Mar 2018 No.363

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WORKING PAPER SERIES

Centre for Competitive Advantage in the Global Economy

Department of Economics

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Abstract

This paper is a draft of the concluding chapter of *The industrialisation of Soviet Russia*, vol. 7: *The Soviet economy and the approach of war, 1937–1939*, in preparation for publication by Palgrave Macmillan. We consider the development of the Soviet economy over the period of the series, that is, from the launching of the first five-year plan and the collectivisation of agriculture to the outbreak of the Second World War. We review, in turn, the pattern of forced industrialisation, the measurement and mismeasurement of economic progress, the extraordinary militarisation of a mobilised society and economy, the emergence of the Soviet Union as a global military power, and the scope for reforms within the economic system that Stalin created and ruled over. Concluding, we ask what kind of economic development this was.

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Keywords: communism, economic development, economic growth, incentives, industrialisation, military power, mismeasurement, mobilisation, policy reform, power, Soviet Union, violence, war economy.

JEL Codes: H56, N44, P21.

This version: 1 March 2018.

Acknowledgements: Many people and organizations have contributed to the research for this volume, and we owe thanks to all of them. Various institutions have provided financial and other support. Davies thanks the Centre for Russian, European, and Eurasian Studies of the University of Birmingham; he remains grateful to the Economic and Social Research Council of the UK for its past support of the Soviet Industrialisation Project, the foundation of the present series. Harrison thanks the Department of Economics of the University of Warwick and its ESRC Centre for Competitive Advantage in the Global Economy. Khlevniuk thanks the Basic Research Program at the National Research University Higher School of Economics of the Russian Federation (HSE) and the Russian Academic Excellence Project '5-100' for research funding. Wheatcroft thanks the University of Melbourne, Nazarbayev University, Hokkaido University, and Deakin University, and the Australian Research Council for funding under Discovery Project 120104384.

Our work would have been impossible without access to the wonderful resources of the Russian state archives. We thank the directors and staff of the Archive of the President of the Russian Federation (APRF), the State Archive of the Russian Federation (GARF), the Russian State Economic Archive (RGAE), and the Russian State Archive of Social and Political History (RGASPI), for their sincere cooperation and unmatched expertise. We extend the same gratitude to the British National Archives and their director and staff.

We have been blessed in our colleagues and friends, who have freely given their time and experience to help us. We are deeply grateful to Mike Berry, who at the last minute dropped everything to assist with the final preparation of the text; and to Leonid Borodkin, Mikhail Denissenko, Jane Gatrell, Ian Gazeley, Yoram Gorlizki, Amanda Gregg, Saulius Grybkauskas, Paul Gregory, Melanie Ilič, Viktor Kondrashin, Debin Ma, Joe Maiolo, Andrei Markevich, Mikhail Nakonechnyi, Steven Nafziger, Evgeny Rebrov, Arfon Rees, Ivan Rodionov, and Filip Slaveski. Finally, we thank those nearest to us for their love and support through our project: Anne, Dasha, Maurice, Nicky, and Ragini.

The Soviet economy: the late 1930s in historical perspective

In eight volumes and a million words, we have narrated the development of the Soviet economy since 1928. The first of these volumes was the concluding instalment of the *History of the Bolshevik Revolution*, the great project begun by E. H. Carr after the Second World War (Carr and Davies 1969). That volume fixed the starting point for the industrialisation of the Soviet Union, at that time a country of thousands of factories and millions of farms, barely recovered from seven years of foreign and civil war, its economy strained between plan and market, pushed and pulled by a autocratic, modernising regime with shallow roots and vaulting ambitions.

In the present series, *The Industrialisation of Soviet Russia*, Volumes 1 to 3 narrated the dramatic transformations that Stalin set in motion in 1929 and 1930: the collectivisation of 25 million peasant farms, and the centralization of the entire economy under a hierarchy of plans and quantitative controls.[1] These changes were aimed at securing the basis of a vast effort to industrialise the country and modernise its economic and military power. While great steps were now taken towards these goals, the immediate result was a crisis of vast dimensions that spread across both town and countryside. In the context of unexpected harvest shortfalls in 1931 and 1932, Stalin's policies brought about a famine that carried away up to six million lives. The evolution of the crisis was recounted in Volumes 4 and 5.[2]

In the middle years of the decade, that is, from 1934 to 1936, the crisis receded. The harvest returned to a more normal level in 1933, and this was followed by a more general recovery. The recovery was promoted by a turn away from the extremes of 1929 and 1930. The more moderate policies of the mid-1930s included greater toleration of private farming and food markets, the limitation of repression and violence directed at managers and industrial specialists, and a more stable, predictable policy

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[1] R. W. Davies, *The industrialisation of Soviet Russia*, vol. 1, *The socialist offensive: the collectivisation of Soviet agriculture, 1929–1930* (1980); vol. 2, *The Soviet collective farm, 1929–1930* (1980); vol. 3, *The Soviet economy in turmoil, 1929–1930* (1989).

[2] R. W. Davies, *The industrialisation of Soviet Russia*, vol. 4, *Crisis and progress in the Soviet economy, 1931–1933* (1996); vol. 5 (with Stephen G. Wheatcroft), *The years of hunger: Soviet agriculture, 1931–1933* (2004).

This version: 1 March 2018.

framework. This allowed not only the recovery of agriculture and food distribution but also the belated completion of many projects begun in earlier years. There was an upsurge of industrial production and productivity. The progress of this period, described in Volume 6, was remarkable. [3]

On Western and post-Soviet measures of the Soviet Union's real national income, by 1939 the aggregate real output of the Soviet economy was twice that of the same territory in 1913. The natural increase of the Soviet population would no doubt have been slowed over the same period by the decline of fertility that normally accompanies economic growth, but wars, famine, and terror held it back additionally. By 1939, real output per person was 60 per cent greater than in 1913 (Table 1). But the comparison of two years separated by a quarter century does not reveal the pattern of growth, which was extremely unsteady. The figures for output per person show no growth from 1913 to 1932 and almost no growth from 1937 to 1939. The entire increase of output per person recorded between 1913 and 1939 was squeezed into the five years that began from the low point of 1932, after the failed harvest of that year, and ended in 1937 as the circle of repressions widened. Without those five years, there would have been no growth for a quarter of a century.

In 1937, as narrated in the present volume, the upsurge was suddenly halted, and progress was barely resumed by the outbreak of the Second World War. Certainly, economic expansion could not have been sustained for long at the pace of the mid-1930s. Not only was it vulnerable to the weather, as the harvest failure of 1936 demonstrated. It was now disrupted by the things that we have described: terror, mass killings, and accelerated mobilization for war.

Table 1 near here.

What did it all mean? This chapter reflects on the wider significance of these events. We will consider and briefly evaluate the pattern of Soviet industrialisation, the measures of its progress that were made available at the time and subsequently, the extraordinary militarisation of a mobilised society and economy, the emergence of the Soviet Union as a global military power, and the reformability of the economic system that Stalin created. Concluding, we will ask what kind of economic development was this.

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[3] R. W. Davies, *The industrialisation of Soviet Russia*, vol. 6 (with Oleg Khlevniuk and Stephen G. Wheatcroft), *The years of progress: the Soviet economy, 1934–1936* (2014).

(A) Forced industrialisation

In the late nineteenth and early twentieth centuries, the Russian Empire experienced rapid industrial growth. For the quarter-century from 1883/87 to 1909/13, industrial production expanded at 4.5 per cent annually, compared with 3.3 per cent for national income over the same period (Gregory 1982: 133). Despite the pace of industrial expansion, in 1913 only 15 percent of the population of the Empire lived in towns (*Rossiya* 1995: 23) and less than 9 per cent of the working population (within interwar Soviet frontiers) was employed in industry (Davies, ed., 1990: 251). Thus, Imperial Russia's market economy continued to retain a very large share of labour resources in agriculture. A sign of disproportion was that value added by Russian industry in 1913, expressed as a share of national income, was 21.4 per cent, more than twice industry's employment share (Gregory 1982: 73). Under the standard assumption of diminishing returns to labour, a considerable gain could have been made by accelerating the movement of workers into industry, but this gain was not realised.

Several hypotheses have been identified to account for Russia's relatively low level of industrialisation prior to the First World War. Alexander Baykov (1954) argued that industrialisation was delayed by the distances separating Russia's mineral resources from markets and labour and by poor internal communications. According to Alexander Gerschenkron (1966), the rigidity of rural institutions such as the peasant commune endowed peasants with inalienable land rights, and with collective responsibility for the obligations arising, and so created an incentive to retain labour in agriculture.[4] Subsequent scholarship suggested that the restrictions on peasant movement may not have been as binding as Gerschenkron supposed. Peasants were more than capable of working around the limits of the law, and were able to exchange land rights, engage in both local and distant markets for hired labour, and ultimately leave the land altogether (Gregory 994): 49-52; Nafziger 2010). It could not be assumed, however, that the peasants could do these things freely or that the workarounds did not come at a cost.

Other evidence suggests that agrarian markets were not fully efficient. The Stolypin land reforms of 1906 were followed by sharp increases of both peasant migration (Chernina et al. 2014) and agricultural productivity (Castañeda Dower and Markevich 2018) – evidence that the supplies of both food and labour from agriculture were previously limited

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[4] Gerschenkron wrongly maintained that (for this reason) the labour productivity of Russian agriculture stagnated over the last quarter of the nineteenth century; for discussion see Wheatcroft (1991: 131).

by the communal land tenure that Stolypin aimed to undermine. At the same time, the experience of the First World War indicates that, as labour was mobilized from agriculture, peasants tended to reallocate effort in favour of land that was held communally, despite its lower productivity there, for the sake of the associated land rights and social insurance (Castañeda Dower and Markevich forthcoming). For these reasons it remains plausible to think of Russian agrarian institutions as a brake on industrialisation.

Other limitations on industrialization before the Revolution have been identified on the side of industry. Various mechanisms gave incumbent firms the power to raise profits by restricting output and raising prices, and also by restricting employment and reducing wages. These included legal obstacles to incorporation (Gregg and Nafziger 2016), the lack of legal obstacles to the formation of cartels that restricted competition at home (Kaser 1978), and tariff barriers that limited foreign competition (Kahan 1967). (See also discussion by Cheremukhin et al. 2017.) Thus, Russia's business institutions are also a plausible source of frictions impeding industrialisation.

These findings suggest Russia's industrialization could have been accelerated by policy reforms aimed at both industry and agriculture. Consolidation of the Stolypin land reforms could have encouraged a land market and easier migration from the countryside. Legal reforms could have given private businesses easier access to the benefits of incorporation, making the capital market more competitive. In product markets, a competition policy could have discouraged collusive price-setting. The reform of commercial policy could have liberalized foreign trade. With an easier supply of labour, subject to fiercer competition, Russia's industries would have grown more rapidly still, despite making lower profits, and would have employed more workers, despite paying higher wages.

In the outcome, the Soviet economy achieved its industrial breakthrough by other means. All obstacles to the supply of labour to industry disappeared in the early 1930s, when millions of peasants were driven from the countryside by famine. The mechanism and the extent of its success were unintended, and the famine was accompanied by a return to restrictions on agrarian labour mobility (Vol. 4: 290-291). As for the obstacles on the side of industry, these too were overcome by compulsion. The state imposed compulsory quotas on producers and overrode cost constraints on output by guaranteeing financial losses, and the quotas forced output to higher levels (as argued by Allen 2003: 91-94). Industrialisation was violently accelerated. Between 1928 and 1940, the real growth of Soviet civilian industry was around 10 per cent per year (Davies et al. 1994: 292), and that of the defence industries was much

higher than that (Davies and Harrison 1997). By the time of the 1939 census, 33 per cent of the population lived in towns (up from 15 per cent in 1913), and 19 per cent of the employed population (up from 9 per cent) worked in industry (*Vsesoyuznaya perepis'* 1992: 22, 96).

The forced industrialization of the 1930s achieved a 'Great Breakthrough.' It changed the structure of the economy abruptly, pushing up the shares of industry in output and employment. The rush of labour up the productivity gradient from agriculture to industry should have improved allocation in the economy as a whole; it should have raised output per head across the economy, more rapidly in agriculture than in industry. But the outcome was different: it reduced productivity in both agriculture and industry, so that the overall results fell far short of expectations (Cheremukhin et al. 2017: 617–619). In the period of the first five-year plan, there was industrialisation without growth (Table 1 above).

Taking a longer view, the damage to productivity is not hard to understand. The working arrangements of all economic systems rely on incentives and norms of behaviour. The Bolshevik Revolution destroyed the old incentives and norms and struggled to replace them with new ones. Private property was confiscated in successive waves from the Revolution of 1917 to the collectivization of peasant farms, launched at the end of 1929. The waves of confiscation destroyed incentives to work, to save, and to innovate. The famine of the early 1930s arose from the interplay of unexpectedly poor weather with the confiscation of grain stocks to meet the needs of industrialization. Famine and the repression that accompanied it destroyed millions of lives. Later in the 1930s, the purges arose from the party leaders' need to secure their regime and from Stalin's calculation that the greatest danger to the regime arose from the 'potential' and even 'unconscious' enemies that were hiding around him and more widely in society. The purges also destroyed millions of lives by mass killing and ruined further millions by condemning the victims not killed at once to forced resettlement and slave labour. Their legacy, like that of collectivization, was a demoralized society characterized by mistrust and alienation from regime objectives and social norms.

An economy without incentives and without norms of behaviour to which most people are willing to conform soon collapses. Russia's economic history provides the clearest evidence for this in two episodes, one the meltdown of the economy of Soviet Russia immediately after the Revolution, and the other the collapse of Russia's economy at the end of communism.

It is reasonable to interpret the Soviet institutions built under Stalin in the 1930s as improvised to replace the market incentives to work, save, and innovate by substituting artificial incentives to do the same things.

These institutions were those described in our previous volumes: the compulsion to work, the wage and salary structures that established managers' and officials' promotion pathways, the bonuses for meeting quotas, the payments to collective farms for food surpluses, the charges levied on farms for state machinery services, the penalties for shirking and disloyalty, the systems for forced resettlement and forced labour by detainees, and the spectrum of real, artificial, and illegal markets for goods and labour services, including the calculation of collective farm labour contributions and their reimbursement. In their time, these institutions worked, even if they did not work optimally or efficiently. That they worked is shown by their resilience: the Soviet economy did not collapse in the face of famines (in 1933 and 1947) or of deep invasion (in 1941 and 1942). It collapsed only when the central political institutions fell to pieces (after 1987).

Despite this judgement, which some might interpret as favourable, it remains the case that the incentives provided by the Soviet economic system were always impaired and often perverse. The satisfaction of bureaucrats took precedence over the satisfaction of final consumers living in households and of intermediate consumers running businesses. High performance was rewarded at first, and then penalized by the burden of higher expectations. The value of rewards was uncertain; simulated effort was more likely to be rewarded than disruptive innovation.

The UK and US economies would share many of these features in the coming World War, when government priorities replaced market prices and administrative success indicators replaced profits (Broadberry and Howlett 1996; Rockoff 1996). The British and American war economies were distinguished from the Soviet economy, however, by the fact that their decision makers remained accountable to the rule of law and public opinion, with some limitations that, although important, were temporary, being confined to the war period. The absence of all such restraints in the Soviet economy permitted not only costly excesses of radicalism but also the mass incarceration and killing of people in very large numbers, including many who were only suspected of some potential disloyalty and many just to fill the quota. At work this was reflected in harsh penalisation of workers and managers, supposedly for mistakes or low effort, but there was a large random factor in the distribution of punishments, which encouraged everyone to shift their efforts from production to self-protection (Gregory and Harrison 2005). Thus, brakes on growth arose from everyday disincentives that were felt by many millions of people. The frictions could be overcome only by the still greater countervailing force of the state, expressed in a limited range of policies that relied on still more coercion.

Under Stalin the Soviet state became a near monopolist of land, productive capital, and housing, and a near monopsonist of labour. Used to the full, these powers were used to dramatic effect. Within twelve years, nearly one in five workers was shifted from lower-value jobs in agriculture to higher-value jobs in industry, transport, and construction. Over a similar period, nearly one third of GDP was taken out of private hands into the hands of the state.[5] The state used the extra one third in its hands to build national capacities of all kinds – productive capital in state-owned industry and transport, human capital through education, the intangible capital of shared knowledge arising from scientific and technological research, the state capacity necessary to mobilise society and direct efforts, and the military power embodied in a mass army equipped with large quantities of modernized weaponry.

To summarize, Russia began to industrialise before the First World War, and the economy expanded both in the aggregate and in output and consumption per head. By 1913, however, Russia's industrialisation was still quite limited. The sources of its limitation have been identified in both agriculture and industry. Agrarian property rights restricted the supply of resources from agriculture, and the structure of markets and corporate ownership limited the demand for them from industry. While policy reforms could have surmounted those obstacles within the framework of a market economy, the Bolsheviks chose an alternative path to industrialisation. Sweeping acts of confiscation and coercion broke through the limits. The pace of industrialisation that followed was without precedent in Russian history. But the industrialisation of the Soviet economy did not bring rapid or stable economic growth. Economic growth was limited, was not reflected in higher living standards, and was continually interrupted by periodic disasters that were either self-inflicted or, if they had some other origin, were made worse by the policy response.

(B) The measurement of economic performance

In its appearance, the pyramid structure of the Soviet planned economy was arranged so that orders could flow down from the Politburo to the productive units, becoming more detailed and more disaggregated at each level of the cascade. At the same time, information on the capacities and

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[5] One in five workers: the change in the share of the employed population between the census of December 1926 (using data adjusted for comparability) and January 1939, from Davies et al. eds 1994: 277). Nearly one third of GDP: the change in the GDP shares of government consumption and domestic investment between 1928 and 1940 (ibid., 272).

the performance of the productive units would flow upwards to the Politburo, providing it with the evidence base for the next round of orders.

The reality was somewhat different. The production of knowledge was highly politicised, and information flows were contaminated by political pressures at every level. From the Politburo, Stalin and other leaders set limits on what could be known, and on what facts would be politically acceptable. At every level, managers and others responsible for reporting primary data used their initiative to shape the flows of facts to the criteria of success and acceptability that were fixed from above.

In the present volume we have described in detail two focal points for statistical manipulation. One was the grain harvest. Here the pattern was longstanding, being established in the 1920s. At that time the party leaders sought and approved optimistic predictions of the availability of grain to support their ambitious plans for forced industrialisation, so that contemporary harvest estimates became inflated in comparison to prewar measures (Vol. 1: 63-66). When the harvest then fell short, they wished not to admit to the failure of an important precondition for the success of their plans, and to press forward regardless. As a result, in the decade covered by our seven volumes, there was not one year in which the harvest was reported honestly to the public.

In our work we have identified successive moments in the development of the statistical methodology for harvest evaluation from the situation that prevailed in the 1920s. One moment came in 1933, when a harvest measure based on the 'biological' yield (of the crop standing in the field, after allowance for harvesting and storage losses) replaced the concept of the 'barn yield' (of the crop after reaping and threshing (Vol. 5: 442-447). A second moment came in 1939 when, encouraged by Stalin and Molotov, Voznesenskii recommended a more encompassing concept of the biological yield, making no allowance for harvesting and storage losses and even adding in supposed pre-harvest losses and a factor for under-reporting (Chapter 4). In practice, both these moments proved to be steps on a path towards increasing exaggeration of the harvest.

We have found that statisticians who were professionally responsible for harvest measurement pushed back against manipulation from time to time. In 1933, for example, Osinskii, the incoming head of the newly formed TsGK, presented the biological yield as a more evidence-based harvest measure which, done carefully and after time for due consideration of the aggregated yield data, would correct the subjectively inflated barn-yield estimates of preceding years (Vol. 5: 246-247). But things did not work out in the way he evidently hoped. The underlying

reason was that the political leaders could never admit the failure of their plans.

In a highly centralised and closed political system, most professional statisticians (like other 'experts') lacked the independence to 'speak truth to power.' When the political system was also highly mobilised to search for enemies and eliminate them, to speak out was not only difficult but dangerous. Those responsible for reporting from lower levels were at least as vulnerable to the pressures of triumphalism as higher officials. Nonetheless, evidence of continuing resistance to exaggeration can found in the pattern of harvest reports over time. When the harvest was in progress, preliminary harvest claims were most responsive to the spirit of victory. When the harvest was in and the flag waving was over, it was easier for realism to prevail, and so final harvest reports were generally more sober than the preliminary reports submitted within the harvest period (Table E-11). Even so, the final harvest measures based on the biological yield continued to be substantially overstated through the 1930s. As for the more encompassing harvest concept introduced by Voznesenskii in 1939, the change was then imposed retrospectively to the harvest reports of 1936 to 1938 (Chapter 7), but not to previous years. The results softened the appearance of harvest failure of 1936, overstated the success of 1937, and supported a false impression of an upward long-term trend.

A second focus of statistical manipulation was the size and growth of the population, which Stalin considered to be an indicator of national power and prosperity. On that basis, the five-year plans made optimistic projections of the population, which did not live up to the expectations placed upon it. Among the reasons was the substantial mortality arising from food shortages and repressions. It damaged the party leaders' authority if its projections were known to be wrong, and it damaged their legitimacy if the population shortfall was attributed (at least in part) to their own policy failures.

In both the censuses of the late 1930s, as far as we can tell, the census workers did a professional job – a surprise, perhaps, given the circumstances. But the fate of their findings (and in some cases their personal fates) was entirely dependent on the leaders' overriding objective, which was to support Stalin's authority and cover up all evidence of mistakes (Chapter 5). In 1937 the census findings were buried; in 1939, they were manipulated before publication. The effect of the manipulation was to make the Soviet population appear to be larger and more rapidly growing than was the case, and to suppress evidence of millions of missing people, the casualties of the 1933 famine, especially among the male populations of Ukraine and Kazakhstan.

It is true that the officially accepted outcome of the 1939 census also represented a major concession to reality. At the risk of their lives, the professional statisticians persuaded Stalin and Molotov to accept a population figure of around 170 million. This was 2 to 3 million more than the census findings justified. Perhaps more significantly, it was also 13 million less than the 183 million that any moderately numerate reader of *Pravda* could have inferred from Stalin's projections. A possible explanation is that, following the conclusion of the Great Terror, Stalin was confident that not a single person would point this out.

The boosting of claimed results that we have described in demography and agriculture exemplifies practices that affected most if not all aspects of Soviet economic measurement. A third focal point of manipulation was the system of accounting for planned production and prices.

The presence of manipulation in Soviet measures of real output has been long established. In 1939, the real volume of Soviet economic activity was twice that of 1913 (on the same territory), and also of 1928 (Table 1).This was based on the reconstruction of the Soviet production accounts from the bottom up, on the basis of admittedly incomplete published data, by independent western scholars. It was not the picture presented by Soviet official statistics of output and productivity. According to an official measure, based on the plan prices of 1926/27, real Soviet material production in 1940 exceeded that of 1928 by a factor not of two but of more than five (*Narodnoe khozyaistvo* 1955: 16).

Over the shorter period covered by the present volume, we can contrast Soviet official and western measures of the real growth of industry and of the economy as a whole from 1937 to 1940 (Table 2; see Vol. 6: xvi for similar but smaller discrepancies over the period of our previous volume). As the figures show, Soviet reports and western estimates agree that the nominal value of national income in rubles and the prices prevailing at the time increased from 1937 to 1940 by about one half. A gap emerges only when correction is made for inflation. The Soviet statistics, which again used the plan prices of 1926/27, claimed that the real national income increased by one third in just three years, and real industrial production by 45 per cent. The Western estimates also show real growth, but of no more one fifth, whether our focus is on industry or on the economy as a whole.

Table 2 near here

How did these gaps arise? Soviet measures of the real volume of output relied on the fixed prices used to plan the economy, that is, to set production quotas in rubles that could be devolved to ministries and their enterprises at the beginning of the plan period and used afterwards to evaluate their performance against the plan. This required a fixed

standard of value, in order to prevent managers from fulfilling the quota by the simple expedient of raising prices. The standard of value chosen for the first five-year plan was the 'unchanged prices of 1926/27.' In the 1930s (and in fact up to 1950) the plans handed down to Soviet managers at every level were usually denominated in these prices. (In this respect the plans for the harvest and the population, which were set out in unambiguous physical units, were untypical. The problem for the accountable officials was the same, however: how to manipulate the performance indicator to show success).

The underlying sources of bias in Soviet accounting for planned production are now well known (Davies and Wheatcroft 1994: 30-32; Davies 1994: 138-141; Harrison 1998; Harrison 2000). Overstated claims did not arise from any high-level authority for managers to lie about achievements. Managers were caught lying from time to time, but they took great risks when they did so because to hoodwink the authorities by fabricating results was a serious crime. Rather, higher officials imposed continuous pressure on managers to meet performance indicators and to demonstrate outstanding results, and managers responded by finding less risky ways to satisfy appearances without undue effort. While there were many such stratagems, those that were quantitatively important exploited an intrinsic weakness in the plan's standard of value, the 'unchanged' prices of 1926/27. The weakness arose because, as 1926/27 receded into the past, the scope increased to vary the qualities of products that had been produced and priced in 1926/27, and also to introduce entirely new products. From this there followed the opportunity to set new 'unchanged' plan prices for the upgraded and new products, which were generally based on unit costs at the time the changes were made. Because this was an era of high inflation, and inflation was particularly rapid in the early 1930s, such new 'unchanged' plan prices were always higher than the old ones. As a result, it was generally easier to show real growth and to satisfy the plan with newer products than with older ones, the plan prices of which remained anchored in 1926/27.

As the product profile of the Soviet economy lengthened, so did the lists of 'unchanged' plan prices, and the new additions were always tilted towards the higher price level current at the time of each successive innovation. The outcome was a bias that was particularly favourable to those branches of industry where product changes were particularly rapid, such as the machine-building and metalworking industries and especially military machine-building. The manager of a bakery producing a standard Soviet loaf of bread year after year had little opportunity to make the changes that would allow the production assortment to be repriced favourably. In the aircraft industry, in contrast, the aeroplane of 1939 was unrecognisable by the standards of the 1920s. The entire

production profile of an aircraft factory changed from year to year with extreme rapidity, and each successive design was radically different from its predecessor. It is not surprising to find, therefore, that measures of the real growth of heavy industry over time in plan prices and in current prices were virtually identical. It was only in the consumer industries, where product improvements and new products were less encouraged, that measured growth in the plan prices of 1926/27 lagged substantially behind.

As in accounting for grain and for birth and deaths, the professional statisticians responsible for planned production were aware of the biases in the system they operated, discussed them in private, and devised schemes to try to limit them. The most obvious solution lay in frequent updating of the base year. In the period of our volumes there was one attempt at such a reform, which was ordered in September 1933 by Sovnarkom and implemented in February 1935 for the compilation of the 1936 plan. But the reform encountered strong resistance and, while some minor rationalisation was achieved, 1926/27 was retained as the base year. The most important source of conservatism was evidently the desire of the authorities not to have the statisticians revalue the sectors of the economy in such a way that its most rapidly growing branches would have less weight in the aggregate growth rate that would be claimed in public (Harrison 1998: 1048). In this sense, the party leaders expressed a clear preference for exaggeration.

The Soviet accounts did not only systematically overstate the dynamism of the economy. They also understated the burdens of accumulation and defence. We see this when we turn to shares of income denominated in current prices, that is, in the ruble prices used for transactions in the Soviet economy at the time. The main issue was the subsidy of prices of products used for accumulation and defence, which was partly paid out of the taxation of consumer goods and services. Because of this, the prices of consumer goods were raised above their 'factor costs,' while the prices of industrial materials and civilian and military equipment were held down. When measured in these prices, the shares of national income allocated to investment were systematically lower in Soviet measures than in Western estimates, which attempted to identify the 'factor costs' of Soviet activities by removing taxes and subsidies. The same was true, although to a lesser extent, for defence (Table 3). The subsidies of accumulation and defence persisted through the the lifetime of the Soviet system, serving the same function that is sometimes found behind wartime controls in market economies: to 'suppress one of the indicators that the government is involved in an expensive enterprise' (Rockoff 2012: 11, writing about price controls as a way of suppressing wartime inflation).

Table 3 near here

An effect of the manipulations and biases in Soviet economic statistics was that the Politburo was misinformed almost as frequently as the public. Occasions when the party leaders ordered the publication of one set of facts, knowing them to be fabricated, and having access to another set that it believed to be the unvarnished truth, were rare. One such example was the decision to falsify the defence line in the Soviet state budget from 1931 to 1935 in order to conceal the rapid growth of defence outlays at the time of the World Disarmament Conference in Geneva (Vol. 4: 117-118). In that case, the leaders knew the truth, and those responsible for funding defence were in no doubt that that they should supply funds in line with the secret budget line, not the published one. Stalin's decision to declare a larger population than that found by the census takers in 1939, leading to fabrication of the published results of the census, discussed in the present volume (Chapter 5), has some similarities. Even if the published results of the census falsified the numbers and whereabouts of the 'special contingents' of the armed forces and the forced labour system, Stalin knew what the preliminary results of the census had revealed, and those in charge of the Defence Commissariat and the NKVD knew perfectly well who was under their control and where they were. But in the general run of Soviet statistical practices, the instances where the Politburo knew the truth and ordered the public to be told a lie were somewhat unusual. More commonly, if the truth could not be revealed, the public was told nothing at all.

Also common, however, was the statistical exaggeration that arose spontaneously from the universal pressure to declare victory in the struggle to implement the party's directives. This tendency was felt at every level, high and low, and in every locality from the field and factory to the ministerial boardroom. There were periodic attempts to check it, made visible by the efforts of statisticians to exercise the critical, sceptical function that is essential to their profession. But such efforts were too feeble, too infrequent, and too threatening to powerful interests to be effective. One result was that, on such basic matters as the rate of growth of planned production, the Politburo was as likely to be misinformed as the public. Unlike the public, Stalin and Molotov had the chance from time to time to authorise improvements of the statistical system, or to prevent deteriorations, or to scale down the atmosphere of triumphalism that created the incentives for everyone below them to exploit the system's weaknesses, and when they were offered the opportunity they typically chose not to. In that sense we can say that they preferred to be fooled by their own propaganda, but it is important to understand that this was not unwilling or unwitting on their part.

(C) Militarization: a war economy in peacetime

The economic system that Stalin built in the 1930s persisted, with remarkable continuity, to the end of the Soviet Union. The way of life that the Soviet Union imposed on its citizens would be utterly unfamiliar to Western readers of the millennial generation. But their grandparents and great-grandparents, who lived through the world wars of the twentieth century, even if they saw only the external appearance of the Soviet neighbourhood or workplace, would quickly have recognized it. This was the atmosphere of a country at war and under siege. At work, long hours of effort were motivated by patriotic appeals and managed by regimentation. Household goods and service were often unavailable. There were shortages in the stores and queues in the streets. At home there was austerity, leavened by occasional pleasures, sometimes forbidden. Slackers and speculators lurked in the shadows, to be tolerated or exposed and eliminated depending on the period and season.

No one expressed this more pointedly than the Polish economist, Oskar Lange (1962: 18). In a lecture that he delivered in Belgrade in 1957, not long after Khrushchev's denunciation of Stalin, he described the generic features of a war economy, pointing out how closely they resembled those of the Stalinist command system:

> Concentration of all resources towards one basic objective . . ., centralization of disposal of resources in order to avoid leakages of resources to everything that was considered non-essential . . . Allocation of resources by administrative decision according to administratively established priorities and large-scale use of political incentives to maintain the productivity and discipline of labour through patriotic appeals.[6]

If one asked how the Bolsheviks came upon this model, the answer was that they found it not in the economic ideas of Marx and Engels, but in the lived experience of the First World War, the first interstate conflict of modern times that was fought by mass armies equipped by mass industrial production. The Bolsheviks observed closely how the capitalist countries managed their resources for this conflict, and they watched and admired, in particular, the experience of Germany, mobilized for total war by Walther Rathenau and Erich Ludendorff. On taking power in their own country, they set about implementing this model with enthusiasm. Unencumbered by private property rights and constitutional restraints, they expected that they would do a better job than the Germans. But the

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[6] On the misperception of the Soviet economy as an economic development project with primarily civilian goals, see also Samuelson (2000); Stone (2000); Kontorovich and Wein (2009); Kontorovich (2015).

Bolsheviks also quickly forgot where they found their inspiration, as Lange (1962: 19) himself acknowledged:

> One of the methods of war economy, which most of the socialist countries have resorted to at one stage or another, is the compulsory delivery by peasants of part of their product. Many Communists in Poland feel rather upset by the present programme of our government of abolishing such deliveries. I usually answer them by asking if they remember who first introduced compulsory deliveries in Poland. For, the fact is that such deliveries were first introduced during the First World War by the occupation army of Kaiser Wilhelm the Second, whom I do not think anybody regards as a champion of socialism.

The transformation of the economy under Soviet rule was dramatic in all its branches, but the changes were less striking in some than in others. To most appearances, a great motor factory was organized on similar lines whether in Moscow or in Detroit. Likewise, a great steel mill was recognisably similar in Magnitogorsk and in Gary, Indiana. Such similarities should not be surprising, because the Bolsheviks also admired American mass production and the scale and centralization of production that it fostered.

The transformation was at its most extreme in farming. Russia was a country where, for a thousand years, without instruction, farmers had followed the rhythm of the seasons, planting and sowing in autumn and spring, enduring the winter, reaping and threshing in summer. No one from that background can have imagined that in the fourth decade of the twentieth century, on orders from Moscow, tens of millions of farmers would have been regimented in battle formation to rise up and occupy a million square kilometres of land to be ploughed, sown, reaped, and threshed on a weekly schedule in militarized struggles marked by victories, setbacks, campaign medals for heroes, and exemplary punishment for deserters.

Most strikingly, all this was brought about in time of peace, for the Soviet Union was not at war when it collectivized agriculture, any more than when it built Magnitorgorsk. It is true that, in the period between the two World Wars, ‘peacetime’ was often a relative concept. Soviet borders were continually disputed, and these disputes sometimes erupted into open conflict. But, while Soviet military planning continually envisaged existential threats and drew up plans to deal with them (Samuelson 2000), the Soviet Union did not face any real and present danger from 1920, when the Red Army withdrew from Poland, to 1937, the year in which Japanese leaders began to push the ‘northern’ strategy of expansion into Siberia (Paine 2012: 146-148), and Hitler began to turn

war on the eastern front from a contingency to a plan (Adamthwaite 1992: 71).

If the Soviet regimentation of industry and the industrial worker showed how far the centralization of mass production could proceed, the militarization of agriculture showed its limits. In Moscow, the centralized state placed great stress upon its detailed plans for agricultural operations. The truth, however, seems to be that this merely imposed the appearance of order on tasks that would be performed anyway, as and when the rural cadres would get around to them. In practice, the harvest was much less responsive to centralized plans than to the weather. This could be observed from year to year. But in 1937, specifically, something more could be observed. In that year the nomenklatura purge wreaked havoc among the officials responsible for both managing and coordinating all branches of the economy. But the results were not the same in all branches. In industry and transport, production was visibly disorganised, and productivity declined sharply. In agricultural production, in contrast, there was no particular effect. The weather was better than average, and so the harvest was better than average, regardless of the chaos in the bureaucracy. What was affected by the disorganisation at the centre was not agricultural production but distribution: the state failed to capture the gains from the good harvest (Chapter 4 (G)). In 1938 and 1939 that capacity had to be rebuilt (Chapter 7). This confirms that Soviet state capacity for agriculture was focused on extraction; it played little or no productive role.

Long before 1939, the Soviet Union looked like a country at war. For the sake of national targets for production and for economic and military construction, all of society was mobilised in military-style campaigns that celebrated heroism and penalised shirking and desertion. We see the same in other countries in the twentieth century, but only when total war was being waged or actively prepared. The militarization of the Soviet economy was facilitated by the industrial technologies of the time, which promoted mass production and made centralised coordination relatively effective. But militarization was also applied to Soviet agriculture, where the productive returns to standardisation and coordination were low or negative. While the militarisation of agriculture was damaging to production, however, it still benefited the state by enhancing controls over the distribution of agricultural produce.

(D) The emergence of the Soviet Union as a world power

By 1939, the Soviet Union ranked alongside Germany as one of the world's two leading producers of weapons. Globally, aviation was the branch of military of technology that advanced most rapidly during the interwar period. Aviation was also the technology on which the great

powers placed their greatest hopes. Fighters and bombers, it was widely believed, would enable a country to attack its adversaries from a distance. The same fighters and bombers would provide the means of defence and deterrence. Some of these hopes were exaggerated or premature, but the fact remains: air power, or the lack of it, was decisive in every theatre in the Second World War. Every major power committed at least one quarter of its wartime budget for military equipment to aviation and air forces (O'Brien 2015: 23, 38-39, 53, 60; Harrison 2016). It is notable, therefore, that, as the war broke out in 1939, the Soviet Union produced more than one quarter of the world's military aircraft, and was the second largest producer of military aircraft in the world, lagging Germany by a barely perceptible margin (Table 4).

Table 4 near here.

Table 5 near here.

A broader comparison of the Soviet Union's military production with Germany's in 1939 is also instructive. We find that the two countries' profiles were broadly matched (Table 5). The Soviet Union gave first place to Germany in aircraft and naval shipbuilding, but by small margins. The Soviet Union was ahead across a wide range of armaments and munitions and was seriously deficient only in the production of automatic infantry weapons.

Legitimate questions might be raised concerning the relative quality of Soviet military power, including weaponry. Such defects certainly existed and would be exposed by the experience of the battlefield; this happened in the winter war of 1939/40 with Finland and, on a much larger scale, in the first period of the Soviet-German war that began in June 1941. When war transpired, however, and the qualitative defects of Soviet armaments were exposed in combat, Soviet industry would prove fully capable of forcing the necessary technological improvements to the extent that Soviet armaments would eventually prevail.

The prewar position of the Soviet economy as a world-class supplier of military equipment had broad foundations. It was the goal to which vast efforts had been directed since the mid-1920s, when the political leaders began to receive increasingly precise formulations of the problem of 'future war' from the Red Army.[7] In aviation, armour, armament, and ammunition, the later Soviet military-industrial complex was largely created in the 1930s. Measured by the number of research, design, and

[7] 'Future War' was the title of an influential report by the Red Army intelligence directorate in 1928, discussed by Samuelson (2000: 22-28).

production facilities (in other words, counting one for each factory and institute, regardless of size), the size of the Soviet military industry accelerated steadily from 1917, when the war effort of the Russian Empire reached its peak. On that measure, the Soviet defence industry doubled in size by 1928, and this first doubling took 11 years. The second doubling was achieved by 1935, which was just 7 years. From 1935, only 5 more years were required for a third doubling, which was achieved by 1940, when the number of defence industry facilities reached more than 1,600 (Table 6). The largest element of the defence industry in 1940 was the traditional branch of munitions, but this was closely followed by two branches that barely existed in 1917: aviation and electronics. A sign of things to come, atomic research was already under way.

Table 6 near here.

Underlying the growth of the defence industry was the propagation of all branches of modern heavy industry and engineering, which supported rearmament by supplying industry and the armed forces with metals and metal goods, fuels, and chemicals. Many of these goods were 'dual-purpose,' that is, they could be applied equally to civilian and military uses. Everyday examples ranged from engines and motor vehicles to nitrates, which held chemical energy in unstable compounds that were applicable both for plant fertilization and for explosives. As rearmament was pursued with increasing urgency, these goods were directed increasingly towards the defence sector at the expense of civilian production and household consumption.

The emergence of the Soviet Union as a world-class military power might be thought surprising when viewed from some angles, though not others. The element of surprise arises partly from the Bolshevik narrative, which repeatedly emphasized Russia's historic backwardness, its lack of modern industries and technologies, its vulnerability to penetration and aggression by hostile forces, the likelihood that external enemies would victimize it for these weaknesses, and the reactive, defensive character of its war preparations. From that perspective, it is disconcerting to find that, by the end of our period, the Soviet Union disposed of as many weapons in a year as another great power, Germany, that was to a considerable extent already mobilized for a war with other great powers, a war that its leaders had long planned and now initiated.

From another perspective, the Soviet position as a world leader in military production is less surprising. The Soviet Union was one of a handful of countries with enough size in population and natural resources to contend for global leadership. Imperial Russia, the predecessor of the Soviet state, had participated willingly in the great-power rivalry of the nineteenth and early twentieth centuries. Even if, in other aspects, the

Bolsheviks emphasized their break with Russia's past, in the aspect of international affairs they declared from the outset the necessity of restoring Russia as a great power. This was expressed, above all, by Lenin when he put forward the goal to 'catch up and overtake' the imperialist powers in economic and military capabilities, and by Stalin when he deliberately echoed this goal.

Preparation for 'future war' was an explicit motivation behind all the most consequential decisions of Soviet economic policy in the 1920s and 1930s. A great obstacle that confronted the decision makers was that, in Russia after the end of the Civil War (as in every other European country after the Great War), a longing for peace was widespread, so that many citizens were unwilling to be further regimented and forced to make further sacrifices (Sokolov 2008; Velikanova 2013: 33-36). The Stalinist command system could emerge only by censoring this longing and overwhelming it by ceaseless propaganda of the external threat and the dangers posed by the enemy within.

Concluding the present volume (Chapter 9 (E)), we sought to understand the Soviet-German rapprochement of the last summer before the Second World War. The sudden warming of relations between the two powers at that time helps to clarify the long-standing character of Soviet great-power ambitions. In August 1939, Stalin's Russia and Hitler's Germany displayed both commonalities and differences. The two leaders had in common their opposition to the existing boundaries of the European states and the balance of power that went with it. The goals of Stalin's foreign and military policies, like Hitler's, went beyond 'defence' in the narrow, literal sense of passive response to immediate threat. Defence under Stalin was forward-looking, calibrated to a wide range of future threats and future opportunities. It was also active, and actively revisionist, in seeking opportunities for advantage over his country's neighbours at the cost of their integrity and sovereignty.

The comparison has its limits. The foreign and military policies of Stalin's Russia and Hitler's Germany were not the same. While Hitler actively planned to secure world domination for Germany within his own lifetime, the Bolsheviks had shelved the prospect of world revolution, at least for a time. When the opportunities arose, Stalin was pleased to restore Soviet control of neighbouring territories in 1939-1940, and he would make and take opportunities to do so in 1944-1945. But he was no more than an opportunist, when compared with Hitler as a strategist. This gave Hitler the advantage in the Soviet-German friendship of 1939; both sides sought to use each other for short-term gain, but it was Germany that held the initiative, making the alliance in the first place, then breaking it by war in 1941.

The Soviet pursuit of great-power status was a long-term project, finally realised after the Second World War, but already a considerable success before the war broke out. If there should be an element of surprise, it is because great-power status was achieved without 'catching up and overtaking' the Soviet Union's rivals in productivity and mass prosperity. In the Second World War the Soviet Union was able to rival Germany – a country of similar economic size, measured by its real GDP, but with a longer and deeper history of industrial revolution, skills, and education, and higher overall living standards and productivity. After the war, the Soviet Union became a global nuclear superpower to rival the United States, although the American economy was much larger and more productive than even Germany's. The combined experience of many countries in two world wars shows that, as a rule, countries of lower prewar productivity were much less able to mobilize their economies for total war in all respects that we can easily measure. But the rule is proved by one clear exception. The Soviet Union, a relatively poor country, should have failed the test of the Second World War, much as Imperial Russia failed in the First World War (Harrison 2015: 67-98). The fact that the Soviet Union did not fail is testimony to the mobilization capacity of the economic system that Lenin and Stalin built, and to the ruthlessness with which they exploited its properties.

Measured against civilian criteria of productivity and prosperity, the Soviet economy of the 1930s failed. Measured against benchmarks of national capability, such as military power, it looks far more successful. A distinctive and enduring feature of the Soviet economy was its capacity to support military power out of proportion to its level of development. By the end of our story in 1939, the Soviet economy was one of the first producers of military hardware in the world, equalled only by Germany under national socialism. This is remarkable, given that by the end of 1939 Germany was fully engaged in the first of a series of wars that was intended to end in victory over all the other great powers.

(E) The reformability of the Soviet economy

Soon after Stalin's death, reform-minded economists, among them Oskar Lange in Poland, began to discuss openly whether it was possible to reform the Soviet-type economy. The root cause of their dissatisfaction was the position of the government as the compulsory purchaser of nearly everything. The government dictated what was to be produced, paid for it, and then sold it on to the eventual users—the industrial and military users of equipment and materials, and the household users of food, clothing, and consumer services. This system gave the party leaders in the Politburo immense discretion over immediate allocations, but it also broke the link between the seller and the final user; it built neglect of

public assets, disdain for the consumer, and resistance to innovation into the Soviet economy. The reformers of the post-Stalin period sought, therefore, to restore the direct link between buyer and seller by widening the sphere of market exchange while retaining the property framework of state-owned enterprises and offices and collective farms.

It is correctly supposed that Stalin resisted such reforms. It is widely believed that the search for solutions therefore began only after Stalin's death, but this is wrong. Our research in the archives has shown, in contrast, that those who operated the system from day to day became aware of its adverse consequences and began to look for solutions almost immediately, although much of their search remained hidden from the public. In other words, the case for reform became evident to insiders from the very beginning; it did not wait to arise until the Soviet economy had become industrially more developed.

Early attempts at reform were aimed at both industry and agriculture (Vol. 4: 11-18, 201-28, 265-70, 345-6). In 1931 and the first months of 1932, measures were adopted to reduce the pressure on agriculture, to improve incentives for the peasants to participate in the collective farms, and to give urban consumers access to the kolkhoz households' private produce through the 'kolkhoz markets.' These measures were soon overwhelmed by the onset of famine following the failed harvest of 1932 (Vol. 5). Nonetheless, some aspects of these reforms, such as the kolkhoz markets, became permanent.

At the same time, attempts were made to reform industrial planning. Early experiences quickly convinced Sergo Ordzhonikidze, the chief of Vesenkha (the industrial ministry of the time), that detailed inter-plant transactions should be decentralized. By 1931 he had become a keen advocate of cost accounting and the idea that, if placed under stricter financial discipline, industrial enterprises could be relied on to make contracts for material supplies in a decentralized way, without guidance from a central plan (Vol 4: 12).

This idea became a project that Orzhonikidze shared with his subordinates, some of whom went further, advocating the liberalization of credit and prices. It was eventually blocked, however, by Stalin and Molotov, who considered quantitative controls of outputs and inputs to be the only reliable way to get desired results. Moreover, Ordzhonikidze's own experimentation appeared to prove them right. At the end of 1932 Ordzhonikidze unexpectedly cancelled centralized equipment supply plans for the iron, steel, coal, and oil industries for 1933. The buyers and sellers of the equipment were instructed to contract with each other independently of the plan. The buyers, disbelieving that they would be held to account for financial losses, tried to place orders that were vastly inflated. The sellers, who were criminally liable if they refused an order,

did not know whom to refuse. The market was frozen by indecision and mistrust (Vol. 4: 269). Still committed to a reform, Ordzhonikidze turned the problem over to a conference of industry representatives in Moscow. In the spring of 1933, the Politburo stepped in, ordering the dismissal of the more radical reformists. Ordzhonikidze was isolated and humiliated.

Given their objectives, Stalin and Molotov made the right choice. They aimed for a highly mobilized economy, able to deliver surplus resources for economic and military capacity-building. If that was the primary goal, it did not make sense to give broad discretion over detailed implementation to middle managers, let alone to consumers. For these would only use their control of day-to-day transactions to divert resources away from the government's 'one basic objective' (to use Lange's phrase) to 'non-essential' uses.

In the mid-1930s there was some softening of the Soviet economic system. After the worst of the famine, food products were taken off the ration (Vol. 6: 121-129, 173-176). There were attempts at financial reform (Vol. 6: 248-252) and a more conciliatory approach to 'elements' formerly regarded as hostile, such as former kulaks and their children (Vol. 6: 282-284). But no further substantial moves were made towards economic decentralization before the war.

In the present volume, considering the late 1930s, we describe conditions that were perhaps uniquely unfavourable to the consideration of further reforms: a hunt for traitors, widespread arrests and executions amongst the party elite, and mass killings and mass incarcerations in society as a whole. A series of measures increased the centralisation of the economy: the expanding scope of forced labour (Chapters 4, 6, and 9), the growing pressure on the peasantry and the private sector (Chapter 7), and the harsher regimentation of waged non-agricultural employment (Chapter 8). Other changes in the system at this time were also designed to protect the authority of the centre as the economy expanded and its supply chains became increasingly complex. These included breaking up the empires of the industrial commissariats and giving Gosplan more authority to coordinate the supply chains that linked them (Chapter 2).

Was the Soviet economy reformable? At its most general, this question cannot be answered on the evidence of the Soviet Union in the 1930s. The examples of Russia, China, Vietnam, North Korea, and Cuba since the 1950s show many transitions away from economic institutions of the Soviet type. The Soviet experience of the 1930s does show us two things. First, the postwar stalemate of reformers versus conservatives was rooted in the system from its first years. It is wrong to suppose that pressure for economic reforms began only when reformist opinions first found a public voice in the 1950s. Such pressures appeared almost as soon as the command system was instituted, and they were felt at every

level of the system from bottom to top, although they remained secret for the time being. Second, the stalemate would not be resolved while Soviet leaders were committed to uphold the party's absolute monopoly of power. The Soviet economy was certainly not reformable while Stalin lived, and the reason is that Stalin and Molotov immediately headed off any and all attempts at reform. In other words, whenever the top leaders were offered the chance to trade a little power for more productivity or more efficiency in the economy, they chose power.

(F) The nature of Soviet economic development

One of the chief claims of Stalin and other Soviet leaders for their right to preside over an authoritarian system was that the system they had built gave superior outcomes for peaceful economic and social development, as in time of war (Stalin 1997, 15: 169; 16: 10-11).

What is economic development? Economic development has many dimensions. Most commonly acknowledged have been the various aspects of 'structural change' – the widening of markets, the division of labour and specialisation, the diversification of production from agriculture to industrialisation and the emergence of modern services, the rise of towns, the movement of workers into factories and offices, the increase of living standards and longevity, the transition to a low-mortality, low-fertility society including the advancement of women and the protection of children, the creation of a skilled and literate workforce through education and training, the rise of entrepreneurs and corporations that sponsor systematic productivity growth by linking science to production, and the trading and borrowing of goods, services, ideas, and cultures across the world. While all these aspects are logically connected, economists and economic historians have found many varied patterns in their ordering and rates of change across countries and over time (Gerschenkron 1962; Kuznets 1971).

During the Cold War, the discipline of economics as it was practised in the West gave rise to several new fields, including development economics, the study of Soviet-type economies as a specialism in its own right, and 'comparative economics' – the comparison of all types of economic system, including capitalism and socialism. The economic history of the Soviet Union was a unifying thread, binding these fields together. The scholars involved gave much attention to the advantages and limitations of various historical paths of economic development, including that of the Soviet Union. They often described Soviet economic policies as one possible 'strategy for growth' or 'model of development.' (Nove 1964; Spulber 1964; Wilber 1967). It was common to engage in some form of cost-benefit analysis. The Soviet pattern of economic development was held to confer benefits, such as accelerated

industrialisation and the building of infrastructural capital. There were also costs, such as inefficiencies and forms of wastage associated with the heavy hand of authoritarian rule. Among these were the destruction of raw labour and human capital by mass killing and their misallocation by mass imprisonment and negative selection, although orders of magnitude were unknown and unknowable at that time. Whether the costs were avoidable and whether the achievements could be thought of as worthwhile were debated.

The mobilised character of Soviet society was one factor that gave the Soviet pattern of economic development undeniable appeal among contemporary observers. In the 1930s, the Soviet mobilisation for labour suggested a contrast to the conditions of depression and widespread unemployment in the much wealthier market economies of Western Europe and North America. In the 1940s, the Soviet mobilisation for war inspired admiration for the unexpected resilience shown in the face of overwhelming military attack and a cruel war of annihilation. In the 1950s, the Soviet mobilisation for postwar reconstruction and the Cold War suggested a model to the new leaders of much poorer countries, such as China and India, who wished to build national identity and national capabilities after military occupation or colonial rule.

How should we evaluate the Soviet pattern of economic development? The record of the Soviet economy of the 1930s shows plenty of structural change. This evidence is stronger in some aspects than in others. Most obvious was the rise of modern industries and cities. Linked to these were other structural changes, such as a phase of the Soviet demographic transition (described in Chapter 5). The position of women in society also changed radically. As millions of new jobs were created in factories and offices, and as thousands of new schools and colleges raised their literacy and numeracy, millions of young women were beneficiaries. From the beginning of Soviet rule, the Bolsheviks saw a wasted asset in Russia's illiterate women and worked to retrieve their efforts and talents through literacy campaigns and education. In 1926, 57 per cent of Soviet women aged 9 to 49 could not read or write; by 1939 that proportion had fallen to 18 per cent (the comparable rates for men were 28 and 6 per cent) (*Narodnoe khozyaistvo* 1972: 35). Until this time, Russian women of humble origin generally had no better options than drudgery in the household or the field or factory. Illiteracy trapped them in these roles. With mass schooling, women could aspire to skilled work and to vocational and professional employment. The industrialisation of the Soviet economy created these roles in vast numbers. By 1940, women made the majority of employees in health, education, and culture, and one third of employees in government administration (*Narodnoe khozyaistvo* 1972: 348). It is true that a glass ceiling continued to restrict women's

promotion, and the urban family maintained the traditional division of domestic labour between the sexes found in the countryside. Still, many women experienced a dramatic widening of opportunities.

The young women who benefited so much from access to education and office work also found they had much to lose. The state that provided their education and employment demanded absolute loyalty in return. The same state not infrequently rewarded that loyalty by breaking careers, friendships, and family bonds, imprisoning and killing loved ones and, as often as not, their family members (a fictional account is the story of Sofia Petrovna by Chukovskaya 1967).

While opportunities were widened for many, for many others they narrowed or became entirely closed. As millions of young people moved upward towards the light, they were passed in the opposite direction by significant numbers of their own cohorts, as well as of older and young people who, having begun to rise, and meeting with some political or social difficulty, were caught up in one of the periodic famines or mass operations and were thrown back down into darkness. Thus, from farm to factory and office was not the only direction of movement in society. There was a counter-movement from farms, factories, and offices to resettlement, to the labour camp, and to the mass grave.

In the outcome, the Soviet society of the 1930s shows a paradox. As new jobs were created in factories and offices, and as new schools and colleges raised their literacy and numeracy, millions experienced a widening of opportunities. But this was brought about without their agency; it was done to them by a coercive state in the name of a party that cast down as many as it raised up, while denying nearly all of them any significant voice in the process.

For Joseph Schumpeter (1934) the agent of economic development was the entrepreneur, without whom there was no innovation. (Sen 1999 extends this idea to the relationship of economic development to human agency in a more general sense.) In this aspect the Soviet economy of the 1930s suggests backward movement. Collectivisation reduced millions of independent farmers to servants of the collective (Vols 1 and 2). As things turned out, the Soviet state could not manage agriculture and urban food supplies without leaving a role for decentralised household economic activities (Vol. 5). Within the period of the present volume, as we have seen (Chapter 7), the state acted repeatedly to restrict their scope and penalise their successes. In Soviet industry, construction, transport, and distribution, entrepreneurial functions were reserved entirely for the closed circle of party leaders who determined the plan and the party directives that implemented and supplemented the plan; no one could start up a new project or venture without their approval.

Schumpeter associated innovation with independent entrepreneurship. The Soviet economy of the 1930s showed that centralised policy initiatives could force new products and processes in limited fields such as machine building and the defence industry. But centralised decision-making also made mistakes for which there was no market-economy corrective, such as in the selection of agricultural seed varieties (Chapter 7). As for the incentives faced by Soviet managers in their daily routines, these either discouraged innovation or channelled it into the simulated improvement of the production profile (see Section (B) above). Thus, the economic system failed to foster innovation. At the same time Soviet society was deliberately closed off from the fertilising influence of foreign ideas and examples, except to buy Western technologies and designs when terms were acceptable and steal them otherwise. The Russian demographer Anatolii Vishnevskii (2010) has characterized the outcome as 'conservative' modernisation – a style of economic development that aimed first to copy and then to rival the West, but that lacked the capability to succeed (see also Ellman 2014: 363-365).

Under Stalin's rule, Soviet Russia made a giant leap towards industrialisation. The radicalism and sweep of the economic policies that brought industrialisation about distributed large gains and large losses amongst the population. It is a mistake, however, to think that these gains and losses were the point – to suppose that the primary goal of Soviet economic policies was to promote the welfare of some groups in society or to enserf or exterminate others. The changes of this nature that came about were typically improvised in support of a greater goal. The greater goal was to build the military and industrial capabilities of the Soviet state, making it secure and powerful at home and abroad. This was the objective that Stalin and his colleagues pursued at all costs. While doing so, they made many miscalculations. Every mistake distributed additional losses across society, and the losses were magnified by Stalin's reluctance to recognize or adapt his policies to them. Despite this, hindsight leaves us with a measure of success: by 1939 Stalin had built an economy able to supply enough of the means of national power that the Soviet state would survive the coming war and be in position to compete for global influence in the decades that followed.

TABLES

Table 1. Soviet real GDP and mid-year population, 1913 and 1928 to 1940

	1913	1928	1929	1930	1931	1932	1933
Population, million	134.8	153.2	156.1	158.6	160.8	162.4	159.8
Gross domestic product at 1937 factor cost:							
Billion rubles	112.9	123.7	127.0	134.5	137.2	135.7	141.3
Rubles per head	837.6	807.7	813.8	847.9	853.0	835.7	884.0

Table 1 (continued)

	1934	1935	1936	1937	1938	1939
Population, million	157.5	159.2	161.3	164.0	167.0	170.2
Gross domestic product at 1937 factor cost:						
Billion rubles	155.2	178.6	192.8	212.3	216.1	229.5
Rubles per head	985.5	1,122.2	1,195.2	1,294.5	1,293.9	1,348.2

Sources. Population is from Andreev, Darskii, and Khar'kova (1993: 118), who give totals for January 1 each year, here converted to mid-year; the figure for 1939 is based on the January 1 figure extrapolated to mid-year based on the population movement from 1939 to 1940 within postwar frontiers. GDP for 1928 to 1939 is from Moorsteen and Powell (1966: 623), extrapolated back to 1913 on the basis of figures for 1913 and 1928 given by Markevich and Harrison (2011: 672-703). Finally, GDP per head is GDP divided by population.

Table 2. The Soviet economy, 1940 compared with 1937: Soviet official and western estimates (per cent of 1937)

	A Soviet official measure	A Western estimate
At current prices:		
National income	151%	155%
At fixed prices:		
National income	133%	118-121%
Industrial production	145%	119%
Munitions output	283%	272-282%

Sources. National income: net material product in current prices and in plan prices of 1926/27 from Vol. 7, Table J-1; gross national product at current prices and factor costs of 1937 from Vol. 7, Table J-2, the upper limit being taken from Bergson and the lower limit from Moorsteen and Powell. Industrial production, from Vol. 7, Table J-4. Munitions output: Vol. 7, Table J-5, the upper limit being taken from Moorsteen and Powell (1966) and the lower limit from Davies and Harrison (1997).

Table 3. The uses of Soviet national income, 1937 and 1940 (per cent of national income)

	1937	1938	1939	1940
A Soviet official measure				
Investment	11.4%	11.4%	9.3%	
Defence	7.2%	9.0%	11.9%	
A Western estimate				
Investment	25.9%			19.1%
Defence	8.8%			18.7%

Sources. Soviet official measure, from Vol. 7, Table J-5. Western estimate (by Bergson 1961), from Vol. 7, Table J-6.

Table 4. Combat aircraft produced, 1939: the Great Powers (units and per cent)

	Units	Per cent of total
Germany	8,295	29%
Soviet Union	7,480	26%
United Kingdom	3,731	13%
France (estimated)	3,564	12%
United States	2,141	7%
Japan (estimated)	2,100	7%
Italy	1,750	6%
Total	29,061	100%

Sources. Germany, from US Strategic Bombing Survey (1945): 6; USSR, from Davies and Harrison (1997: 405), counting fighters, bombers, and reconnaissance aircraft only. UK, from *Statistical Diges*t (1951: 152), counting fighters, bombers, reconnaissance, and naval aircraft. France: aircraft produced, September to December 1939, from Higham (2012: 169), multiplied by three for an upper bound on production at yearly rate. United States, from Modley (1945: 8). Japan: combat aircraft produced, September to December 1939, from Grechko, ed., (1982), 12: 201, multiplied by three for an upper bound on production at yearly rate. Italy, from Zamagni (1998: 196). Where possible, training aircraft (relatively cheap, and often produced in large numbers) are discounted; these contributed to air force capacity-building, but not to immediate combat strength.

Table 5. War production, 1939: Soviet Union versus Germany (units and per cent)

	Germany	Soviet Union	Soviet Union, per cent of Germany
Rifles and carbines, thou.	1,352	1,497	111%
Automatic pistols, thou.	120	0	0%
Machine guns, all types	59,100	96,400	163%
Guns, all types and calibres	6,300	16,459	261%
Mortars	4,200	4,457	106%
Tanks and self-propelled guns	2,100	2,986	142%
Combat aircraft	8,295	7,480	90%
Warships, main types	30	28	93%

Sources. Germany, from US Strategic Bombing Survey (1945): 6; USSR, from Davies and Harrison (1997: 403-6).

Table 6. Research, design, and production facilities of the Soviet defence industry by specialization, selected years (number of establishments)

	1917	1928	1935	1940
Munitions	98	143	268	506
Aviation	38	75	154	391
Electronics	35	101	188	296
Armament	27	71	121	221
Shipbuilding	28	55	100	149
Armoured vehicles	4	16	44	96
Atomic research	0	1	13	21
All facilities	230	460	886	1,679

Source: calculated from Dexter and Rodionov (2017).

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