

## Soviet Economic Growth Since 1928: The Alternative Statistics of G. I. Khanin

MARK HARRISON

GIRSH ITSYKOVICH KHANIN came to world attention in 1987 with the publication of his article 'Lukavaya tsifra', written jointly with the reforming journalist Vasilii Selyunin, in *Novyi mir*.<sup>1</sup> The article caused a sensation with its claim that by 1985 Soviet national income had been multiplied not by 84.4 times the level of 1928, as the official statistics would have had it, but by only 6.6 times; it swiftly achieved notoriety in conservative circles, and encountered a chilly official reception. By this time Khanin had already experienced years of official harassment and employment difficulties; now he was subjected to public abuse from the official statistical authorities and their supporters, who described his results as erroneous and fabricated.<sup>2</sup> In the West, Khanin's findings attracted more sympathetic interest, although they were treated with caution by official agencies; in 1988 several scholarly evaluations appeared.<sup>3</sup>

Born in Latvia in 1937, Khanin had followed a course of undergraduate and postgraduate study at the Leningrad Institute of Economics and Finance. After this he taught at Novosibirsk University, until he was sacked in 1972 for 'oppositionist views'. He found work next with the Management Systems Research Institute of the all-Union Ministry of Instrumentation, then the Training Institute of the all-Union Ministry of Construction Materials. In 1981 and 1984 he published two precursors of 'Lukavaya tsifra' in scholarly journals; these were primarily methodological pieces, both dry as dust, not least because they had been heavily censored.<sup>4</sup> In 1986, denied further employment in Novosibirsk, he was appointed to the senior staff of the economics workshop of the Tuva interdisciplinary department (*kompleksnyi otdel*), a distant outpost of the Siberian division of the USSR Academy of Sciences, 1000 kilometres to the south-east on the Mongolian border. It was from this situation that he published 'Lukavaya tsifra'.

After 1987 the publication of Khanin's work in the central Soviet press gained momentum. His most important results appeared in 1988 under the title 'Ekonomicheskii rost: al'ternativnaya otsenka' in the columns of *Kommunist*; he was also able to defend himself against critics. He was taken on as a consultant both by the Council of Ministers of the Tuva Autonomous Republic and by the all-Union Ministry of Ferrous Metallurgy, and regained a position at Novosibirsk University. More recently, the Academy of Science's Siberian division has published Khanin's monograph, *Dinamika narodnogo khozyaistva SSSR*; the book was previously held up for years in the hands of the publishing house Ekonomika. And, in 1992, Khanin was awarded a

doctorate for successful defence of his work on Soviet economic growth at the Academy's Central Economic–Mathematical Institute (TsEMI) in Moscow. He has travelled abroad, visiting scholarly institutions in the United States and Sweden, and has extended his research to write a critique of Western independent studies of Soviet economic growth.<sup>5</sup> He continues to work in the field of statistical economic analysis, partly under the aegis of the private Moscow-based Intellectual Technology Institute, but he is still shut out of official statistical circles of the Russian Federation.

The purpose of this article is to reassess some of the main themes and results of Khanin's work, now that the core of it is available to the Western reader, and to suggest a preliminary evaluation. This places my primary focus on his *Dinamika*, a monograph with more than 200 pages of text and more than 20 statistical appendices, together with one or two other recent articles which update the record. I do not pretend to comprehensive coverage of the entire corpus of his work, which now includes some 20 publications. I place Khanin's research findings in the context of the main competing alternatives, Soviet official and Western, but I do not attempt to cover other alternative Soviet and Russian unofficial estimates, which have been adequately surveyed elsewhere.<sup>6</sup>

#### *A political economy of illusions*

Khanin starts from the unquantified evidence of everyday life—the eye-witness, the anecdote, the overheard conversation, the literary record, all the collective sediment of unofficial personal experience.

Now it is probably fair to say that several of the present-day debates over evaluation of the Soviet historical record are polarised between those who have begun from such non-statistical experiential data and those who have begun from statistics. A complicating factor for those who like to begin from statistics is that in a Soviet context this has inevitably meant initial reliance on *official, published* statistics, despised and discounted by those who have spoken for unofficial society. Significant examples of such polarisation range from the evaluation of Soviet living standards in the 1980s relative to the West, to the scale and historic significance of Stalin's repressions.<sup>7</sup>

Khanin discounts official data, but not without discrimination. Willing to be selective and exercise judgement, Khanin has devoted the greater part of his skill and energy to creating an alternative statistics which is open to analysis and criticism, not encircled by the closed defences of authoritarian formulae. A direct, beneficial result is that his work has provided more than just an opportunity for further release of the dangerous fission products of old, decaying hostilities.

The initial focus of Khanin's work concerns the gap between official statistics and the unofficially encountered realities of economic life. The official statistics of TsSU (the old USSR central statistical administration) have exaggerated Soviet economic growth, efficiency and price stability. It was already absolutely obvious from the everyday experience of the 1980s that Soviet consumers did not live at or near the level of Western Europe, as traditional TsSU evaluations suggested. The main factors accounting for this were the poorer availability and quality of Soviet goods, and hidden inflation not reported by official indices.

As an economist, however, Khanin knew that this was not simply a matter of unfounded claims to ideological legitimacy. The quality of economic information must always have practical results.<sup>8</sup> Planning, whether carried out in a market or an administered context, whether done by governments, companies or household family members, has an intrinsic quantitative aspect, because first and last it is a matter of evaluating and making quantitative choices. In the Soviet case, the practical consequences were these: exaggerated claims to success made the regime complacent about economic stability, encouraged an official belief in the ability of society to shoulder fresh burdens, and inhibited the necessary adaptations of the economic structure to changing requirements. The world was changing, official policies were ineffective, and plans were obsolete before they were implemented, yet the regime soldiered on because TsSU told it that all was for the best.

History and hindsight tell us that this was a permanent feature of the Soviet economic system. At the outset, the great investment and food mobilisation of the first five-year plan period was pushed up to and past the tolerance limits of Soviet consumers and the farming system; false statistics played a decisive role in forming the illusions which resulted in famine and demographic disaster. Although not repeated on this scale, similar episodes punctuate the next six decades of Soviet economic expansion with law-governed regularity.

Of course, intelligent participants in the making of the regime's decisions and policies understood the defective character of the statistical apparatus, and Khanin chronicles their efforts to improve it.<sup>9</sup> They knew something of the costs accruing to society from the atmosphere of illusion. They issued individual pleas for more truth telling, and practical measures to punish lies; here the trouble was that they were up against basic economic institutions. These systematically rewarded certain kinds of lying (especially the exaggeration of past achievements, and of future needs, and the understatement of costs); in contrast, decrees and regulations could punish liars and falsifiers, but *only if they were individually found out*. As a result, the pressure to distort and exaggerate proved highly resistant to official remedies.

This analysis bears not only upon the circumstances of the Soviet economic system's formation. Seeing recent history through Khanin's eyes, we find here an essential key to understanding the system's collapse. From the standpoint of official data, the worsening of Soviet economic conditions in the 1980s remained largely invisible; serious long-term problems were admitted, but no crisis. Meanwhile, unofficial experience told all too clearly of the sharply worsening quality and availability of goods and services.<sup>10</sup> Soviet leaders' reliance on the official statistical record, which blanked out the true picture and shielded them from the necessity to act, explains the uncomprehending complacency with which they ignored the first Law of Holes (if you're in one, stop digging). The upsurge of economic discontent, followed by a turn to terminal disintegration, simply took them by surprise.

Hidden inflation, a specialised minority interest among Western observers in the 1970s and 1980s, is central to Khanin's understanding of these processes.<sup>11</sup> The deteriorating state of the economy was only partially captured in the underfulfilment of official plans, although plan failure was reported often enough. Ruble plans were fulfilled or nearly fulfilled because the true extent of inflation was concealed. As a result the value of output grew satisfactorily, and it was claimed that this also

represented satisfactory growth of real output, but in reality output grew by less, and prices by more than the official data allowed.

Hidden inflation was made possible under conditions of the changing quality and assortment of the economy's range of products. The main mechanisms are known to have operated in the interface between the firm (the productive unit) and the higher administrative levels which set prices in relation to the unit costs and quality, or use characteristics, of products, and which monitored firms' performance. First, the quality of firms' existing products might be allowed to fall, while the price was maintained, resulting in an unreported rise in the ratio of price to use characteristics. Second, the firm might falsely claim an improvement in the use characteristics of products. The authorities permitted a rise in price, which was reported but falsely offset against an illusory increase in product quality; the product's true technical specifications either remained unaltered, or more commonly were amended in ways which added useless detail to the product. Third, new products were introduced at prices and costs which were raised out of proportion to real use characteristics; in reality, the overall price level was inflated, but in official statistics the increase was offset against the false claim of quality improvement, and price stability was reported.

Because this inflation was hidden, it contributed to the veil of illusion which prevented an accurate assessment of Soviet economic progress. The central thrust of Khanin's work was therefore directed at stripping this veil away in order to provide a true statistical representation of the Soviet record.

This was made possible because some data remained at least relatively reliable. Reliability could be graded by the branch of the economy, the level of collection and aggregation of the data concerned, and the uses for which they were intended. Khanin finds that distortion applied mainly to branches where products were heterogeneous and quality and assortment were continually changing—in industry, construction and road transport. Elsewhere relatively homogeneous products, more easily measurable in physical units, generated more reliable data—for example, in agriculture or railway transport.<sup>12</sup>

### *Results*

Khanin's findings can be summarised under a number of main headings.

#### *Long-run growth*

Over the long period (1928–87), Soviet national income according to Khanin expanded 6.9 times, not the 89.5 times found in official data. Figure 1 illustrates this, and shows that Khanin's evaluation also undercuts the most authoritative, detailed Western estimate of 10.2 times provided by combining figures of the CIA's former Office of Soviet Analysis (1950–87), and Moorsteen & Powell (1928–50).

The CIA has correctly pointed out that Khanin's series are far closer to its figures than to those of TsSU. In fact, in respect of the overall trend since 1950, there is virtually no difference between the latest CIA revision and Khanin; both give 3.8% for the annual average growth of national income, 1950–87 (Table 1). There are,

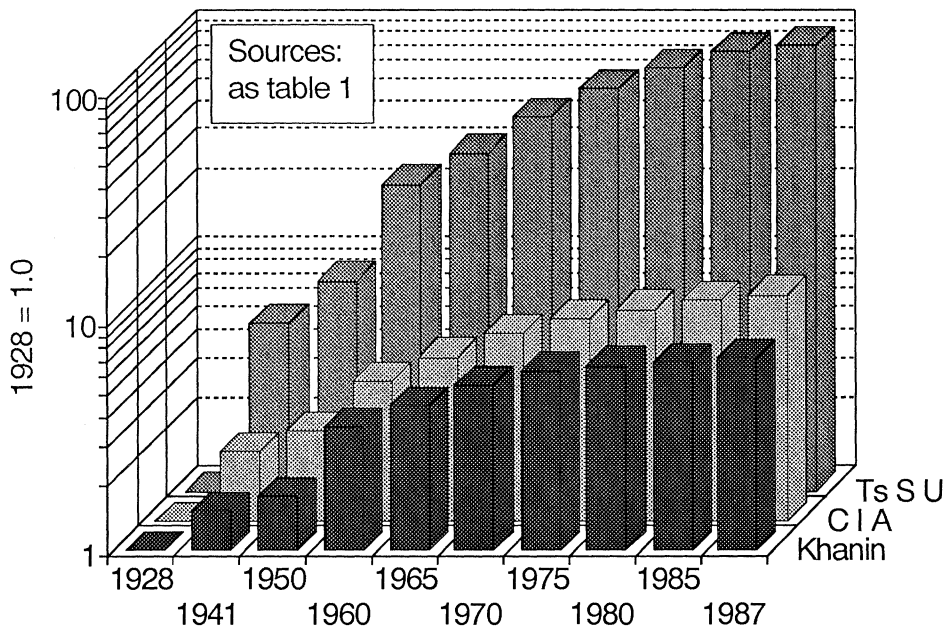


FIGURE 1. Soviet national income, 1928–87—Alternative estimates.

however, differences of short-run evaluation, considered below, and implicit in this are also wide divergences over national income levels, as distinct from growth rates.

Table 1 confirms that the difference between best Western estimates and Khanin for the long run since 1928 arises almost entirely within the period 1928–40, and has nothing to do with the CIA; according to Moorsteen & Powell, Soviet GNP doubled under the prewar five-year plans, where Khanin finds only a 1.5-fold expansion. This may be regarded as ironic in view of widespread disparaging of the bureaucratic labours of the despised Agency in contrast with the high reputation of Moorsteen & Powell's scholarly endeavours.

#### *Short-run growth*

As well as a new long-run evaluation, Khanin also offers a revision of the short-run dynamic of the Soviet economy.<sup>13</sup> Most obvious from Table 1 is his downgrading of performance under the prewar five-year plans. Where official data suggest colossal rates of expansion of up to 14% per year for the whole economy (reappraised at 6% by Moorsteen & Powell), Khanin identifies only 3.2% annual growth, marginally below his figure for the long-run average, 1928–87. Under the first five-year plan (1928–32), Khanin sees a 20% decline and, since there was also stagnation under the third five-year plan (1938–41), it follows that the entire growth of the prewar years was concentrated in the years of the second five-year plan (1933–37) alone.<sup>14</sup> This finding echoes Naum Jasny's identification of 1934–36 as the 'three "good" years' of the prewar period.<sup>15</sup>

TABLE 1

SOVIET NATIONAL INCOME GROWTH, 1928–1987:  
ALTERNATIVE ESTIMATES  
(CHANGE OVER PERIOD, % PER YEAR)

	TsSU	CIA, Moorsteen & Powell		Khanin
1928–40	13.9	6.1	3.2 <sup>a</sup>	
1940–50	4.8	2.0	1.6 <sup>b</sup>	
1928–50	10.1	4.2	2.5	
1950–60	10.2	5.2	7.2	
1960–65	6.5	4.8	4.4	
1965–70	7.7	4.9	4.1	
1970–75	5.7	3.0	3.2	
1975–80	4.2	1.9	1.0	
1980–85	3.5	1.8	0.6	
1985–87	3.0	2.7	2.0	
1950–87	6.6	3.8	3.8	
1928–87	7.9	3.9	3.3	

*Notes:*

<sup>a</sup> 1928–41.

<sup>b</sup> 1941–50.

*Sources:*

TsSU, Khanin: Net material product, calculated from Khanin, 'Ekonomicheskii rost: al'ternativnaya otsenka', p. 85.

CIA: GNP, calculated from CIA, *Measures of Soviet GNP*, Table A–1.

The 1950s emerge strongly in everyone's account as the best decade of postwar Soviet growth. But in Khanin's story the 1950s witnessed the most rapid expansion of the entire Soviet epoch—national income growth reached 7.2% annually (Table 1). Consistently with this, he argues that the prewar period saw a peak of falsification of economic data, while the Khrushchev period saw significant improvement in this regard; as a result, some of the expansion traditionally ascribed to 1928–41 must be redistributed to the 1950s.<sup>16</sup>

From the 1950s through to the early 1980s, Khanin argues for a process of uninterrupted retardation. Here he differs from both TsSU and CIA, which have agreed that in the late 1960s there was a modest revival of economic growth (Table 1). Soviet economists have often credited this revival to the industrial reforms introduced by Kosygin in 1965, but Khanin takes a more pessimistic view of the reforms, shared in the West by recent appraisals such as that of Kontorovich.<sup>17</sup> Despite showing revived economic growth in the late 1960s, CIA evaluations have also contributed to a cautious view of the Kosygin reforms; they confirm continued deceleration of industrial growth, but there is still a revival in the CIA's whole-economy indicators because industrial deceleration is more than offset by improved economic performance of non-industrial branches.<sup>18</sup>

Khanin also presents estimates for the growth of industrial production and construction (Table 2); these are of some interest both as elements forming his national income estimates and in their own right.

### *Hidden inflation*

Khanin's figures for real product growth help to form a new estimate of hidden

TABLE 2

SOVIET OUTPUT AND INFLATION, 1928-90  
(CHANGE OVER PERIOD, % PER YEAR)

	<i>Real product growth</i>			<i>Wholesale price inflation:</i>	
	<i>Industry</i>	<i>Construction</i>	<i>National income</i>	<i>True</i>	<i>Hidden</i>
(A) TsSU					
1928-40	17.0	..	13.9	8.8	..
1940-50	..	..	4.8	2.6	..
1950-60	11.7	12.3 <sup>a</sup>	10.2	-0.5	..
1960-65	8.6	7.7	6.5	0.6	..
1965-70	8.5	7.0	7.7	1.9	..
1970-75	7.4	7.0	5.7	0.0	..
1975-80	4.4	..	4.2	-0.2	..
1980-85	..	..	3.5	..	..
1985-87	..	..	3.0	..	..
1928-87	..	..	7.9	..	..
(B) Khanin					
1928-41	10.9	..	3.2	18.5	8.9
1941-50	..	..	1.6	5.9	3.2
1950-60	8.5	8.4 <sup>a</sup>	7.2	1.2	1.8
1960-65	7.0	5.1	4.4	2.2	1.6
1965-70	4.5	3.2	4.1	4.6	2.6
1970-75	4.5	3.7	3.2	2.3	2.3
1975-80	3.0	..	1.0	2.7	2.9
1980-85	..	..	0.6	..	..
1985-87	..	..	2.0	..	..
1928-87	..	..	3.3	..	..
1980-82	..	..	-2.0	..	..
1982-88	..	..	1.8	..	..
1988-90 <sup>b</sup>	..	..	-4.6	..	..

*Notes:*

<sup>a</sup> 1955-60.

<sup>b</sup> Preliminary.

*Sources:*

1928-87: National income: calculated from Khanin, 'Ekonomicheskii rost: alternativnaya otsenka', p. 85. Other columns: calculated from Khanin, *Dinamika*, pp. 146 (industry), 167 (construction), 206, 212 (wholesale prices).

1980-90: Calculated from Khanin, 'Ekonomicheskii rost v SSSR', p. 29.

inflation. The index of hidden inflation is simply the TsSU index of officially reported output growth divided by Khanin's index of 'true' output growth. (In other words, the *lukavaya tsifra*, divided by the *vernaya tsifra*, forms an index of concealment.) As Table 2 shows, Khanin concurs with official data in finding rampant inflation under the prewar five-year plans, but true inflation was double the reported level, indicating widespread statistical distortion. As for the postwar years, instead of the rough price stability suggested by official figures, Khanin finds that hidden inflation ran at a fairly steady 1.6–2.6% annual creep, edging upwards towards the 1980s.

### *Inputs and productivity*

Khanin presents parallel estimates of the growth of productive inputs and productivity or intensity of resource use, shown in Table 3. Most significant is his downward revision of the growth of fixed assets—less than 4% per year, 1928–87, barely in excess of national income growth. This pessimistic view of the results of six decades of Soviet capital construction is strongly differentiated from the much higher figures shared alike by TsSU (7.2% per year) and conventional Western evaluations. Here the good news is that, on Khanin's account, Soviet capital productivity has declined much more slowly than was thought. The bad news is that, where others have seen substantial scope for rapid increases in Soviet output from rationalising the use of a huge, poorly utilised capital stock, Khanin's work suggests little left in reserve.<sup>19</sup>

Employment forms the only composite series shared by Khanin with TsSU. The difference between their evaluations of output per worker arises solely, therefore, from divergent perceptions of product growth. Khanin sees only slow labour productivity growth, with a spurt in the 1950s followed by loss of momentum in the 1960s, falling to zero in the stagnation decade of 1975–85. He therefore characterises the overall growth process as 'extensive'—based on rising employment rather than rising productivity.<sup>20</sup>

The last series on which Khanin offers an independent view is materials intensity, i.e. the quantities of fuels and other materials consumed per unit of output. He suggests that this indicator rose slowly but steadily, decade after decade, in contrast with the official picture of materials intensity as constant or declining.

### *Multifactor productivity*

Although neither Khanin nor TsSU do so, these data can be put together, under simple illustrative assumptions, to make a more general statement about the efficiency of resource use and the sources of real product growth.<sup>21</sup> In Figures 2 and 3 I show the implications for alternative estimates of weighting employment at one-half, capital input at two-fifths and raw materials at one-tenth. This assumes that a 1% increase in national income can be achieved by a 10% increase in raw materials consumption alone, a 2.5% increase in fixed assets alone, a 2% increase in employment alone, or



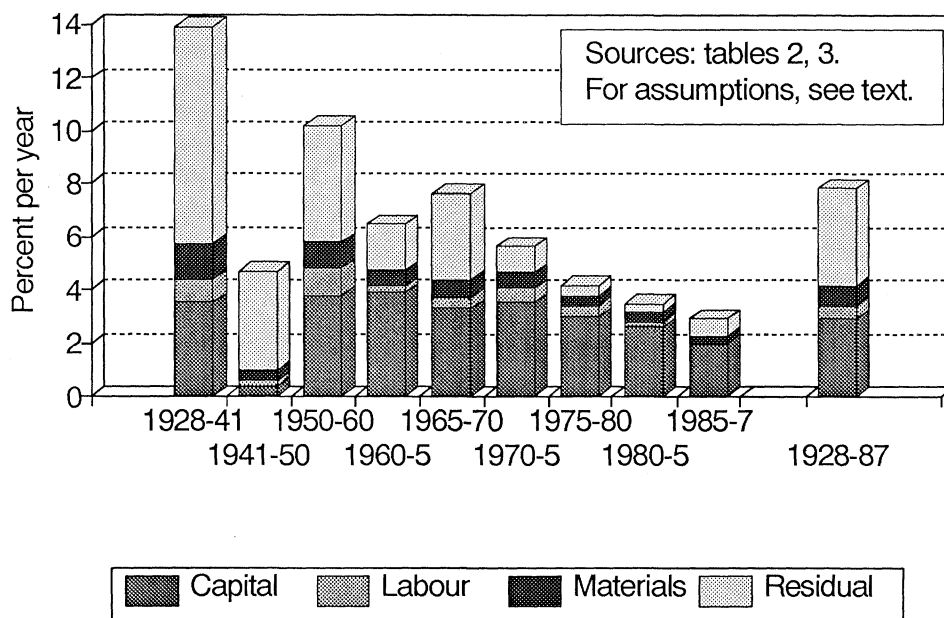


FIGURE 2. Soviet national income from TsSU data—Role of inputs in output growth.

a 1% increase in all three simultaneously. When the increases in capital inputs, employment and raw materials are weighted in this way, and their sum (the increase in combined factor inputs) is deducted from total output growth, the 'residual' represents the amount of output growth attributable to other sources—technical progress, improved organisation, economies of scale, the quality of labour inputs, etc. The results shown here, I repeat, only illustrate the differences between two competing data sets, and are not a final judgement on the Soviet growth record.

TsSU data (Figure 2) give rise to a relatively large residual, the result of increased quality and better use of inputs (as opposed to the increased volume of inputs)—3.7% per year, nearly half of the overall growth reported since 1928. Thus, Soviet economic growth was significantly 'intensive' in character. Of the measured inputs, capital was by far the most important, and this represents the return on the huge Soviet investment effort over many decades.

Khanin's data (Figure 3) point in a different direction. Not only was long-term economic growth lower, but it appears almost all extensive in character, with a small residual element reflecting increased multifactor productivity—on average, only 0.8% per year since 1928. The only significant run of years in which intensive growth predominated was the decade of the 1950s. In the prewar years, and also from 1975 to 1985, multifactor productivity growth was negative. Moreover, among Khanin's intensive factors, the role of capital investment is also downgraded, contributing only 1.6% to the long-run annual growth rate of output, compared with nearly 3% from TsSU data.

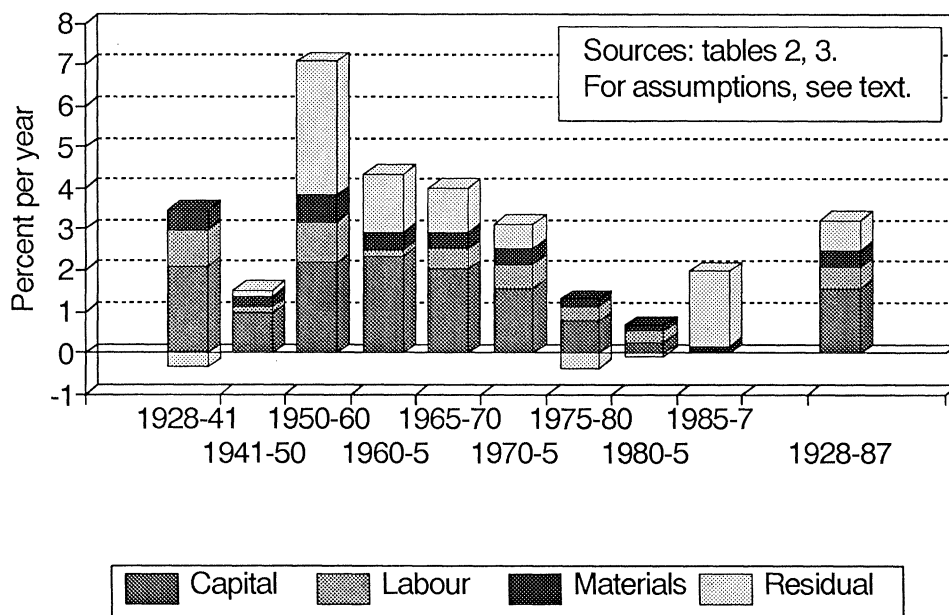


FIGURE 3. Soviet national income from Khanin—Role of inputs in output growth.

#### *Methods and models*

To evaluate the reliability of Khanin's alternative estimates it is necessary to provide some detail of sources and methods. Here I stick to the main issues of principle, confining the more tedious essentials to an appendix.

#### *Alternative methods*

Khanin is not the first to grapple with the problems of evaluating the economic development of countries with poor national income data. In many low-income countries problems of quality and availability of goods, corruption and the existence of an underground economy, and direct statistical distortion, all make it difficult to measure economic welfare and progress. But the Soviet economy has probably inspired more, and more imaginative approaches than many others.

There are two main alternatives for independent scholars. One is the method of *direct revaluation*; it involves trying to replicate honestly the sort of procedures which might have been followed by a national statistical agency without a vested interest in the figures which might result. The main Western model for this kind of activity is the RAND Corporation project which Abram Bergson led in the 1950s, the methodology of which was eventually inherited by the CIA Office of Soviet Analysis, and which gave rise to the most detailed and, until recently, widely accepted Western computations of Soviet GNP.<sup>22</sup> Data are collected for a wide range of prices and quantities of goods and services, their quality is independently evaluated; in this way

TABLE 3  
SOVIET INPUTS AND PRODUCTIVITY, 1928-90  
(CHANGE OVER PERIOD, % PER YEAR)

	<i>Stock of fixed assets</i>	<i>Capital productivity</i>	<i>Output per worker</i>	<i>Materials intensity</i>
(A) TsSU				
1928-40	8.7	4.8	11.9	-0.3
1940-50	1.0	3.1	4.1	-0.2
1950-60	9.4	0.8	8.0	-0.5
1960-65	9.7	-3.0	6.0	-0.2
1965-70	8.2	-0.4	6.8	-0.4
1970-75	8.7	-2.7	4.6	0.6
1975-80	7.4	-2.7	3.4	0.0
1980-85	6.5	-3.0	3.0	0.0
1985-87	4.9	-2.0	3.0	0.4
1928-87	7.2	0.5	6.7	-0.2
(B) Khanin				
1928-41	5.3	-2.0	1.3	1.7 <sup>a</sup>
1941-50	2.4	-0.8	1.3	1.1
1950-60	5.4	1.6	5.0	-0.5
1960-65	5.9	-1.4	4.1	0.4
1965-70	5.1	-1.0	3.0	0.4
1970-75	3.9	-0.6	1.9	1.0
1975-80	1.9	-1.0	0.2	1.0
1980-85	0.6	0.0	0.0	1.0
1985-87	0.0	2.0	2.0	-0.5
1928-87	3.9	-0.6	2.2	0.8
1980-82	1.5	-3.6	-2.5	2.5
1982-88	1.9	-0.2	1.4	0.7
1988-90 <sup>b</sup>	-0.5	-4.1	-4.1	3.4

Notes:

<sup>a</sup> 1.7-2%.

<sup>b</sup> Preliminary.

Sources:

1928-87: Calculated from Khanin, 'Ekonomicheskii rost: al'ternativnaya otsenka', p. 85.

1980-90: Calculated from Khanin, 'Ekonomicheskii rost v SSSR', p. 29.

a significant fraction of GNP is valued directly, the rest being filled in by plausible assumptions and indirect data.

The other route is to look for alternative *indirect indicators* which do not themselves measure national income, but which can stand as proxies for it. The use of such indirect indicators is represented by various approaches found in the work of Francis Seton on prewar Soviet industrial production, Wilfrid Beckerman on international GDP relativities, and Ferenc Jánosy and Éva Ehrlich on the postwar level and growth of the GNPs of the USSR and Eastern Europe.<sup>23</sup>

Khanin's approach involves aspects of both methodologies. In spirit, however, he is probably closer to the second, the method of indirect indicators.

*Which data are reliable?*

For selecting indirect indicators in the absence of good national income data, it is important to know which figures *can* be trusted. Khanin classifies official data by the pressure on them for distortion, which was essentially a function of the use to which they were put; and by the ease of distortion, which depended on the relationship of the data to stocks and flows which are visible and physically homogenous. The pressure for distortion was greater in the case of series used as success indicators, such as the value and volume of output. This also means that data passed upwards into the administrative hierarchy were more likely to be distorted than data compiled for internal use within the firm. Since aggregation was a necessary aspect of passing data up the hierarchy, more highly aggregated data were also more liable to distortion. Data relating to non-standardised, quality-sensitive engineering products or non-residential construction objects were more easily distorted than figures for basic industrial goods or agricultural commodities.

However, the ease of distortion remained greater for value series than for physical volumes; suppliers' claims to fictitious output in physical units (*pripiski*) were directly punishable by law, and more easily exposed by dissatisfied customers. Therefore, Khanin is generally more ready to use physical output data as a foundation for alternative estimates, while accepting that distortion did take place, and that it may not have been constant over time.<sup>24</sup> Khanin argues that there were two main waves of distortion of physical output, one in the prewar years (corrected in the 1950s) which resulted from the Stalinist excess of optimism, and another in the late 1980s associated with the disintegration of rule-governed behaviour under *perestroika*.<sup>25</sup>

Khanin also claims to have checked the trustworthiness of the data which he uses against a wide range of consistency criteria, including consistency at a point in time, synchronicity through time, and compatibility with regularities of technological and economic development observed in other countries.<sup>26</sup>

*Which indicators?*

Khanin identifies a number of principles which should underlie the choice of indirect indicators.<sup>27</sup> First, there is no one ideal model. All methods of indirect estimation will imperfectly predict aggregate trends. All the feasible models should therefore be used. Final estimates should take the form of the unweighted average of the result of each different model; as with the Hungarian physical indicators approach, "unweightedness" is an attribute of the method'.<sup>28</sup>

The different models should, however, be conceptually consistent with each other; their results should also be distributed within a narrow range, and discrepancies should be randomly distributed. The extent of agreement of each model with the others in estimating national income growth over many periods should form a criterion for their inclusion. They should work at both low and high levels of economic development. They should not have exotic data requirements, but should be viable on the basis of published data sources. They should rest predominantly on the identified range of reliable data—microeconomic series and series for physical output.

Last, but not least, 'the results obtained should not contradict *the daily living*

*experience of the broad masses, as in the sphere of production, so too in the sphere of consumption*'.<sup>29</sup>

*Conceptual and technical consistency*

The models which Khanin has developed for estimating the various national aggregates are set out in appendix A—six for industrial production, three each for construction and for national income, two for the capital stock and one for materials intensity. Taken as a whole, they inspire admiration for both the ingenuity required to invent them and the qualities of diligence and dogged determination required for a single individual to put them to such practical use; they assure a place for Khanin in the history of applied economic statistics.

Application of the full range of models is confined generally to the period 1955–75. However, some of them are extended to the periods before and after, making possible long-run evaluations covering the whole period from 1928 to the very recent past.

While a blow by blow evaluation of each model would be out of place, it is possible to make a general appraisal of their individual and collective consistency, robustness in practice, and the replicability of results. First, detailed inspection indicates that, in both broad conceptual and narrowly technical terms, each model is internally consistent. The assumptions required to operate them are honestly stated, and I have had to add little to Khanin's own commentary in order to compile the appendix. Taken as a whole, however, there are elements of inconsistency between the different models. These inconsistencies are both conceptual and technical in character; the size of their effects on results may not be serious but cannot be judged on present information.

The conceptual inconsistency is relatively mild. Two of the models used to estimate industrial production (IP–2, IP–4) incorporate assumptions about the relationship between outputs and materials inputs (IP–2 assumes that the relationship is one of fixed coefficients in the long run; IP–4 assumes that the technological relationship between industrial production and electricity consumption (which in turn requires the expenditure of coal and oil) is internationally homogeneous). The resulting index of industrial production contributes to Khanin's figures for growth of national income which, in turn, is contrasted with the estimated growth of consumption of raw materials to show that the volume of raw materials consumed per unit of real national product ('materials intensity') has been rising gently through time. Khanin notes that his initial assumptions are if anything favourable to the Soviet record, but it is not clear that he is aware of the element of circularity.<sup>30</sup>

The technical inconsistency between different models involves the use of incompatible weighting schemes. Twelve models are used to estimate different product categories, several using more than one weighting scheme. Five involve some element of fixed weights of various types of years (mainly from the 1960s and 1970s), five involve continuously or occasionally variable weighting schemes, two involve US dollar prices (whether of fixed years is not stated), and in four cases some element of the weighting scheme is not defined. When it comes to taking an average for final estimates of industrial production or national income, we cannot classify the properties of the resulting indices. On balance it looks as though the results must fall nearer

index numbers of fixed, late years than of fixed, early years, and somewhere in between fixed and variable weighted index numbers.

### *Robustness*

The best guide to robustness is the strength of the assumptions required to operate each model. Here it is apparent that some of Khanin's models are much more robust than others. Some rely on a broad sample of relatively reliable data, which can be aggregated on reasonable assumptions to which results will not be unduly sensitive—for example, IP-1, and also NI-1 if the underlying series are accepted as reliable. In other cases data from relatively restricted spheres of activity are made to carry a terrific burden of responsibility for judging overall results after underpinning them with relatively strained hypotheses—for example, IP-2, IP-4, IP-6, CON-1. There are many intervening categories, including one which looks as if it ought to work (NI-2) but relies on US-Soviet comparisons of fearsome difficulty and unreliability.

For industrial series Khanin allows electric power consumption and capacity to carry quite a lot of weight (IP-4, CAP-1). Here (as also in the matter of 'unweightedness') he comes close to the Hungarian method of physical indicators.<sup>31</sup> However, individual physical indicators can be poor predictors of development rate and level. Consider, as analogues for estimating Soviet GNP, Canada versus the United States over the period 1937-60. In 1937 Canada used more than three times the US amount of electricity to generate a dollar's worth of GNP; by 1960 this ratio had fallen below twice as much. It follows that, for dynamic comparisons, the growth characteristics of Canadian electricity consumption were also quite different from those of the United States. The Canadian elasticity of power consumption with respect to GNP was roughly 1.25, half that of the United States.<sup>32</sup> Thus, dividing Soviet power consumption by the Canadian power/GNP ratio from this period would have suggested a much lower Soviet GNP level, but *growing twice as fast*.

All this is no surprise, and is one reason for Khanin's combining and unweighted averaging of the results of different models. In this way the greatest use can be made of the available data judged reliable, and the consequences of any one model's bias are reduced, perhaps even offset. At the same time, it may be worth remembering that 'unweightedness' is in some ways a misnomer; what is involved is forcing each model to bear *equal weight*, instead of allowing weights to be chosen through interaction of the data with reliability criteria. For example, an alternative procedure would be to choose the apparently most reliable method (say, IP-1, or NI-1) for a central estimate, and use the other methods to help shade the resulting figure, define the side on which it is better to err, or set the margins of possible error.

### *Replicability*

Khanin's work represents a giant step forward compared with traditional Soviet quantitative work in its presentation of evidence, *glasnost* concerning sources and methods, and attention to replicability of results. His efforts are not entirely successful (for reasons of space, *Dinamika* includes only three-fifths of the data included in his

dissertation), and only in a few cases is it possible to follow his calculations through their various stages.<sup>33</sup>

In some cases this is extremely tantalising. For example, why is his estimate of economic growth under the prewar five-year plans so far below those of Bergson, Moorsteen and Powell? This critical gap can hardly be explained by reference to underlying branch product indices, since his figures for industrial production are close to Moorsteen & Powell's (in 1937 rubles), and he uses official index numbers for agriculture and railway transport.<sup>34</sup> The answer must lie in Khanin's weighting of these branch indices when he combines them; agriculture, in particular, must attract an enlarged weight. Khanin tells us that he used branch shares in the labour incomes of the workforce (appendix A, NI-1), but data on labour incomes in Soviet agriculture were not collected under headings comparable to those used for other branches, either before or after collectivisation, and Khanin does not tell us what data he used to approximate this concept.<sup>35</sup>

There is also some doubt around Khanin's view of steady decline in the rate of economic growth through the 1960s. CIA results (mentioned above), which show a temporary revival in the late 1960s, are based on improved economic performance in non-industrial branches, especially agriculture, construction and trade. Given the extent to which these are based on serial data for physical output, it is not clear why improved non-industrial economic results for the late 1960s do not also show up in Khanin's estimates of national income growth for the same period.<sup>36</sup>

#### *Hidden inflation and the index number problem*

Study of Khanin's sources and methods also casts light on whether his findings are truly comparable with alternative Soviet official and Western estimates.

What is the most important distortion in Soviet official statistics which an honest methodology must correct? Loosely speaking, the postwar decades have seen a major evolution in the answer to this question, from the insights of the RAND project to those of modern revisionists. The Western literature of the 1950s and 1960s was permeated by the understanding that there is no one *vernaya tsifra*; all statistics, and especially index numbers, are value-laden artifacts. For this insight thanks were due first to Gerschenkron for a fundamental advance in index number theory; this soon became known as the 'Gerschenkron effect'.<sup>37</sup> Changes in the structure of supply and demand over a long period mean that different lines of production grow at different rates. Typically, the most rapidly growing lines have prices which fall relatively; output expands more rapidly when technical change and economies of scale cut unit costs, and falling prices stimulate demand. Consequently, output valued at early-year prices appears to grow more rapidly because of the high value of the most rapidly expanding products. In late year prices, however, the more slowly growing items are more highly valued, and tend to dominate the index.

Levels of economic development play an important part. When the economy is poor and labour is cheap, labour-intensive commodities like food are also cheap, while machinery is expensive. In a more developed, capital-rich economy, machinery has become cheap and abundant, while food is dear. In the 1920s, before the violent structural transformation of the trans-World War II period, Soviet machinery prices

were high, but they fell sharply within a few years relative to food and consumer prices. Consequently, Soviet official indices for the period, based on the so-called 'unchanged prices of 1926/27', could be expected to show much higher rates of subsequent economic growth than indices using weighting schemes based on later years, even without any element of hidden inflation.

On this basis all the Western studies, from the RAND Corporation project through to the latter-day research of the CIA, carefully calculated estimates of Soviet product and income growth using both the Laspeyres formula with fixed weights of various base years (1928, 1937, 1955, 1970, 1982), and Paasche indices with continuously variable weights, or, if they could not, carefully spelt out the limitations of their estimates. And when it came to establishing the reasons for the very much higher Soviet official growth estimates, this issue—the choice of weights, and the TsSU preference for fixed weights of early years—loomed larger than anything else.

It is also true that the Gerschenkron effect was particularly strong in the first stages of Soviet industrialisation. Thus, for 1928–40 Nutter's estimate of Soviet industrial production grows at 19.3% per year at 1928 prices, but only 8.7% at prices of 1955.<sup>38</sup> According to Bergson, GNP at 1928 prices grew by 11.9% annually in 1928–37, but only 5.5% at prices of 1937.<sup>39</sup> In the postwar period the Gerschenkron effect is still at work, but on a much smaller scale. Thus, when the CIA shifted its base year for GNP valuation from 1970 to 1982, the result was to cut the estimated rate of Soviet GNP growth over 1951–84 by roughly half a percentage point.<sup>40</sup> (And this, incidentally, is the reason why any discrepancy in postwar economic growth rates between the CIA and Khanin has now disappeared.)

Of course it was understood amongst this generation of scholars that there were other sources of distortion too in the official record. Among them was recognised the failure to control the relationship between the price and use characteristics of products, resulting in hidden inflation. Thus, the secrets of the 'unchanged prices of 1926/27', which in reality rose steadily from year to year through the 1930s as new products were introduced into the *nomenklatura* of the engineering industry, were carefully unravelled by Jasny and Hodgman.<sup>41</sup> But as the main source of bias in Soviet official data the profession was generally more impressed by the Gerschenkron effect; this impression was reinforced by the fact that, when Moorsteen estimated Soviet machinery output in fixed prices of 1928, he found that it rose faster than even the official index allowed, despite the fact that the engineering industry was supposedly the main locus of price-quality drift and hidden inflation.<sup>42</sup>

On the other hand, in the Soviet (now Russian) literature on growth rates and development levels, awareness of index number problems, and of the decisive significance of the choice of values used for weighting outputs, was and remains very low. Instead, it is widely believed that, behind the *lukavaya tsifra* of official pseudo-science, there is an objective *vernaya tsifra* waiting to be uncovered by real science. It would be tempting to ascribe this neglect of value standards to the influence of an economic culture in which prices were seen to play little allocative role; more certainly, it reflects a serious training deficit among economists with quantitative concerns.

Today, Khanin, with others, has done the undoubted and indisputable service of placing the issue of hidden price inflation—its systemic roots and its consequences for



official statistics, policy choice and resource allocation—squarely at the centre of our understanding of the old Soviet economic system. But at the same time the old index number problems have tended to disappear from view.

### *Comparability of competing estimates*

When reading Khanin and comparing his results with others', it is important, therefore, to remember that assumptions are continually being made about prices and weights, implicitly if not explicitly, which are decisive both for the resulting evaluation, and also for its comparability.

Here are three examples. First, Khanin uses the relationship between electricity consumption and industrial production observed in the United States to predict the growth of Soviet industrial production (IP-4). But the result is that Soviet industrial production is estimated *as if valued in US dollars of the period used*; on the basis of the Gerschenkron effect, we can guess that this will give us a lower growth rate for Soviet industrial production than a ruble value estimate, because relatively low US machinery prices downvalued the most rapidly growing branch of Soviet output.

Second, we have seen that the trans-World War II period (1928–50) is crucial to the difference between Khanin's and the best Western estimates for Soviet economic growth over the long period. And we do not know exactly why Khanin's estimate is so far below those of Bergson, Moorsteen and Powell, but we have guessed that a decisive role is played in the difference by an obscure weighting scheme.

Third, Khanin employs a direct comparison between his product indices and those of TsSU in order to estimate hidden inflation (see above—TsSU, divided by Khanin, measures the concealed rise in the price/quality ratio). But there are two components, not one, rolled up together in the discrepancy between Khanin and TsSU. One of them is TsSU's failure to account for hidden inflation, but the other is a pure index number effect: where Khanin uses a mixture of late-year and variable weights, TsSU prefers fixed early-year weights to value real output. Khanin's measure of hidden inflation includes both components, hidden inflation and the index number effect, without differentiating between them. Probably this is less important in the postwar period, when the structure of Soviet industry and the economy changed relatively slowly and different index number concepts could be expected to diverge only to a small extent. But we know for a certainty that in the prewar period the Gerschenkron effect was very marked, and it follows that Khanin's figures for hidden inflation between 1928 and World War II are significantly overstated to this extent.

### *From economic crisis to collapse*

Khanin's most recent work clarifies the trends of the very recent past. Tables 2 and 3 show the 1980s as beginning with two years of absolute decline. A weak recovery began in 1982, and was sustained through the middle years of the decade. Khanin believes this recovery is overstated in his figures by the extent to which there was a sharp increase in *prípiski* (fictitious output) as administrative controls and legal sanctions weakened; but this exaggeration is offset by understatement of the rising output of the private sector.<sup>43</sup> Recovery was followed in 1988 by a very sharp

downturn. In the most recent period factor inputs stopped growing, but they do not explain the extent of the setback to production, since output per unit of capital and employment alike fell dramatically, while materials intensity rose.

Khanin's discussion of the causes of the processes leading up to the Soviet economic collapse is markedly broader than the themes of *Dinamika*, reflecting no doubt the freer atmosphere in which it is written. Some of it is conventional. He criticises the half-hearted, compromise character of *perestroika*—the partial reforms, the undermining of the administrative system coupled with the failure to replace it with anything else, the attempts to avert social and national disintegration at the expense of the budget deficit.<sup>44</sup> These aspects, Khanin believes, come together to explain the phasing of economic collapse; *perestroika* opened not with an immediate turn to whole-hearted reform but with *uskorenie* (acceleration), an attempt to modernise the economy and raise living standards by the discredited means of mobilisation for extensive growth.<sup>45</sup>

Less convincingly, Khanin devotes some attention to the factor of economic sabotage by conservative officials.<sup>46</sup> While the possibility of ill-intentioned decisions is undeniable, in Soviet history the political consequences of social panic over sabotage allegations have typically exceeded the real economic consequences of sabotage, if any, by several orders of magnitude.

In his writings of 1990–91, Khanin is deeply pessimistic as to the possibilities of finding a way out of the crisis, but the reasons for his pessimism do not flow directly from economic analysis. Rather he believes that the Soviet Union has suffered a deep-seated degradation of its population as a result of 70 years' dictatorship and repression. Soviet history began with three demographic crises—the civil war and famine of the early 1920s; then collectivisation, renewed famine, and purges in the 1930s; and World War II. Each of these carried off a proportion of Soviet society's most educated, energetic, creative citizens—farmers, workers, scientists, intellectuals. In the postwar years this social stratum was no longer threatened by violent death, but was held back by principles of 'negative selection', which persisted into the most recent past. Mediocrity was rewarded, and social ideals were undermined. Results included systematic neglect of the health and physical environment of the population, reaching crisis proportions in the present day.<sup>47</sup>

Consequently, by the summer of 1992 the scale of the downturn in the Soviet economy had already substantially exceeded that of the Western market economies in the slump of 1929–32, but with the difference that there was no prospect of recovery.<sup>48</sup> No one has yet suggested a strategy for overcoming the crisis adequate to its depth and the difficulty of dealing with it. Meanwhile, criticism of current official statistics remains necessary, since their accuracy has not improved—indeed, in some respects it has worsened.

### *Conclusion*

Khanin's alternative evaluation of Soviet economic growth is a very serious, thoughtfully designed and comprehensive challenge to both Soviet official and Western independent statistical methodologies.

Khanin's results tend to suggest (a) that Soviet official statistical claims were

greatly exaggerated, (b) that Western independent studies also exaggerated Soviet prewar economic growth by a significant margin, and Soviet postwar economic growth by a small or negligible margin, (c) that Western studies underestimated the Soviet economic renaissance of the 1950s, (d) that both camps overstated the economic results of the Kosygin reforms in the second half of the 1960s, and (e) that the most recent economic crisis had already begun with negative economic growth in 1979–82, which the successive shocks administered by Andropov and Gorbachev (in the latter case the policy of *uskorenie*) reversed only temporarily.

The concept of hidden inflation, and the study of its origins and consequences, form the central theme of the analysis underpinning these findings.

In the past it was possible for antagonists to dismiss Khanin's work, and for more sympathetic sceptics to maintain reservations, on the grounds that his sources and methods were not fully available. Publication of *Dinamika* in 1991 has removed most (but not all) of the grounds for such reservations. From what is now available it is clear that Khanin's estimates are honest and, for the most part, consistent and well founded.

Not all reservations can be eliminated. Some of Khanin's sources and methods are not clarified, and some calculations remain non-replicable. Moreover, some important technical inconsistencies remain among the various estimating models which he deploys, the most important of which arises from neglect of index number problems.

The most important practical results are that it is impossible to confirm Khanin's very pessimistic appraisal of the results of the prewar five-year plans, and of the late 1960s, and that Khanin's estimate of hidden inflation over the long period since 1928 almost certainly lumps together both real hidden inflation and an index number effect without distinguishing between them.

The most important conclusion arising from these considerations is that Khanin's work cannot be regarded as standing apart from the mainstream of future work on these subjects. Both Russian and Western statistical authorities are faced with a considerable challenge in order to reconcile their own procedures and analysis with what Khanin has achieved, largely on his own, despite official harassment and very limited resources.

*University of Warwick*

#### APPENDIX A. KHANIN'S INDIRECT INDICATORS AND ESTIMATING MODELS: CONCEPTS, METHODOLOGY, AND COVERAGE<sup>49</sup>

##### *Industrial Production (IP)*

###### **IP-1.**

*Concept:* growth of physical output of 104 civilian industrial products, plus munitions output (from estimated employment growth, times estimated productivity growth in civilian industry).

*Weighting scheme:*

- (a) industrial branch indices—'average' wholesale product prices of 1972;
- (b) industry as a whole—branch wage funds, 1960 (for 1955–65) and 1968 (1965–75).

*Main assumptions:*

- (a) representativeness of commodity sample;
- (b) prices proportional to value added;
- (c) productivity growth in munitions equals that in civilian industry.

*Period covered:* 1955–75.

### **IP-2.**

*Concept:* industrial employment growth, times a labour productivity index  $q_t$  which is estimated from data for engineering, then generalised to industry as a whole;

$$q_t = (w_t/c_t)/(w \cdot L)_t/(c \cdot Q)_t$$

i.e. the ratio between index numbers of wages ( $w_t$ ) and unit costs ( $c_t$ ) in engineering, divided by the share of the wage bill ( $w \cdot L$ ), in total costs ( $c \cdot Q$ ), of the engineering industry. The index of unit costs ( $c_t$ ) is estimated independently from representative products of engineering established in serial production.

*Weighting scheme:* the converse of the scheme used to weight  $c_t$  (i.e. if the weights of  $c_t$  are fixed, then  $q_t$  has variable weights, and vice versa). Probably not important, since the period covered is very short.

*Main assumptions:*

- (a) constant material costs per unit output, based on US experience;
- (b) real output per worker rises at the same rate in non-engineering branches as in engineering, since there were roughly matching trends in capital per worker.

*Period covered:* 1967–72.

### **IP-3.**

*Concept:* growth of raw material consumption, assuming constant material costs per unit of output, extrapolated from the 1959, 1966, and 1972 input–output tables.

*Weighting scheme:* fixed materials prices of 1966.

*Main assumptions:* constant material costs per unit of output (as IP-2).

*Period covered:* 1955–75.

### **IP-4.**

*Concept:* growth of electric power consumption, multiplied by the US elasticity of industrial production with respect to electric power consumption, estimated over a period defined as analogous to the Soviet period in terms of change in US power consumption per worker.

*Weighting scheme:* implicitly, the same dollar prices used in estimating the US model.

*Main assumptions:* similarity of Soviet to United States processes of power consumption in respect of:

- (a) the change in proportions between motive, technological and service uses,
- (b) the change in efficiency of power utilisation.

*Period covered:* 1955–75.

**IP-5.**

*Concept:* planned growth of value of branch output, times percentage fulfilment of branch targets in physical units.

*Weighting scheme:* percentage fulfilment of branch targets—'average' wholesale product prices (as IP-1). Industry as a whole—as IP-1.

*Main assumptions:*

- (a) value of output is planned at truly fixed prices;
- (b) representativeness of branch commodity samples, sensitive to absence of munitions, chemical products, and non-serial engineering products.

*Period covered:* 1955–75.

**IP-6.**

*Concept:* industrial employment growth, times a labour productivity index  $q_t$ , estimated as IP-2 from data for engineering, then generalised to industry as a whole. But an index of export prices of engineering products ( $p_t$ ) is used instead of the index of unit costs ( $c_t$ ) used in IP-2, and export receipts of engineering ( $p \cdot X_t$ ) are used instead of total output, i.e.

$$q_t = (w_t/p_t)/[(w \cdot L)_t/(p \cdot X)_t]$$

Again,  $p_t$  is estimated independently.

*Weighting scheme:* as IP-2.

*Main assumptions:*

- (a) export prices are assumed to be automatically quality-adjusted by competition in the world market;
- (b) growth of real output per worker in engineering is a good guide to trends in industry as a whole (as IP-2).

*Period covered:* 1967–72.

*Construction (CON)*

**CON-1.**

*Concept:* a measure of residential construction, divided by the share of residential construction ( $RC$ ) in the value of total construction ( $CON$ ) activity,  $RC_t/(RC/CON)_t$ , (the reason for this procedure is that residential construction is easier to measure than non-residential).  $RC_t$  is an index of the volume ( $V_t$ ) of residential construction in  $m^2$ , adjusted for the change in housing quality ( $h_t$ ); the latter is measured by the change in unit costs ( $c_t$ ) not accounted for by changes in input prices ( $i_t$ ), i.e.

$$\begin{aligned} h_t &= c_t/i_t \\ RC_t &= V_t h_t \\ &= (c \cdot V)_t / i_t \end{aligned}$$

*Weighting scheme:* same as the schemes used to weight  $c_t$  and  $i_t$  (i.e. if the weights of  $c_t$  and  $i_t$  are fixed, then  $RC_t$  has variable weights, which will leave overall construction as a fixed weight index, and vice versa).

*Main assumptions:*

- (a) unit costs rise at the same rate in residential and non-residential construction;
- (b) housing quality varies with the change in unit costs not accounted for by changes in input prices.

*Period covered:* 1955–75.

**CON-2.**

*Concept:* the change in additions to capacity in physical units of output, for a varying range (between 20 and 40) of main industrial products.

*Weighting scheme:* branch indices of new capacity—arithmetic mean of product indices (i.e. all prices are assumed fixed and equal to one). Industry as a whole—variable weights (branch shares in value of total investment).

*Main assumptions:*

- (a) changes in construction activity aimed at reconstructing existing capacity, not adding new capacity, may be ignored, together with construction activity for defence and conservation;
- (b) representativeness of the commodity sample.
- (c) assumes that branch shares in total investment are representative of branch shares in the narrower range of construction and installation activities.

*Period covered:* 1951–75.

**CON-3.**

*Concept:* planned additions to capacity in terms of value of output, times percentage fulfilment of targets in physical units of output.

*Weighting scheme:* as CON-2.

*Main assumptions:*

- (a) value of output resulting from additions to new capacity is planned at truly fixed prices;
- (b) representativeness of the commodity sample.

*Period covered:* 1956–75.

*National Income (NI)*

**NI-1.**

*Concept:* an index of global social product, deflated by an index of materials intensity (below). Independently estimated measures of gross value of output (GVO) of industry, construction and motor transport are combined with official indices for GVO of agriculture, rail transport and trade.

*Weighting scheme:* branch shares in ‘wage fund’; not stated how the share of agriculture is estimated, nor whether shares are fixed or variable.

*Main assumptions:* reliability of official indices of GVO of agriculture, rail transport and trade.

*Period covered:* 1928–80.

**NI-2.**

*Concept:* an index of US GNP, multiplied by an index of the ratio of Soviet to US GNP. This ratio is taken as the average of two alternative measures:

- (a) a TsSU measure, based on re-pricing at purchasing power parity (only the change in the measure matters, so distortion of the level does not matter);
- (b) independent re-pricing of consumption (selected commodities in physical units), investment (residential construction in each country, divided by the share of residential in total

investment—see CON-2), and defence goods and services (measures available in published literature).

*Weighting scheme:*

- (a) US dollars of years used in the TsSU methodology;
- (b) purchasing power parity of goods compared, weights not specified.

*Main assumptions:*

- (a) only the change in the ratio of Soviet to US GNP matters, so Soviet official distortion of relative levels may be ignored;
- (b) representativeness of commodities entering into US–Soviet comparisons, and reliability of quality comparisons (especially for US housing).

*Period covered:*

- (a) 1955–75.
- (b) 1928–80.

### **NI-3.**

*Concept:* branch outputs, from NI-1, allocated between expenditure categories and re-weighted by expenditure shares.

*Weighting scheme:* implicitly variable.

*Main assumptions:* reliability of allocation of branch products between uses.

*Period covered:* 1928–80.

### *The Capital Stock (CAP)*

#### **CAP-1.**

*Concept:* industrial capital stock, based on serial data for electric motor capacity in industry, divided by the share of industry in the capital stock as a whole.

*Weighting scheme:* In the first stage electric motor capacity is implicitly given a fixed weight of 100%; at the final stage, industrial and non-industrial assets are given variable weights.

*Main assumptions:* the change in the price of electric motors represents the change in price of all industrial fixed assets.

*Period covered:* 1928–80.

#### **CAP-2.**

*Concept:* initial capital stock in 1928, plus the value of investment in each year deflated by an index of investment good prices, less depreciation in each year at 3%.

*Weighting scheme:* the converse of the scheme used to weight the index of investment prices, i.e. if the weights of the price index are fixed, then the capital stock index has variable weights, and vice versa.

*Main assumptions:* reliability of:

- (a) index of investment good prices;
- (b) constant depreciation factor.

*Period covered:* 1928–80.

### *Materials Intensity (MAT)*

#### **MAT-1.**

*Concept:* raw materials consumed per unit of national income. Raw materials consumption is

measured by an index of the output of raw materials producing branches (an official combined index since 1960; before then, official indices for coal and oil), adjusted for net raw materials imports.

*Weighting scheme:* not stated.

*Main assumptions:*

- (a) reliability of official index of materials produced;
- (b) representativeness of coal and oil before 1960.

*Period covered:* 1928–80.

I wish to thank Bob Davies, Michael Ellman, Girsh Khanin and Gertrude Schroeder for comments on an earlier draft; Ellman in particular gave me much considered advice, all of it useful. I am especially grateful to Khanin for clarifying some of his views in correspondence, which saved me from various errors and misapprehensions, and for much of the personal information which appears in the article. This research is supported financially by a grant from the Leverhulme Trust towards research on 'Soviet production, employment, and the defence burden, 1937 and 1940–1945'. Responsibility for remaining errors of fact and interpretation is mine alone.

<sup>1</sup> For full details of this and Khanin's other works, see the attached list of references.

<sup>2</sup> These and other Soviet reactions of the time are surveyed by Ericson, 'The Soviet statistical debate', pp. 86–89. The abusive and economically illiterate tone of such critical responses continued until quite recently; see for example Kozlov, 'Tonkosti scheta i dostovernost' dannykh', followed by Khanin's reply, 'Otvét opponentu'.

<sup>3</sup> Most sympathetic was Ericson, 'The Soviet statistical debate', first circulated in 1988; Ericson was fortunate to attend two seminars given by Khanin personally under Academy of Sciences auspices in Moscow in the spring of 1987. For a more guarded welcome, also in 1988, see Kushnirsky, 'New challenges to Soviet official statistics'. Still more defensive was the official response of the same year from the CIA's Directorate of Intelligence, *Revisiting Soviet economic performance*.

<sup>4</sup> 'Al'ternativnaya otsenka'; 'Puti sovershenstvovaniya'.

<sup>5</sup> *Sovetskii ekonomicheskii rost: analiz zapadnykh otsenok*, in preparation.

<sup>6</sup> For alternative economic growth estimates by Abel Aganbegyan, the Institute of World Economy and International Relations (IMEMO), and others, see Kushnirsky, 'New challenges to Soviet official statistics'; CIA, *Revisiting Soviet economic performance*; Ericson, 'The Soviet statistical debate' (more informative on this score in its first, research-paper format); Åslund, 'How small is Soviet national income?'.

<sup>7</sup> See, for recent examples, on Soviet per capita consumption, Navrozov, 'Assessing the CIA's "Soviet economic indices"', and Hanson, 'Navrozov versus the Agency'; on forced labour, Wheatcroft, 'More light on the scale of repression', and Conquest, 'Excess deaths and camp numbers'.

<sup>8</sup> *Dinamika*, pp. 41–51.

<sup>9</sup> *Dinamika*, pp. 51–102; F. E. Dzerzhinsky emerges as the first Soviet leader to identify such problems and take them seriously.

<sup>10</sup> So, too did Igor Birman in works such as 'Financial crisis', 'Inflation and the money supply' (with Roger A. Clarke), and 'Imbalance'.

<sup>11</sup> For a survey see Nuti, 'Hidden and repressed inflation', pp. 109–118.

<sup>12</sup> *Dinamika*, pp. 14–41.

<sup>13</sup> *Dinamika*, pp. 14–97.

<sup>14</sup> *Dinamika*, p. 175.

<sup>15</sup> Jasny, *Soviet industrialization*, pp. 122–125.

<sup>16</sup> *Dinamika*, p. 50.

<sup>17</sup> Kontorovich, 'Lessons of the 1965 Soviet economic reform'.

<sup>18</sup> CIA, *Measures of Soviet GNP*, p. 58.

<sup>19</sup> This point, attributed to Vasilii Selyunin, is made by Ericson, 'The Soviet statistical debate', p. 91.

<sup>20</sup> *Dinamika*, pp. 156, 177.

<sup>21</sup> The CIA does this with its own figures, but defines output and labour inputs in ways which differ too widely from those used here for comparison to be useful. CIA estimates for total factor



productivity are confined to either 'nonagricultural, nonservice GNP', or industrial production; labour inputs are measured in 'man-hours', not employment. See for examples CIA, *Handbook 1990*, pp. 66–67.

<sup>22</sup> The continuities of this intellectual tradition are outlined briefly in CIA, *Measures of Soviet GNP*, p. 2.

<sup>23</sup> Seton, 'The tempo of Soviet industrial expansion', and 'Soviet progress in Western perspective'; Beckerman, *International comparisons of real incomes*; Ehrlich, 'Contest between countries'. The Hungarian methodology was adopted for a time by the UN Economic Commission for Europe.

<sup>24</sup> *Dinamika*, pp. 14–28. However, it should be noted that in the Stalin years agricultural production data were distorted by *pripiski* at the highest level (Wheatcroft, Davies, Cooper, 'Soviet industrialization reconsidered', p. 280). This distortion went entirely unpunished, and the power of dissatisfied food consumers to expose them was absolutely negligible.

<sup>25</sup> *Dinamika*, pp. 107–108 'Economic growth', p. 78.

<sup>26</sup> *Dinamika*, pp. 29–32.

<sup>27</sup> *Dinamika*, pp. 102–114.

<sup>28</sup> The quotation is from Ehrlich, 'Contest between countries', p. 876.

<sup>29</sup> *Dinamika*, p. 114 (emphasis added).

<sup>30</sup> *Dinamika*, pp. 109–112.

<sup>31</sup> A significant difference is that the Hungarian method relies on synchronous observations across countries. In correspondence, Khanin stresses that '... I use data for American industry as a standard in determination of Soviet estimates of growth for analogous periods, i.e. periods were chosen which were comparable in terms of the level of power consumption [per worker], not periods which coincided chronologically.'

<sup>32</sup> GNPs (measured in US dollars of 1985) and populations are from Maddison, *Dynamic forces in capitalist development*, appendices A, B. Electricity consumption per head is from Ehrlich, 'Nemzetközi elemzések a magyar távlati tervezéshez', p. 17.

<sup>33</sup> This was also the conclusion of Kushnirsky, 'New challenges to Soviet official statistics', pp. 12–19. The latter also found it difficult to replicate Khanin's results from data which were available. The discrepant results which Kushnirsky found may have arisen because his simulations often departed from the letter and spirit of Khanin's methodology, but this then reflects badly on the robustness of Khanin's findings, since it suggests that they are excessively sensitive to small variations in data sources and approaches to estimation.

<sup>34</sup> One possibility is a lower estimate for construction, but Khanin does not report a construction series for before 1955, and Moorsteen & Powell's series for the period only carries a 5% weight in 1937 GNP (*The Soviet capital stock*, p. 622).

<sup>35</sup> Khanin calls it the '*fond oplaty truda robotnikov*' (*Dinamika*, p. 139). In correspondence he adds: 'In calculating weights, as a rule, I used weights of late years of the period under review. But so did Western authors. So there is no difference between us here'.

<sup>36</sup> Gertrude Schroeder drew this point to my attention in correspondence.

<sup>37</sup> Gerschenkron, *A dollar index of Soviet machinery output*.

<sup>38</sup> Nutter, *Growth of industrial production*, pp. 144, 146.

<sup>39</sup> Bergson, *Real national income*, p. 217.

<sup>40</sup> CIA, *Measures of Soviet GNP*, p. 8.

<sup>41</sup> Jasny, *The Soviet price system*, pp. 110–116; Hodgman, *Soviet industrial production*, pp. 9–11.

<sup>42</sup> Moorsteen, *Prices and production*, p. 115.

<sup>43</sup> 'Economic growth in the 1980s', p. 78.

<sup>44</sup> 'Ekonomicheskii rost v SSSR', pp. 28–33. This analysis is developed at greater length in 'Economic growth in the 1980s', pp. 81–83, and updated in 'The Soviet economy: from crisis to catastrophe'.

<sup>45</sup> 'Ekonomicheskii rost v SSSR', p. 31.

<sup>46</sup> 'Economic growth in the 1980s', pp. 83–84.

<sup>47</sup> 'Ekonomicheskii rost v SSSR', pp. 25–26.

<sup>48</sup> 'Ekonomicheskii rost v SSSR', p. 34; 'Pervyi kvartal 1992 g.', p. 34.

<sup>49</sup> This appendix summarises *Dinamika*, pp. 114–143, with a minor element of added commentary. The identifying symbols (IP-1, etc.) are mine.

## References

### (A) G. I. Khanin

'Al'ternativnaya otsenka rezul'tatov khozyaistvennoi deyatelnosti proizvodstvennykh yacheek promyshlennosti', *Izvestiya AN SSSR. Seriya ekonomicheskaya*, 1981, 6.

- 'Puti sovershenstvovaniya informatsionnogo obespecheniya svodnykh planovykh narodnokhozyaistvennykh raschetov', *Izvestiya AN SSSR. Seriya ekonomicheskaya*, 1984, 3.
- 'Sochem fondy', *Sotsialisticheskaya industriya*, 27 August 1986.
- Metody opredeleniya dinamiki optovykh tsen* (with V. A. Volkonsky, A. P. Vavilov, A. V. Pavlov, Yu. P. Solov'ev), (Moscow, 1986).
- 'Lukavaya tsifra' (with V. Selyunin), *Novyi mir*, 1987, 2.
- 'V poiskakh bolee tochnykh ekonomicheskikh otsenok (iz istorii sovetskoï ekonomicheskoi nauki vtoroi poloviny 30-kh i 40-kh godov)', *Izvestiya sibirskogo otdeleniya AN SSSR. Seriya ekonomiki i prikladnoi sotsiologii*, 1987, 1.
- 'O roli tsen v raschetakh sootnosheniya mezhdú sovokupnym obshchestvennym produktom i natsional'nym dokhodom v sovetskom ekonomike (1928–1950 gg.)', *Ekonomicheskie nauki*, 1987, 10.
- 'Ekonomicheskii rost: al'ternativnaya otsenka', *Kommunist*, 1988, 17.
- 'Opredelenie dinamiki tsen v sovetskoï ekonomike za 1929–1985 gg.', *Ekonomiko-matematicheskie metody*, 1989, 3.
- 'Ob otsenke ob''ema i dinamiki osnovnykh proizvodstvennykh fondov', *Ekonomicheskie nauki*, 1989, 6.
- 'Razmyshlenie nad tsiframi 1988 g.', *EKO*, 1989, 4.
- 'Pochemu i kogda pogib NEP', *EKO*, 1989, 10.
- 'Krizis uglublyaetsya', *EKO*, 1990, 1.
- Dinamika ekonomicheskogo razvitiya SSSR* (Novosibirsk, 1991).
- 'Otvét opponentu', *EKO*, 1991, 2.
- 'Ekonomicheskii rost v SSSR v 80-e gody', *EKO*, 1991, 5. Translated, and considerably extended, as 'Economic growth in the 1980s', in M. Ellman & V. Kontorovich, eds., *The Disintegration of the Soviet Economic System* (London, 1992).
- 'Novyi etap krizisa', *Kommunist*, 1991, 12.
- 'The Soviet economy: from crisis to catastrophe', Working paper 33, Stockholm Institute of Soviet and East European Economics, 1991. To be published in A. Åslund, ed., *The Post-Soviet Economy* (forthcoming, 1992).
- Al'ternativnye otsenki razvitiya sovetskoï ekonomiki i ikh ispol'zovanie dlya upravleniya narodnym khozyaistvom. Avtoreferat na soiskanie uchenoi stepeni doktora ekonomicheskikh nauk*, TsEMI AN SSSR, (Moscow, 1991).
- 'Pervyi kvartal 1992 g.: ekonomicheskie itogi Rossii', *EKO*, 1992, 6.

(B) Other works

- A. Åslund, 'How small is Soviet national income?', in H. S. Rowen & C. Wolf, eds., *The Impoverished Superpower: Perestroika and the Soviet Military Burden* (San Francisco, CA, 1990).
- W. Beckerman, *International Comparisons of Real Incomes* (Paris, 1966).
- A. Bergson, *The Real National Income of Soviet Russia Since 1928* (Cambridge, MA, 1961).
- I. Birman, 'The financial crisis in the USSR', *Soviet Studies*, 32, 1, 1980.
- I. Birman, 'The imbalance of the Soviet economy', *Soviet Studies*, 40, 2, 1988.
- I. Birman, & R. A. Clarke, 'Inflation and the money supply in the Soviet economy', *Soviet Studies*, 37, 4, 1985.
- Central Intelligence Agency, Directorate of Intelligence, *Revisiting Soviet Economic Performance Under Glasnost: Implications for CIA Estimates* (SOV 88–10068) (Washington, DC, September 1988).
- Central Intelligence Agency, *Measures of Soviet Gross National Product in 1982 Prices* (Washington, DC, 1990).
- Central Intelligence Agency, *Handbook of Economic Statistics, 1990* (Washington, DC, 1991).
- R. Conquest, 'Excess deaths and camp numbers: some comments', *Soviet Studies*, 43, 5, 1991.
- É. Ehrlich, 'Nemzetközi elemzések a magyar távlati tervezéshez', *Országos Tervhivatal Tervezésügyi Intézet*, 1968, 2.
- É. Ehrlich, 'Contest between countries: 1937–1986', *Soviet Studies*, 43, 5, 1991.
- R. E. Ericson, 'The Soviet statistical debate: Khanin vs. TsSU', Columbia University, Harriman Institute Occasional Papers, 1, May 1988, published in H. S. Rowen & C. Wolf, eds., *The Impoverished Superpower: Perestroika and the Soviet Military Burden* (San Francisco, CA, 1990).
- A. Gerschenkron, *A dollar index of Soviet machinery output, 1927–28 to 1937* (Santa Monica, CA, RAND Corporation, 1951).

- P. Hanson, 'Navrozov versus the Agency', in P. J. D. Wiles, ed., *The Soviet Economy on the Brink of Reform: Essays in Honor of Alec Nove* (Boston, MA, 1988).
- D. R. Hodgman, *Soviet Industrial Production, 1928–1951* (Cambridge, MA, 1954).
- N. Jasny, *The Soviet Price System* (Stanford, CA, 1951).
- N. Jasny, *Soviet Industrialization, 1928–1952* (Chicago, IL, 1961).
- V. Kontorovich, 'Lessons of the 1965 Soviet economic reform', *Soviet Studies*, 40, 2, 1988.
- T. I. Kozlov, 'Tonkosti scheta i dostovernost' dannykh', *EKO*, 1991, 2.
- F. Kushnirsky, 'New challenges to Soviet official statistics: a methodological survey', in Central Intelligence Agency, Directorate of Intelligence, *The impact of Gorbachev's policies on Soviet economic statistics* (SOV 88–10049) (Washington, DC, July 1988).
- A. Maddison, *Dynamic Forces in Capitalist Development: A Long-run Comparative View* (Oxford, 1991).
- R. Moorsteen, *Prices and Production of Machinery in the Soviet Union, 1928–1958* (Cambridge, MA, 1962).
- R. Moorsteen, & R. P. Powell, *The Soviet Capital Stock, 1928–1962* (Cambridge, MA, 1966).
- L. Navrozov, 'Assessing the CIA's "Soviet economic indices"', in P. J. D. Wiles, ed., *The Soviet Economy on the Brink of Reform: Essays in Honor of Alec Nove* (Boston, MA, 1988).
- D. M. Nuti, 'Hidden and repressed inflation in Soviet-type economies: definitions, measurements and stabilization', in C. Davis, & W. Charemza, eds., *Models of Disequilibrium and Shortage in Centrally Planned Economies* (London, 1989).
- G. W. Nutter, *Growth of Industrial Production in the Soviet Union* (Princeton, NJ, 1962).
- F. Seton, 'The tempo of Soviet industrial expansion', *Manchester Statistical Society*, 2, 1956–57.
- F. Seton, 'Soviet progress in Western perspective', *Soviet Studies*, 12, 1960.
- S. G. Wheatcroft, 'More light on the scale of repression and excess mortality in the Soviet Union in the 1930s', *Soviet Studies*, 42, 2, 1990.
- S. G. Wheatcroft, R. W. Davies, & J. M. Cooper, 'Soviet industrialization reconsidered: some preliminary conclusions about economic development between 1926 and 1941', *Economic History Review*, 39, 2, 1986.