livestock, and cotton are from RSFSR, *Narodnoe khoziaistvo v 1916*. Grains are computed as the sum of winter and oats, barley, spring rye and wheat, buckwheat, and millet. Original data for 1916 and 1917 do not cover the entire territory of the Empire because of the occupation of western provinces and the failure of some interior provinces to report to the centre. Adjustments are based on the weights of missing provinces in 1913-1915. Russian *pudy* are converted at 61.04821 per metric ton.

1917: livestock are from RSFSR, *Statisticheskii ezhegodnik 1918-1920*. Original data for 34 provinces are multiplied by a factor of 82/34 for the 82 provinces of the Empire. An alternative correction would use population weights.

1918-1919: grains, potatoes, livestock, and cotton are from *Ibid.* Original data for 34 provinces are multiplied by a factor of 82/34 for Empire territory.

Soviet interwar territory:

1913-1917: grains and potatoes are calculated from RSFSR, *Svodnye statisticheskie tablitsy za 1913-1916*.

1913-1917: livestock are calculated from *Ibid.* up to 1915; for 1916, from USSR, *Sbornik ... 1918-1923*, pp. 136-137; for 1917, from RSFSR, *Statisticheskii ezhegodnik 1918-1920*. Original data for 34 provinces are multiplied by a factor of 72/34 for the 72 provinces of the interwar Soviet Union

1913-1917: cotton is from RSFSR, *Svodnye statisticheskie tablitsy za 1913-1916*.

1918-1919: grains, potatoes, livestock, and cotton are from RSFSR, *Statisticheskii ezhegodnik 1918-1920*. Original data for 34 provinces are multiplied by a factor of 72/34 for Soviet interwar territory.

1918-1923: cotton is from USSR, *Narodnoe khoziaistvo za 70 let*.

1920-1921: grains, potatoes, livestock, and flax are from USSR, *Sbornik statisticheskikh svedenii ... 1918-1923*, pp. 131, 135).

1922: potatoes, livestock, and flax are from *Ibid.*

1923: potatoes are from Gukhman, *Produksiia* (1e), p. 133.

1922-1923: grains are from USSR, *Narodnoe khoziaistvo ... v tsifrakh*, p. 83).

1924: grains, potatoes, flax, hemp, and cotton are from USSR, *Itogi desiatiletiia ... 1917-1927*, p. 119.

1924-1926: livestock are from *Ibid.*, p. 188.

1925-1928: grains, potatoes, flax, hemp, and cotton are from USSR, *Sel'skoe khoziaistvo ... 1925-1928*, pp. 221, 249-261).

1927-1928: livestock are from *Ibid.*, p. 221.

Table A23. Large-scale industry, 1913 to 1917: the Russian Empire, physical units

	Coal	Anth- racite	Oil	Peat	Pig iron	Open hearth steel	Rolled steel	Aircraft	Gasoline	Solar oil	Flour	Raw spirit
	<i>Tons</i>	<i>Tons</i>	<i>Tons</i>	<i>Tons</i>	<i>Tons</i>	<i>Tons</i>	<i>Tons</i>	<i>Units</i>	<i>Tons</i>	<i>Tons</i>	<i>Tons</i>	<i>Grams</i>
	<i>000</i>	<i>000</i>	<i>000</i>	<i>000</i>	<i>000</i>	<i>000</i>	<i>000</i>		<i>000</i>	<i>000</i>	<i>000</i>	<i>million</i>
1913	30631	4077	8876	1458	4186	4302	3560	280	29.2	77.0	1713	87101
1914	30288	4366	8896	1649	4062	4442	3625	535	25.0	69.9	1528	79972
1915	31212	3258	9197	1417	3667	4098	3249	1305	22.0	39.8	1520	93307
1916	32018	2150	9723	1360	3779	4252	3356	1870	...	...	1659	83351
1917	28615	5189	8198	1163	3121	2549	...	1897	...	...	1761	...

Sources: RSFSR, *Statisticheskii sbornik za 1913-17*; RSFSR, *Svodnye statisticheskie tablitsy za 1913-1916*.

Table A24. Large-scale industry on Soviet territory, 1913 to 1927/28: Stone and glass, physical units

	Cement	Red brick	Window glass
	<i>Casks</i>	<i>Units</i>	<i>Tons</i>
	<i>000</i>	<i>million</i>	
1913	9275	2143.6	403255
1914	10996	2353.6	374344
1915	8632	1374.2	310230
1916	8167	921.5	214011
1917	5425	674.1	121789
1918	578	314.5	53351
1919	42	188.8	28224
1920	222	189.7	18919
1921	397	94	17600
1922	888	129	41600
1922/23	1385	215.6	70858
1923/24	2250	303.5	98122
1924/25	4454	486.3	174563
1925/26	8144	1007.9	246078
1926/27	10056	1397.8	281788
1927/28	11661	1765	356200

Sources. 1917: USSR, *Itogi ... 1917-1927*, pp. 244-247.

1918-1928: USSR, *Statisticheskii spravochnik ... 1928*, pp. 302-311.

1913-1927/28: Kafengaus (1994/1930, *Evoliutsiia*), pp. 354-551.

Table A25. Large-scale industry on Soviet territory, 1913 to 1927/28: Mining, physical units

	Coal and lignite	Anthracite	Lignite	Oil	Peat	Coke	Iron ore	Copper ore	Manganese	Sulphur pyrites	Chrome ore	Asbestos	HCl salts
	<i>Tons million</i>	<i>Tons million</i>	<i>Tons million</i>	<i>Tons 000</i>	<i>Tons million</i>	<i>Tons million</i>	<i>Tons million</i>	<i>Tons 000</i>	<i>Tons million</i>	<i>Tons 000</i>	<i>Tons</i>	*	<i>Tons 000</i>
1913	24.257	4.706	9.235	9235	1.724	...	9.215	1117	1.254	66.2	25979	22490	1978
1914	26.813	5.137	9.132	9132	1.814	...	6.539	999	0.906	131.3	9828	15905	1933
1915	26.443	5.037	9.305	9305	1.635	...	5.269	838	0.537	158.8	7207	10172	2003
1916	28.935	5.511	9.880	9880	1.608	...	6.635	762	0.472	364.5	4259	12171	2602
1917	26.232	4.997	8.725	8725	1.391	...	4.955	607	0.382	206.3	13694	6274	1804
1918	10.894	2.075	3.842	3842	1.099	...	0.772	135	0.065	...	868	1360	1321
1919	7.805	1.487	4.614	4614	1.187	...	0.183	64	0.056	...	115	672	610
1920	7.186	1.369	3.831	3831	1.526	...	0.164	4	0.097	...	2965	1458	740
1921	7.002	1.528	...	4001	2.027	...	0.129	4	...	...	...	...	983
1922	7.317	1.723	4.646	4912	2.137	...	0.244	13	0.066	6.3	966	3391	743
1922/23	8.604	2.035	5.271	5271	2.376	...	0.481	62	0.320	18.5	672	6028	1040
1923/24	12.659	2.530	6.069	6069	2.821	0.725	1.043	100	0.427	24.9	7273	8469	1207
1924/25	13.138	3.334	7.060	7060	2.680	1.356	2.083	178	0.573	46.0	30648	12318	1356
1925/26	20.180	5.351	8.323	8323	3.510	2.761	3.307	381	0.970	95.0	26667	18297	1587
1926/27	25.220	6.798	10.284	10284	4.813	3.415	4.804	541	0.840	167.4	18060	21056	2088
1927/28	26.439	8.074	...	11509	5.040	...	5.357	647	0.737	...	...	...	2428

Source. As Table A24. Note: * Units not reported.

Table A26. Large-scale industry on Soviet territory, 1913 to 1927/28: Metallurgy, physical units

	Sheet Iron	Sheet steel	Rolled steel	Copper	Zinc	Lead	Silver	Rails
	<i>Tons</i>	<i>Tons</i>	<i>Tons</i>	<i>Tons</i>	<i>Tons</i>	<i>Tons</i>	<i>Tons</i>	<i>Tons</i>
	<i>000</i>	<i>000</i>	<i>000</i>	<i>000</i>				<i>000</i>
1913	4216	4247	3509	32.3	2948	1371	4.1	645
1914	4082	4400	3582	32.3	2408	1082	2.4	706
1915	3685	4106	3257	26.0	1884	819	2.0	561
1916	3798	4273	3372	23.6	1523	901	0.9	408
1917	3023	3080	2444	18.5	...	41	...	195
1918	516	402	357	4.0	...	...	...	19
1919	113	199	179	...	...	...	...	35
1920	115	162	147	...	82	193	...	21
1921	116	182	224	...	...	...	...	...
1922	188	317	250	10.8	...	328	0.4	6
1922/23	300	615	474	2.3	16	405	2.6	65
1923/24	680	993	690	2.8	508	643	2.8	93
1924/25	1292	1873	1390	7.6	1491	876	4.2	169
1925/26	2202	2911	2250	11.6	1867	1273	10.0	295
1926/27	2961	3592	2744	13.7	2266	1027	12.6	313
1927/28	3282	4104	3232	...	...	...	...	...

Source: As Table A24.

Table A27. Large-scale industry on Soviet territory, 1913 to 1927/28: Machine building and metalworking, physical units

	Aircraft	Tractors	Ploughs	Harrows	Seeders	Threshers	Winnow- ers and sorters	Reapers and mowers	Steam engines	Pass- enger wagons	Freight wagons
	<i>Units</i>	<i>Units</i>	<i>000</i>	<i>Units</i>	<i>Units</i>	<i>Units</i>	<i>Units</i>	<i>Units</i>	<i>Units</i>	<i>Units</i>	<i>Units</i>
1913	280	1	667	...	68300	110180	49000	111000	654	1031	13801
1914	535	0	...	...	...	...	...	...	763	1223	20385
1915	1305	0	...	...	...	...	...	...	917	886	23486
1916	1870	0	133	...	13688	22000	...	22200	600	502	16792
1917	1897	0	50	6500	...	15200	3200	7600	420	298	12702
1918	255	0	13	100	...	100	500	600	...	...	...
1919	137	0	23	1000	...	100	800	1000	...	...	...
1920	166	0	89	2600	9900	1200	3300	2300	...	...	...
1921	13	0	101	6200	5000	1700	2000	1700	...	...	...
1922	44	0	159	15400	8500	19700	8800	19700	...	...	...
1922/23	146	2	207	26800	10700	25900	11600	25900	...	...	...
1923/24	208	10	174	125800	9700	13600	21300	13600	...	...	...
1924/25	326	481	582	174500	29980	35600	57600	55800	...	...	...
1925/26	469	813	945	310200	61995	54700	94800	88100	...	...	...
1926/27	575	781	1037	355390	58065	66472	141974	170501	...	...	...
1927/28	870	1332	1167	590028	55123	84025	194052	244895	...	...	...

Source: As Table A24.

Table A28. Large-scale industry on Soviet territory, 1913 to 1927/28: Woodworking, physical units

	Sawn timber	Ply- wood
	<i>Cu. m</i> <i>million</i>	<i>Cu. m</i> <i>000</i>
1913	11875	24556
1914	10062	40459
1915	7657	42583
1916	5813	45905
1917	5578	54652
1918	2754	...
1919	2008	...
1920	1484	...
1921	1710	...
1922	3057	3330
1922/23	4584	22995
1923/24	5621	52600
1924/25	8165	84500
1925/26	9943	118000
1926/27	11322	137435
1927/28	12458	...

Source: As Table A24.

Table A29. Large-scale industry on Soviet territory, 1913 to 1927/28: Chemicals, physical units

	Caustic soda	Baking soda	House- hold soap	Rubber foot- wear	Sul- phates	Nitric acid	Hydro- chloric acid	Sul- phuric acid	Conc. sul- phuric acid	Paints	Gasoline	Lighting oil	Solar oil	Resi- dual oils	Mat- ches
	<i>Tons</i>	<i>Tons</i>	<i>Boxes 000</i>	<i>Pairs 000</i>	<i>Tons</i>	<i>*</i>	<i>*</i>	<i>*</i>	<i>*</i>	<i>*</i>	<i>Tons 000</i>	<i>Tons 000</i>	<i>Tons 000</i>	<i>Tons 000</i>	<i>Boxes 000</i>
1913	49338	159873	94892	27885	70649	9992	60737	132786	51142	3243	262.6	1553	144.1	4127	3753
1914	52565	144378	96252	23164	41033	8665	42376	98414	43441	3964	179.3	1366	111.6	4132	4092
1915	46291	117071	111273	23769	54973	16626	31582	156172	79773	1114	91.3	1153	76.1	5514	2940
1916	49205	135647	111273	19695	49010	25390	39263	184980	73704	164	223.5	1164	112.9	3713	2900
1917	40017	101307	87341	17402	30502	20197	39354	194693	85224	410	229.8	1223	147.8	3410	2280
1918	7797	18984	63835	5856	14489	5602	21726	45197	24586	213	18.7	386	36.9	956	1019
1919	1671	4056	7579	2616	3623	3178	4875	22403	17418	98	50.9	524	23.2	1643	1008
1920	...	11212	11475	10	9999	1769	16734	16911	6952	49	36.2	396	103.8	1115	633
1921	...	...	8348	626	...	...	...	...	...	...	67.0	532	32.0	2167	782
1922	10631	32170	11603	8568	...	...	17780	36491	6843	524	83.0	565	39.0	2258	1031
1922/23	19384	55120	20263	9971	15398	...	23440	51848	12489	1605	140.3	613	242.0	2190	1425
1923/24	29550	78151	41197	6178	26176	...	38380	84818	22146	1458	223.4	789	275.1	2399	1883
1924/25	35742	98447	74957	15731	23408	...	35906	106064	23424	3800	406.6	1132	355.1	2927	3162
1925/26	43621	136728	101690	25302	27912	...	43310	147949	24047	8485	603.0	1324	521.6	3191	3955
1926/27	51437	171445	129623	29631	29824	...	46481	167705	32986	...	775.2	1740	482.5	3705	4250
1927/28	55734	209011	156097	36004	...	...	...	...	...	...	934.0	2047	655.0	4683	5554

Source: As Table A24.

Note: * Units not reported.

Table A30. Large-scale industry on Soviet territory, 1913 to 1927/28: Food, beverages, and narcotics, physical units

	Beet sugar	Vinegar	Candle wax	Gly- cerin	Cigar- ettes	Makh- orka	Butter	Beer	Starch	Molasses	Flour	Groats	Raw spirit
	<i>Tons</i>	*	*	<i>Tons</i>	<i>Units</i>	<i>Tons</i>	<i>Tons</i>	<i>Hectol.</i>	<i>Tons</i>	<i>Tons</i>	<i>Tons</i>	<i>Tons</i>	<i>Hectol.</i>
	<i>million</i>				<i>trillion</i>			<i>000</i>			<i>million</i>	<i>000</i>	<i>000</i>
1913	1794	7257	19100	4980	22.1	78676	...	8064	123673	54154	4938	218631	11564
1914	2130	5242	16348	17707	25.7	84654	...	5015	114357	110241	5496	243365	13443
1915	2578	6634	12482	15561	31.1	73304	...	136	97418	111027	7305	321582	6028
1916	2354	3833	10467	16184	29.4	82330	...	...	77578	93664	3888	172126	2005
1917	2030	1556	4292	2637	22.0	81564	...	...	58495	66996	...	...	476
1918	1166	770	2817	2850	12.7	28468	...	...	13497	30304	...	...	...
1919	394	442	...	...	12.0	18722	...	...	9370	17331	...	...	60
1920	98	246	...	...	4.8	21384	...	...	5831	8354	2977	203348	309
1921	65	...	...	...	5.1	11923	26754	...	...	...	...	...	504
1922	241	...	131	98	12.6	13252	55995	...	35415	5209	...	...	216
1922/23	248	410	573	442	10.8	19546	87652	989	...	17593	2673	182266	280
1923/24	499	770	1491	704	13.0	30599	127506	2276	51861	...	3524	180076	220
1924/25	753	983	3636	1769	26.3	46506	219320	2531	63702	20115	4231	277972	1004
1925/26	1507	1523	5111	3112	37.3	81458	327034	4084	99168	22277	5881	358499	4106
1926/27	1285	1770	4346	4310	40.7	82486	252922	4181	119320	26995	7060	250151	4726
1927/28	1637	...	...	...	49.0	83815	335070	...	...	...	6753	300000	5205

Source: As Table A24.

Table A31. Large-scale industry on Soviet territory, 1913 to 1927/28: Leather and fur, physical units

	Large hides	Small hides	Foot- wear	Pig bristle
	<i>Units</i>	<i>Units</i>	<i>Pairs</i>	<i>Tons</i>
	<i>000</i>	<i>000</i>	<i>000</i>	
1913	570	1203	8349	491
1914	1021	4872	9743	491
1915	1156	4353	8705	459
1916	1100	4919	9837	508
1917	1049	3587	7173	491
1918	3140	4764	4551	410
1919	2613	4517	3105	164
1920	2466	3665	2638	49
1921	3416	3274	3361	165
1922	3510	2856	3442	357
1922/23	4973	4676	4070	606
1923/24	6249	5379	4568	1294
1924/25	7385	9651	8200	1572
1925/26	8397	12521	10827	1376
1926/27	10163	13347	17035	...
1927/28	11554	15643	26246	...

Source: As Table A24.

Table A32. Large-scale industry on Soviet territory, 1913 to 1927/28: Cotton textiles, physical units

	Yarn	Un-bleached cloth
	<i>Tons</i>	<i>Metres</i>
		<i>000</i>
1913	270770	250064
1914	270311	...
1915	298207	...
1916	297945	...
1917	209638	120188
1918	118906	92992
1919	17986	15266
1920	13514	11984
1921	21819	10008
1922	71501	33118
1922/23	74394	65440
1923/24	101893	84196
1924/25	185050	157330
1925/26	240826	201857
1926/27	278101	237778
1927/28	316878	256836

Source: As Table A24.

Table A33. Large-scale industry on Soviet territory, 1913 to 1927/28: Woollen textiles, physical units

	Yarn	Un-bleached cloth	Finished fabric
	<i>Tons</i>	<i>Metres 000</i>	<i>Metres 000</i>
1913	46455	45063	...
1914	45521	44161	...
1915	46815	45407	...
1916	44244	44358	...
1917	32450	31483	78602
1918	24948	24194	60417
1919	9943	9632	24068
1920	8045	7338	18340
1921	6790	4583	14305
1922	13745	10694	23402
1922/23	14564	17237	29946
1923/24	19306	17855	33853
1924/25	27665	27664	51823
1925/26	32943	32943	66796
1926/27	41100	40606	85209
1927/28	52383	47240	78575

Source: As Table A24.

Table A34. Large-scale industry on Soviet territory, 1913 to 1927/28: Silk textiles, physical units

	Finished fabrics
	<i>Metres</i> <i>000</i>
1913	...
1914	...
1915	...
1916	...
1917	...
1918	...
1919	604
1920	429
1921	663
1922	2245
1922/23	3542
1923/24	2161
1924/25	2212
1925/26	5588
1926/27	6468
1927/28	9776

Source: As Table A24.

Table A35. Large-scale industry on Soviet territory, 1913 to 1927/28: Flax and hemp textiles, physical units

	Finished fabrics
	<i>Metres</i> <i>000</i>
1913	53253
1914	66751
1915	70076
1916	61198
1917	42360
1918	22605
1919	12367
1920	13104
1921	6605
1922	26678
1922/23	29402
1923/24	39038
1924/25	47536
1925/26	66003
1926/27	66860
1927/28	61979

Source: As Table A24.

Table A36. Large-scale industry on Soviet territory, 1913 to 1927/28: Paper and printing, physical units

	Cartons
	<i>Tons</i>
1913	38216
1914	34055
1915	28764
1916	19657
1917	11188
1918	4714
1919	2277
1920	1854
1921	1553
1922	2935
1922/23	9422
1923/24	12427
1924/25	20168
1925/26	26536
1926/27	37772
1927/28	35460

Source: As Table A24.

Table A37. GDP in 1913, 1917, and 1928: selected European countries in international dollars at 1990 prices and per cent

	GDP per	GDP, total, per	
	head, \$	cent of 1913	
	1913	1917	1928
United Kingdom	4921	113%	109%
Belgium	4220	84%	127%
Germany	3648	76%	111%
France	3485	79%	126%
Austria	3465	67%	104%
Finland	2111	77%	144%
Hungary	2098	75%	125%
Czechoslovakia	2096	...	148%
Romania	1741	...	77%
Greece	1592	55%	161%
Bulgaria	1534	...	99%
Russia	1488	82%	110%
Turkey	1213	75%	85%
Yugoslavia	1057	...	128%

Source. All figures are from or based on estimates by Angus Maddison at <http://www.ggd.net/maddison/>, except as follows: UK (1917) from Broadberry and Howlett, "United Kingdom," p. 208; Germany (1917) from Ritschl, "Pity," p. 45, midpoint of columns VI and VII); France (1917) from Hautcoeur, "Was the Great War?" p. 171; Austria and Hungary (1917) from Schulze, "Austria-Hungary's Economy," p. 83; Russia (1917 and 1928) from Table 5; Turkey (1917) is based on the statement by Pamuk, "Ottoman Economy," p. 120, that "by 1918 the GDP of the empire had declined by at least 30 per cent, and perhaps 40 per cent or more, from its prewar level."

Table A38. GDP per head in 1913 and average annual GDP per head growth, 1913 to 1928: selected countries

	Annual average growth of GDP per head 1913-1928	Natural log of GDP per head in 1913 and 1990 GK\$	Great War dummy
United Kingdom	0.57%	8.50127	1
Belgium	1.31%	8.34759	1
Germany	0.76%	8.20194	1
France	1.60%	8.15622	1
Austria	0.36%	8.15047	1
Finland	1.66%	7.65492	1
Hungary	0.94%	7.64874	1
Czechoslovakia	2.34%	7.64779	1
Romania	-2.34%	7.46222	1
Greece	2.26%	7.37275	1
Bulgaria	-1.53%	7.33563	1
Russia	-0.24%	7.30519	1
Turkey	-0.88%	7.10085	1
Yugoslavia	1.45%	6.96319	1
Denmark	1.34%	8.27180	0
Italy	1.08%	7.84932	1
Netherlands	2.30%	8.30623	0
Norway	1.59%	7.80262	0
Sweden	1.56%	8.03041	0
Switzerland	2.46%	8.35843	0
Ireland	0.00%	7.91425	1
Portugal	1.08%	7.13090	1
Spain	1.52%	7.62852	0
Australia	0.37%	8.54811	1
New Zealand	-0.01%	8.54714	1
Canada	1.01%	8.39999	1
United States	1.43%	8.57565	1
Argentina	0.82%	8.24197	0
Brazil	2.37%	6.69827	1
Chile	0.73%	8.00236	0
Colombia	1.25%	7.11964	0
Mexico	0.46%	7.45703	0
Peru	3.54%	6.93925	1
Uruguay	1.10%	8.10470	1
Venezuela	6.79%	7.00670	0
India	0.32%	6.51175	1
Indonesia and Timor	1.71%	6.77308	0
Japan	2.41%	7.23490	1
Philippines	2.29%	6.89568	1

	Annual average growth of GDP per head 1913-1928	Natural log of GDP per head in 1913 and 1990 GK\$	Great War dummy
South Korea	2.10%	6.76734	1
Taiwan	2.72%	6.59578	1
Malaysia	2.89%	6.80240	1
Sri Lanka	0.12%	7.11802	1

Source. Rows from the UK to Yugoslavia as Table A37; all other GDP figures are from or based on estimates by Angus Maddison at <http://www.ggd.net/maddison/>.

Table A38, note 1. Regression results: Dependent variable is GDP per head growth, 1913 to 1928 in natural logs

	1	2	3	4	5	6	7	8
	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Ln(GDP per head), 1913	-0.005*	-0.006*	-0.006*	-0.007**	-0.004*	-0.005**	-0.005*	-0.005*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)
Great War dummy		-0.009*		-0.009		-0.004		-0.004
		(0.005)		(0.005)		(0.003)		(0.003)
Soviet Union dummy			-0.018***	-0.015***			-0.016***	-0.015***
			(0.003)	(0.003)			(0.002)	(0.002)
Constant	0.054**	0.068**	0.057**	0.07**	0.045**	0.053***	0.049**	0.055***
	(0.024)	(0.027)	(0.025)	(0.027)	(0.020)	(0.019)	(0.020)	(0.019)
Excluding outliers (Venezuela and India)	No	No	No	No	Yes	Yes	Yes	Yes
R-squared	0.06	0.14	0.14	0.17	0.05	0.08	0.10	0.12
N	43	43	43	43	41	41	41	41

Note: robust standard errors are reported in parentheses.

Table A39. Real national income per head in the former Russian Empire and USSR, 1885 to 2006

	Gregory, rubles of 1913	M&H, rubles of 1913	Maddison, inter- national dollars of 1990	Harrison, rubles of 1937
1885	72.5	...		...
1886	69.7	...	...	...
1887	81.5	...	...	...
1888	78.4	...	...	...
1889	72.9	...	...	...
1890	72.6	...	...	...
1891	66.5	...	...	...
1892	72.8	...	...	...
1893	82.5	...	...	...
1894	93.8	...	...	...
1895	86.8	...	...	...
1896	95.6	...	...	...
1897	94.0	...	...	...
1898	96.5	...	...	...
1899	102.4	...	...	...
1900	100.2	...	1237	...
1901	102.7	...	...	...
1902	111.6	...	...	...
1903	103.9	...	...	...
1904	114.9	...	...	...
1905	101.7	...	...	...
1906	97.2	...	...	...
1907	93.4	...	...	...
1908	102.0	...	...	...
1909	105.9	...	...	...
1910	113.0	...	...	...
1911	104.4	...	...	...
1912	112.8	...	...	...
1913	118.5	122.0	1488	...
1914	...	116.5	...	...
1915	...	119.9	...	...
1916	...	106.6	...	...
1917	...	93.6	...	...
1918	...	57.3	...	...
1919	...	49.4	...	...
1920	...	49.6	...	...
1921	...	45.4	...	...
1922	...	52.7	...	...
1923	...	60.7	...	...
1924	...	76.9	...	...
1925	...	96.1	...	...

	Gregory, rubles of 1913	M&H, rubles of 1913	Maddison, inter- national dollars of 1990	Harrison, rubles of 1937
1926	...	107.9	...	...
1927	...	112.4	...	...
1928	...	118.2	1370	...
1929	1386	...
1930	1448	...
1931	1462	...
1932	1439	...
1933	1493	...
1934	1630	...
1935	1864	...
1936	1991	...
1937	2156	...
1938	2150	...
1939	2237	...
1940	2144	1309
1941
1942
1943	1363
1944
1945	1226
1946	1913	...
1947	2126	...
1948	2402	...
1949	2623	...
1950	2841	...
1951	2806	...
1952	2937	...
1953	3013	...
1954	3106	...
1955	3313	...
1956	3566	...
1957	3576	...
1958	3777	...
1959	3669	...
1960	3945	...
1961	4098	...
1962	4140	...
1963	3985	...
1964	4439	...
1965	4634	...
1966	4804	...
1967	4963	...
1968	5202	...

	Gregory, rubles of 1913	M&H, rubles of 1913	Maddison, inter- national dollars of 1990	Harrison, rubles of 1937
1969	5225	...
1970	5575	...
1971	5667	...
1972	5643	...
1973	6059	...
1974	6176	...
1975	6135	...
1976	6363	...
1977	6454	...
1978	6559	...
1979	6472	...
1980	6427	...
1981	6432	...
1982	6535	...
1983	6684	...
1984	6708	...
1985	6707	...
1986	6921	...
1987	6950	...
1988	7040	...
1989	7109	...
1990	6890	...
1991	6419	...
1992	5470	...
1993	4928	...
1994	4247	...
1995	4025	...
1996	3911	...
1997	3995	...
1998	3907	...
1999	4098	...
2000	4454	...
2001	4741	...
2002	5006	...
2003	5397	...
2004	5852	...
2005	6264	...
2006	6766	...

Sources. Gregory, 1885-1913 (Russian Empire territory): Gregory, *Russian National Income*, pp. 56-57.

M&H, 1913-1928 (Soviet interwar territory): Table 6.

Maddison, 1900, 1913, 1928-1940, and 1946-2006 (Soviet post-1945 territory): figures by Angus Maddison at <http://www.ggd.net/maddison/>.

Harrison, 1940, 1943, and 1945 (Soviet controlled territory): GDP from Harrison, *Accounting*, p. 92; population from *Ibid.*, p. 104, and Andreev, Darskii, and Khar'kova, "Otsenka," pp. 25-27.

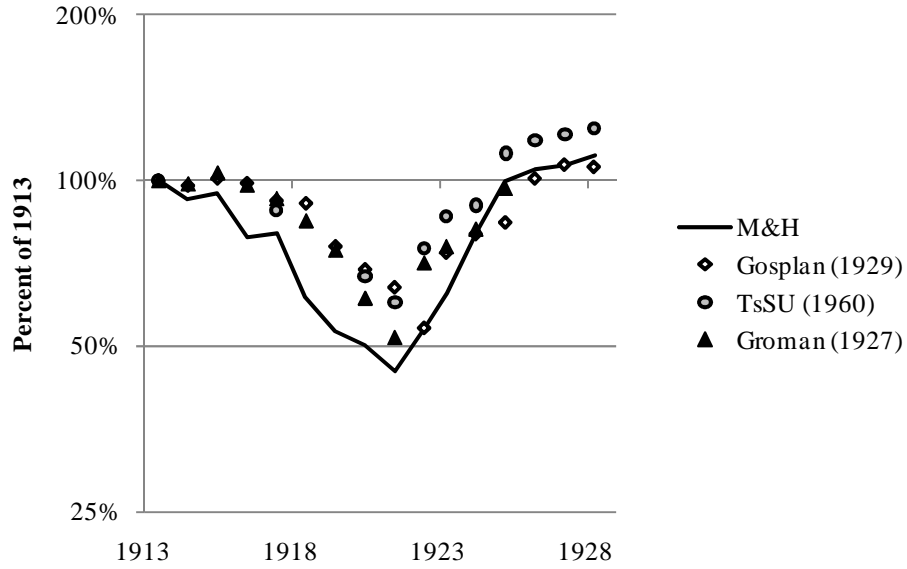
Note. In the text we use an estimate of the pre-1913 trend of national income per head. Using data from 1885 to 1912 (in rubles and 1913 prices), taking natural logs, with t ratios in brackets, and omitting 1913, we get:

$$\ln(INCOME) = -28.48 (7.535) + 0.01738 (8.731) \times YEAR; N = 28, R^2 = 0.7457.$$

Predicted income per head in 1913 is then 118 rubles 5 kopecks compared with measured 118 rubles 50 kopecks.

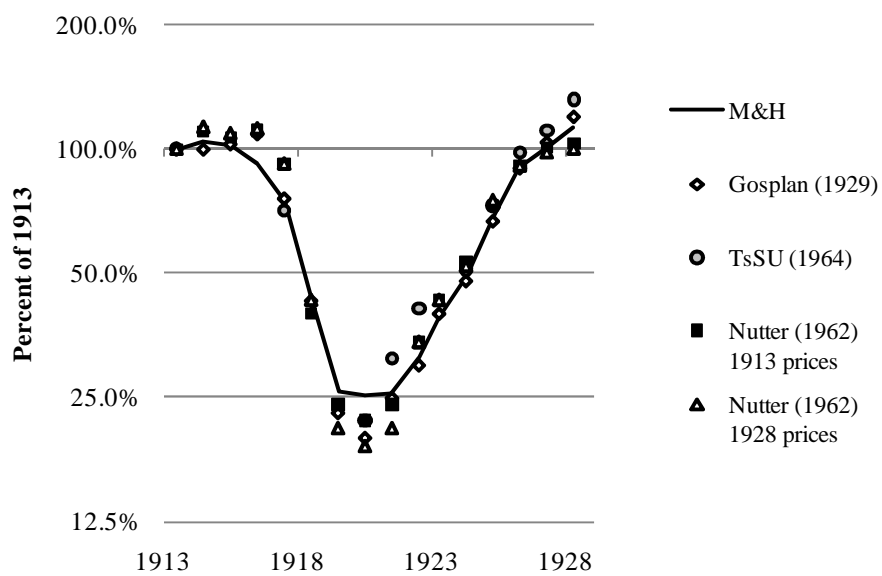
Figures

Figure A1. Agricultural Production on Soviet Territory, 1913 to 1928: Alternative estimates, per cent of 1913



Source. M&H from Table A11; other series from Table A12.

Figure A2. Industrial Production on Soviet Territory, 1913 to 1928: Alternative estimates, per cent of 1913



Source. M&H from Table 5; other series from Table A15.